Graphic Communications Teachers' Concerns and Beliefs Regarding Their Online Teaching of Graphic Communications Hands-On Classes

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ABSTRACT

Previous literature has exposed the impact of concerns and beliefs on a teacher's decision to adopt online teaching methods, and in particular for Graphic Communications teachers, the extent to which their concerns and beliefs influence whether or not they decide to teach online. The potential problem that may exist is that of Graphic Communications teachers' concerns and beliefs are playing a role in impeding their transitioning to teaching in the online environment. The purpose of this study was to examine how teacher concerns and beliefs might be affecting a Graphic Communications teacher's adoption of online teaching. Although there are a multitude of factors that may inhibit Graphic Communications teachers from teaching online, this study sought to document the extent to which teacher concerns and beliefs toward online teaching impact their decision to adopt these practices.

This study included a purposeful sample of 79 Graphic Communications educators across the United States and Canada. Data collected from the Graphic Communications Teachers Beliefs Towards Teaching Online (GCTBTTO) survey were analyzed using the Stages of Concern scoring device, simple means, and sample correlation coefficients to examine participant concerns and beliefs towards online teaching and the relationship between their concerns and beliefs. A theme analysis of open-ended responses about teaching online provided further assessment of participant beliefs and concerns towards the innovation.

Findings from this study revealed Graphic Communications teachers who had taught online had higher levels of external concerns and stronger beliefs towards teaching online. Graphic Communications teachers who had not taught online had higher levels of internal concerns and average beliefs towards teaching online. *T*-tests revealed the difference in concerns between the sub-groups of teachers was significant across all stages except Management, where online and non-online teachers had similar management concerns about online teaching. For online teachers, task value and cost beliefs were found to have a moderately strong negative correlation to concerns in the Awareness stage, with no significant relationship between expectancy/ability beliefs and any stages of concern. For teachers not teaching online, task value and cost beliefs had a strong positive correlation with their Collaboration concerns, and expectancy/ability beliefs were strongly positively related to their Refocusing concerns. These findings also revealed that most Graphic Communications teachers do not believe hands-on courses which require manipulation of machinery can be taught online, although online teachers are teaching these types of classes with hybrid methods of instruction. The findings from this study provide implications for change facilitators and their consideration of faculty concerns and beliefs. The recommendations for this study suggest ways in which researchers, educators, and change facilitators can address concerns and beliefs in order to develop new innovative teaching methods for hands-on classes.

Dedication

This dissertation is dedicated to my husband, Scott Carroll, who continued to support me even during my darkest hours on this emotional roller coaster of writing a dissertation. Without your love, support, patience, and managing both the household and taking care of our children, I would have never had the endurance to hang on to my career goal of becoming Dr. Carroll. Thank you for everything you have done for our family during this journey, I love you more than words can express.

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CHAPTER ONE

Introduction

As higher education institutions recognize the need for offering online classes, the shift of teachers moving out of traditional classrooms and into the online realm has grown tremendously (Benson et al., 2004; Johnson et al., 2003; Reese, 2002; Wonacott, 2001). In turn, Allen and Seaman (2014) reported that almost 70% of all surveyed post-secondary degree-granting institutions stated online learning was a critical part of their long-term strategy for future planning. As reported by the Instructional Technology Council (ITC) in 2013, online learning was a major contributor to increasing enrollment in higher education (Mullins, 2013). Parsad and Lewis (2007) report 68% of postsecondary degree-granting institutions chose to offer distance education courses to meet student demands for flexible scheduling. Additionally, 67% of these institutions stated they wanted to provide access to learning where students would have otherwise not had access, whereas 45% reported choosing to offer online courses in order to increase enrollment (Parsad & Lewis, 2007). Subsequently, postsecondary degree-granting universities have begun including online teaching and learning as part of their core mission to compete for students who need flexible and accessible learning (Kang, 2012).

Furthermore, new technological changes and innovative tools have also been the impetus for transitioning from traditional, face-to-face, to online teaching. The pedagogical approach is constantly affected by technology. Technological advances for online teaching allow for almost the same instructional contact and interaction for students as face-to-face courses (Galusha, 1997; Zirkle, 2003). For example, educational technology tools, such as learning management systems, supplemental videos, discussion boards and other Web 2.0 technologies (including social media, blogging and podcasting), open doors for millions of potential online learners and

allow for new interactive models of learning that engage students on a deeper level (Johnson et al., 2003; Moore & Kearsley, 2012). What used to be considered an independent study in a traditional classroom is now an online collaborative space where students are working together from around the world and instruction is facilitated with group discussion and group assignments using Web 2.0 social networking technologies (Moore & Kearsley, 2012). Such educational technology tools are already being used for traditional, face-to-face courses. Since faculty and students alike are already familiar with these technology tools transitioning from the traditional classroom to an online one is less challenging (Johnson et al., 2003; Redmann & Kotrlik, 2004; Zirkle, 2002a, 2003). Information technology has the ability to help universities adapt to the changing needs of students who seek online classes. It changes the roles of students and faculty by facilitating a more learner-centered, personalized education, allows for cost-saving business models for distance education, and opens the door to new curriculum (Horgan, 1998; Palloff & Pratt, 2000).

Considering previous reports of tremendous growth in online education one would expect faculty acceptance of online teaching has also grown. Yet, less than one-third of chief academic officers believe their faculty accepts the value and legitimacy of online education, and furthermore many have reported there has been no change in faculty beliefs in teaching online since 2003 (Allen & Seaman, 2013). According to McQuiggan (2012),

> Some faculty members have embraced online education, but many faculty members are only beginning to integrate technology into their teaching. Most have no experience with online teaching, having spent the majority of their years as a learner in a traditional, face-to-face classroom. Their initial teaching model is typically born from that of their own teachers, and they teach as they were taught. (p. 27)

A 2014 report by the Instructional Technology Council also found that the most challenging area administrators faced by distance learning faculty were engaging them in the development of online pedagogy (Lokken & Mullins, 2014).

Kagan (1992) found teacher's beliefs are often associated with a consistent style of teaching. Teachers can gain knowledge about new instructional practice, but still not be willing to believe in or adopt them (Calderhead, 1996). For example, a teacher may gain the knowledge and skills to teach online, and may also know other teachers who are successfully teaching online courses with high student achievement, but still not believe teaching online is comparable to traditional, face-to-face teaching. Moreover, teachers were found to have concerns about online course preparation, assessment design, and technology usage more than anything (Lin, Dyer, & Guo, 2012).

Career and Technical Education (CTE) teachers in particular are being challenged with the transition to teaching online because their curriculum is primarily focused on hands-on teaching and learning (Dubois, 2002; Johnson et al., 2003; Zirkle, 2003, 2009; Zirkle & Fletcher, 2009). CTE includes sixteen Career Clusters: Science, Technology, Engineering & Mathematics; Law, Public Safety & Security; Agriculture, Food & Natural Resources; Human Services; Transportation, Distribution, & Logistics; Finance; Architecture & Construction; Education & Training; Arts, A/V Technology & Communications; Health Science; Government & Public Administration; Manufacturing; Business, Management & Administration; Marketing, Sales & Service; Information Technology; and Hospitality & Tourism (ACTE, 2013). In CTE programs students "learn by doing" with "hands-on activities, project- and problem-based learning, laboratory and field work, simulations, and internships" (ACTE, NASDCTEc, & P21, 2010, p. 17). CTE teachers typically are prepared in a trade, craft, or occupation. They use this "hands-

on" experience in the classroom to teach their students "real-world" skills that promote problem-solving, critical thinking, and other skills students can transition to their everyday lives upon graduation. CTE classes, where students are manipulating equipment and tools, are not being offered online because they require learning hands-on skills (Dubois, 2002; Johnson et al., 2003).

Where other CTE programs, such as business, information technology, and health information systems have made the successful transition to the online classroom, CTE programs which require hands-on skills are not as common (ACTE, 2013). Institutions are challenged on how to design online hands-on labs and field experiences and lack the resources to do so (Dubois, 2002; Johnson et al., 2003; Shumer, 2001; Zirkle, 2003). Discussion and didactic lecture are easy to transition to the online classroom, but hands-on programs seek to develop skill through practice and application (Githens, Sauer, Crawford, & Wilson, 2012). Johnson et al. (2003) suggests 39.1% of CTE faculty lacked the expertise to teach online. Thus, not all CTE teachers have access to the instructional technology, and teachers often experience barriers to integrating the technology, which causes anxiety over trying to use it in instruction (Kotrlik & Redmann, 2009). Online programs are the ones that can easily be taught online (ACTE, 2013; Githens et al., 2012; Zirkle, 2003, 2009). Githens et al. (2012) identify these common online program areas as CTE courses in business programs. Subject areas that are not easily taught online are those that require the development of hands-on skills, labs, or fieldwork (Dubois, 2002; Johnson et al., 2003; Zirkle, 2003, 2009; Zirkle & Fletcher, 2009). One such area is in graphic communications. This area is commonly titled "Printing Graphics" and falls under the Arts, A/V Technology and Communications Career Cluster (ACTE, 2013). It is particularly challenging to teach graphic communications courses online due to the hands-on nature of these courses. Students are required to design projects that are printed on a mechanical printing press,

in addition to completing the project with any finishing or bindery operations needed, which utilizes specialized equipment and machinery. Designing and developing these types of skill-based courses for such graphic communications programs online would require a considerable amount of time, resources (Githens et al., 2012; Johnson et al., 2003), a modification in pedagogy, curriculum, and instructional strategies.

Rationale for the Study

Given other similarly kinesthetic content areas have been successful in moving their instruction online, what holds CTE teachers back from teaching in the online environment? Why are CTE teachers not moving to the online classroom? Zirkle (2004) recognized that questions about teaching and learning CTE content online had emerged. "Can psychomotor skills, such as those found in traditional trade and industrial programs such as welding or automotive technology, be taught through distance technology?" (Zirkle, 2004, p. 161). He argued, "many of the skills found in labs can only be obtained through actual interaction with the equipment" (Zirkle, 2004, p. 161). Githens et al. (2012) observed where business programs lend themselves to being easily taught online, and have responded to the demand for online offerings, "the same responsiveness has not occurred among skill-based technical programs" (p. 47). If higher education institutions are responding to a need to offer online courses to address flexible scheduling for students, these institutions have to address ways in which skill-based, technical courses can be offered online.

Current research targeting online instruction has addressed factors such as the amount of work it takes to convert traditional classes to online classes (Dillon & Walsh, 1992), the time constraints involved in developing these types of courses (Ndahi, 1999; Zirkle, 2002b), faculty peer influences about online teaching (Kagan, 1992; McQuiggan, 2007), the need for

professional development and support for the technology needed to teach online, and the incentive to develop these types of courses (Dooley & Murphrey, 2000; Kopcha, 2012; Ndahi, 1999; Wolcott, 1999). While there is no research that directly documents the impact of teacher beliefs on faculty willingness to teach in the online environment, there is research that states teacher beliefs are a major factor in promoting change in practice (Ertmer, 2005; Kopcha, 2012; Sunal et al., 2001). Moreover, research shows that online teaching and virtual environments have been demonstrated to support skill-based teaching (Benson et al., 2005; Dubois, 2002; Johnson et al., 2003; Katsioloudis, Fantz, & Jones, 2013; Ndahi, 2006). And although there is research documenting concerns teachers have toward teaching online (Lin et al., 2012), none of this research documents teacher concerns towards hands-on teaching in the online environment. In spite of such research, the findings do not fully explain what impediments affect choice among CTE teachers for teaching online. To fully understand what impedes CTE teachers from teaching online will require investigation into their beliefs about teaching, learning, and distance learning technology (Ertmer, 2005; Ertmer & Leftwich-Ottenbreit, 2010; McQuiggan, 2012).

Of all of the factors addressed in Zirkle's (2004) research on instructional barriers for teaching CTE online, those related to teacher beliefs were not addressed. This gap in research was also evident in other studies focusing on teaching CTE courses online, particularly with teaching skill-based courses (Benson et al., 2004; Benson et al., 2005; Dubois, 2002; Githens et al., 2012; Johnson et al., 2003; Kotrlik & Redmann, 2009; Ndahi, 1999; Ndahi, 2006; Zirkle, 2003). Because teacher beliefs lie at the heart of teaching they influence teacher decision making about classroom practice (Nespor, 1987; Peterson, Fennema, Carpenter, & Loef, 1989; Shavelson & Stern, 1981, Wilkins, 2008), adopting new pedagogies (Albion & Ertmer, 2002), and as is the focus of this study, their decision to teach in the online environment.

Problem and Purpose Statement

Previous literature has exposed the impact of concerns and beliefs on a teacher's decision to adopt online teaching methods, and in particular for CTE teachers, the degree to which their concerns and beliefs influence whether or not they decide to teach online. The potential problem that may exist is that of CTE teachers' concerns and beliefs are playing a role in impeding their transitioning to teaching in the online environment. Therefore the purpose of this study is to examine how teacher concerns and beliefs might be affecting a CTE teacher's adoption of online teaching. Although there are a multitude of factors (teachers do not have the time, resources, incentives, or support to develop online courses, need professional development, and may be influenced by their peers) that may inhibit CTE teachers from teaching online, this study seeks to document the impact and influence teacher concerns and beliefs have on their decision to adopt online teaching.

Research Questions

This study seeks to answer the following questions to determine the extent to which concerns and beliefs influence Graphic Communications teachers to accept teaching in the online environment:

RQ: What associations can be revealed between concerns and beliefs held by Graphic Communications teachers regarding their online teaching of Graphic Communications hands-on classes?

SQ-1: What are Graphic Communications teachers' concerns related to teaching hands-on online?

SQ-2: What are Graphic Communications teachers' beliefs related to teaching hands-on online?

Limitations of the Study

The participants selected for this study include postsecondary Graphic Communications teachers.

Definition of Key Terms in the Study

Below are the key terms used throughout this study. Definitions of key terms are defined following the identified term.

Online environment: An online environment is an environment where online learning takes place. It uses computers and the World Wide Web on the Internet to teach and learn content (Benson et al., 2004; Johnson et al., 2003). Often referred to as a virtual environment because there is no face-to-face interaction. Online environment in this context refers to a web-based environment used for student learning.

Online teaching: Online teaching uses the World Wide Web on the Internet for teaching content (Allen & Seaman, 2014; Benson et al, 2004; Johnson et al., 2003). Online teaching in this context refers to teaching synchronously or asynchronously in a web-based environment.

Distance education: Distance education is characterized by a separation of student from instructor during the teaching and learning process, the use of educational technologies to support the delivery of course content, and the communication and collaboration via communication technologies between the teacher and the student(s) (Zirkle, 2003). Distance education in this context refers to learning in the online environment across space and time.

Traditional classroom: A traditional classroom is a face-to-face learning environment where the classroom resides in a brick and mortar building (Benson et al, 2004; Johnson et al., 2003). A traditional classroom in this context refers to a face-to-face classroom setting in a brick and mortar building.

Teacher beliefs: Teacher beliefs are defined as their implicit assumptions about student learning, classroom practice and content (Kagan, 1992). Teachers' beliefs can represent their educational beliefs about using technology (Ertmer, 2005) to teach online. Educational beliefs are those that reflect effective teaching practices and its effect on student performance (Pajares, 1992; Ertmer, 2005). Beliefs about using technology to teach online refer to a teacher's epistemological beliefs (beliefs about what they know about the technology) and self-efficacy (beliefs related to how confident they are in using the technology) (Kagan, 1992; Pajares, 1992). Teacher beliefs in this context refer to the beliefs teachers have surrounding teaching hands-on in an online environment.

CTE teachers: CTE teachers are teachers who teach in the discipline Career and Technical Education. CTE integrates academics with a relevant curriculum that prepares post-secondary students for in-demand job opportunities (ACTE, 2013). Program areas within CTE are often skill-based, hands-on programs. Examples of career areas in CTE are Science, Technology, Engineering, and Math (S.T.E.M.); Information Technology; Manufacturing; Agriculture, Food & Natural Resources, etc. The CTE teachers in this context refer to those teachers who teach hands-on skills where students are required to manipulate tools or machinery.

Graphic Communications teachers: Graphic Communications teachers are those that teach a range of skills encompassing the latest technologies and engineering, from design to digital imaging, printing, publishing, packaging, and web design and development. Traditionally known as "printing", this subject area has grown to include a broader range of what commercial "printers" do today (GAERF, 2014).

Hands-on skills: Hands-on skills are those that require the manipulation of tools or machinery to develop a skill on a piece of equipment or knowledge about a process (Dubois,

2002). Hands-on skills are described in this context as those skills gained in courses where students are required to manipulate tools and machinery.

Skill-based learning: Skill-based learning requires that a student be able to apply what they have learned through hands-on practice with tools or machinery to develop a skill (Benson et al., 2004; Githens et al., 2012). The courses described in this context refer to those courses that teach manipulative skills through hands-on practice.

21st century learners: 21st century learners are non-traditional students seeking skills to obtain new knowledge without having to be in a classroom (Ndahi, 1999). They are connected to other students and resources around the world (Jacobs, 2010) learning how to problem solve and communicate. They are considered digital natives (Jacobs, 2010) who know how to use multiple technology resources for learning and research. These new leaders are creative problem solvers who are curious and motivated to learn more about their world and their surroundings. The 21st century learners in this context are students who grew up around technology and prefer to use it for learning in the classroom.

Educational technology: Educational technologies are those technologies used to deliver instruction and course content. Ertmer and Leftwich-Ottenbreit (2010) refers to these as information and communication technologies (ICT) and Dubois (2002) refers to these types of technologies as Internet technologies. Educational technologies in this context refer to technologies used to support online teaching.

CHAPTER TWO

Literature Review

This study focuses on teachers' beliefs and their impact on online instructional practice. Research has shown that teachers' beliefs influence whether or not they adopt new instructional methods, and particularly in this research, how beliefs impact Graphic Communications teachers' decision to teach online. Investigating the theoretical background for this research provides a premise for understanding the role teacher beliefs play in their adoption of online instructional methods for hands-on Graphic Communications courses. This chapter presents an exploration of the research findings from the literature categorized into four main sections. Section one provides the theoretical model for the adoption and diffusion of online teaching within higher education. Section two defines and discusses teacher beliefs in order to provide a framework for identifying the influence of beliefs on instructional practice. And section three presents a thorough review of the current literature on CTE, and specifically Graphic Communications teachers' online instructional practices within higher education, including models for implementing skill-based training in an online environment.

Theoretical Framework

Online Teaching and Learning and Educational Reform

The growth of online and educational technologies has provided the impetus towards driving higher education to focus on online instruction as an alternative educational delivery mode. Chief academic officers in higher education institutions are strong believers that the number of students taking online courses will continue to grow, whereas 66% of those administrators have indicated online education continues to be critical to their long-term mission (Allen & Seaman, 2014; Kang, 2012). According to the U.S. Department of Education (2014),

about 5.5 million students took at least one online course in fall 2012 (U.S. Department of Education, Institute of Education Sciences [IES], 2014). Among those 5.5 million students, about 2.6 million were enrolled in fully online programs. The demand for online education prompts the development of new technologies, new delivery modes, and new course offerings at institutions nation wide. Additionally, it has been a top priority of the United States Department of Education that all learners have technological literacy skills, with digital content and networked software utilized to improve learning (United States Department Of Education, 2010).

Today's online learning offers rich learning resources in various media and the capability to support both real-time and asynchronous communication between instructors and students as well as the potential to teach learners of various abilities (United States Department Of Education, 2010). New online technologies offer the opportunity for teachers to provide the same learning experience in the online environment as compared to the face-to-face classroom (Galusha, 1997; Zirkle, 2003). One report found institutions were offering online education to meet student demand for flexible schedules, provide access to college where students would not have otherwise had access, make more courses available, and seek to increase student enrollment (Parsad & Lewis, 2007).

Considering current reports of growth in online education one would expect faculty willingness to teaching online has also grown. Yet, research has found that university faculty do not accept the value and legitimacy of online education and there has been no change in faculty beliefs about teaching online in the past 10 years (Allen & Seaman, 2014). The Instructional Technology Council reports higher education administrators were most challenged with engaging their faculty in the development of online pedagogy (Lokken & Mullins, 2014). While student demand for online courses increases, the fact remains: Only a handful of faculty

members have embraced online education, whereas most are only beginning to integrate technology into their teaching. Most faculty have spent the majority of their years as a learner in a traditional, face-to-face classroom, have no experience with online teaching (McQuiggan, 2012), and lack the technology skills and online pedagogy to make the transition to the online environment.

Online Teaching and Learning as an Innovation

A conceptual framework for examining CTE teacher beliefs surrounding teaching hands-on online is based on Rogers' (2003) theory of the diffusion of innovations. The theoretical underpinning for the diffusion of an innovation has been researched for over 3 decades, with Everett Rogers' (2003) theory being one of the most popular theories. Rogers (2003) theory has been used as a framework in educational research to examine the adoption of technological innovations by schools and teachers (Bussey, Thomas, Dormody, & VanLeeuwen, 2000; Kotrlik & Redmann, 2009; Sahin, 2006; Sahin & Thompson, 2006). His theory defines diffusion as the process by which an innovation is communicated through certain channels over time among the members of a social system. This communicated message revolves around a new idea or technology. An innovation is defined as an idea, practice, or object that is seen as something new to the individual, and diffusion is the process by which this innovation makes its way through a social system. Rogers (2003) categorizes individuals as members of a system who adopt technology at a faster rate than others according to their "innovativeness" (p. 22). This innovativeness could explain why some teachers adopt online teaching faster than others. These adopter categories are represented using a bell curve and categorize individual innovativeness according to innovators, early adopters, early majority, late majority, and laggards (Figure 1). In this figure, innovators comprise the first 2.5% of the adopters in a social system.

Figure 1. Adopter categorization on the basis of innovativeness

It is important to understand an individual's innovativeness in order to determine their role in the innovation-decision process. Rogers (2003) defines the innovation-decision process as the process of an individual moving through knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject it, to implementation of the new idea, and to confirmation of their decision to adopt. These five steps (Figure 2) help an individual decrease the uncertainty with which to decide on adopting an innovation. The amount of time involved in this five-step decision-making process depends on the decision-making variables surrounding each step in the process. As Rogers (2003) notes, "time does not exist independently of events, but it is an aspect of every activity" (p. 20).

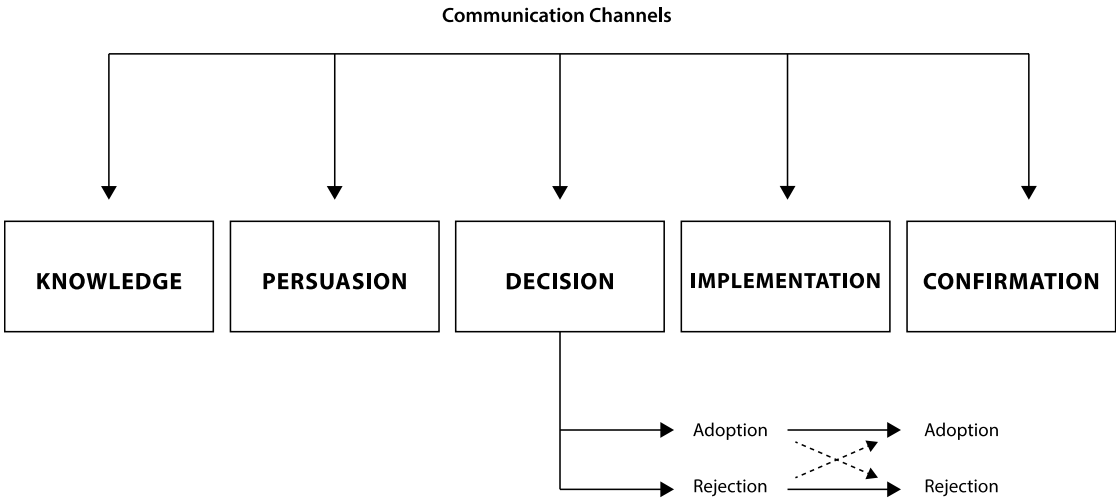


Figure 2. A model of five stages in the innovation-decision process

Online education is an innovation that is being diffused throughout the college culture with mixed results. To many teachers, the idea of online teaching is seen as a new practice involving the use of new technologies. Although many teachers are aware that others around them are teaching online, they may not know enough about it to make a decision on its worthiness for adoption. Especially in CTE, because what they teach traditionally involves face-to-face, hands-on interaction in a lab setting, they may not have any knowledge of the tools available to teach online because they have never investigated the possibility.

Adoption and Diffusion: Factors That Influence Adoption

Rogers (2003) theory emphasizes the ways in which individuals will evaluate and resist proposed innovations according to the perceived attributes. There are certain factors that shape educators' beliefs about teaching online. Diffusion of innovation research has suggested that teachers' perceptions about certain aspects of innovations can predict their adoption behavior (Rogers, 2003). There are five factors identified by Rogers (2003) that affect the rate at which diffusion occurs. These factors include: (1) relative advantage, (2) compatibility, (3) complexity,

(4) trialability, (5) and observability. Relative advantage is measured on the degree to which someone perceives it as being better than the previous idea. An innovation is compatible if it is seen as being in alignment with existing values, previous experiences, and needs of the potential adopter. When an innovation is difficult to understand or use, its complexity may keep it from being adopted. Uncertainty is reduced if a potential adopter can try out the innovation first. When the results of the innovation are observable, and the potential adopters can evaluate the information about the innovation, they may be more likely to adopt it. When innovations are seen as having greater relative advantage, compatibility, trialability, observability, and low complexity they will be adopted at a greater rate than other innovations. Individuals must first obtain knowledge about the innovation in order to form an attitude on whether the innovation should be adopted or rejected (Wells & Anderson, 1997). Faculty are often offered professional development opportunities to learn about online teaching methods and tools. Once faculty attend these professional development workshops they are provided enough knowledge to make decisions about whether the innovation of online teaching is one they are willing to adopt. At that point the individual decides to implement the innovation and confirms her decision (Rogers, 2003). In addition, there are other influencers on the decision-making process including: prior conditions, characteristics of the decision-making unit, the perceived characteristics of the innovation, and the channels in which the innovation is communicated.

Concepts of Diffusion Related to Education. The adoption of educational technologies for teaching and learning are by far the most researched topics in education utilizing Rogers' theoretical framework on the diffusion of innovations. Rogers (2003) notes that innovation is often synonymous with technology because so much diffusion of innovations' research often involves technological innovations (Sahin, 2006). The success of these innovations in education

are attributed by the key qualities they possess, such as the technical, experiential, and affective domains which contribute to their adoption and diffusion into classroom practice (Wells & Anderson, 1997). With the adoption of educational technologies for teaching and learning, the focus tends to be on which teachers are adopting technology at a higher degree and why they choose to implement it into classroom practice. Rogers' (2003) theory is based on the premise that almost every individual has the potential to become an adopter of an innovation.

Online Teaching & Learning in Higher Education. Innovations are adopted when they can be communicated effectively between two or more individuals who are homophilus, meaning they share a common understanding, have similar personal and social characteristics, and belong to the same subculture (Rogers, 2003). Teachers share the same commonalities, are involved in the same subculture, and speak the same "language" as their peers (Blankenship, 1998).

To increase the rate of adoption of new technologies in education faculty are often offered incentives to include new educational technologies into their teaching (Ndahi, 1999). Incentives act as a way to increase the degree of relative advantage where teachers may see the addition of this new tool for teaching as an improvement on previous teaching methods (Dooley & Murphrey, 2000). Incentives can also affect the degree of compatibility with which teachers see the integration of educational technologies as compatible with their current situation. One study found that although teachers perceived distance education technologies as having a relative advantage in enhancing teaching and learning, because of limited incentives, they did not view the innovation as being compatible with their current situation (Dooley & Murphrey, 2000).

Relative advantages of online teaching also included flexibility, interactivity, and the programmatic and technical support offered to faculty and students (Shea, Pickett, & Li, 2005).

When we look at online education as an innovation it is important to promote an understanding of the phenomena of online education, especially concerning the acceptance of this innovation from the perspective of the faculty. So much depends on the early adoption of an innovation in order for diffusion to take place, and having a clear understanding of the characteristics of early adopters and the value they place on innovative technologies greatly affects their acceptance and effective use of innovative classroom practices (Wells & Anderson, 1997).

The complexity of online teaching can be reduced by providing technical and face-to-face support and offering guided online templates for creating online courses from scratch (Shea et al., 2005). Professional development for implementing educational technologies gives teachers the opportunity to "try out" the technologies before implementing them into their classroom. Rogers (2003) states "New ideas that can be tried on the installment plan will generally be adopted more rapidly than innovations that are not divisible. An innovation that is trialable is less uncertain for the adopter" (p. 231). Additionally, professional development that offers insight into the experiences of other teachers who have successfully implemented the educational technologies allows potential adopters the opportunity to observe the results of implementing it into their own classrooms (Shea et al., 2005).

The rate of adoption in the diffusion process is the relative speed at which individuals in a social system adopt an innovation. It is measured by the amount of time it takes for a group of individuals to adopt an innovation. Because individuals in a social system are adopting innovations at different times Rogers (2003) uses the term "innovativeness" to identify the degree to which an individual is relatively earlier in adopting new ideas than other members of a system. He describes five adopter categories that classify individuals on the basis of their innovativeness: (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5)

laggards. Innovators are those individuals that are first to adopt an innovation. They are usually young, social, risk-takers who have a closer connection to innovative technologies and innovators. Early adopters, just like innovators are often younger, social, and educated but not the risk-takers that innovators can be, therefore they are more discrete in their adoption choices. Early majority adopters have above average social status, are connected to early adopters, but tend to be slower in the adoption process. Late majority individuals are highly skeptical of innovations and will not adopt innovations until after the average member of society. And laggards are the last to adopt an innovation. These individuals are typically advanced in age, are tradition-focused, and have very little contact with innovators or early adopters.

These adopter categories are significant in fostering change in teacher practices, specifically with Career and Technical Education (CTE) teachers because technological innovation is often central to the CTE curriculum. Research suggests that there is a relationship between early adoption, motivation, and excellent teaching (Jacobsen, 1998; Jacobsen, 2000). Teachers are motivated to integrate technology into their teaching because they believe it promotes excellent teaching. Additionally, CTE teachers are somewhat at ease with adopting new technologies because what they teach is constantly evolving and they have learned to adapt to change well. Early adopters expect to have problems, are comfortable with problem solving, and find satisfaction in solving problems with technology (Jacobsen, 1998; Jacobsen, 2000). Problem-based teaching is at the heart of what CTE teachers teach and therefore makes it easy for them to transfer these troubleshooting skills to using educational technologies to teach online. Diffusion of online teaching will depend on the teacher and the rate at which they choose to adopt new instructional technologies and methods for online teaching. When a new innovation is introduced, like online teaching, an individual will gather information, test the technology, and

then decide if the amount of time and energy is worth the potential benefits of learning and using the technology for online teaching.

Online education is a good match for Rogers' definition of an innovation, as it shows continued growth and acceptance within higher education (Hixon, Buckenmeyer, Barczyk, & Zamoiski, 2012). Some argue that online education is no longer "new", but Rogers emphasizes that "if an idea seems new to the individual, it is an innovation" (p. 12). "The view of distance education as an innovation provides an important means for understanding the phenomena of distance education, particularly from the perspective of those upon whom its acceptance depends: the faculty" (Dillon & Walsh, 1992, p. 6). Innovators and early adopters in CTE who adopt online teaching are often young, social teachers who have a closer connection to instructional technologies and are more at ease with learning and adopting new innovations. Their teaching beliefs are inclusive of using instructional technologies as a pre-service teacher, often because they were online students themselves. These early adopters may find that although they teach a hands-on curriculum, they can be creative in exploring and using the technology in new ways to offer their courses online. Older CTE teachers, those who can be categorized as late adopters or laggards in adopting online teaching, are skeptical about online teaching as a rigorous teaching method, and are often convinced that the methods they have always used work well, so they lack the motivation to change. Additionally, these teachers may not be familiar with the technology to teach online, and may have concerns about the effectiveness of teaching problem solving and skill development through distance learning methods.

It is important for CTE teachers to adopt online teaching as an alternative teaching method because innovations in education are moving towards a new technological age of hybrid teaching and flipped classrooms. These changes are happening because the students we teach are

taking on more responsibilities while also seeking an education for career advancement. These non-traditional students have to pursue careers and educational majors that allow flexibility in class schedules and convenience for their family and work schedules. Distance and online learning in most cases has been the answer for these students. Rogers (2000) outlines three barriers that may impede faculty from integrating technology into their teaching: access to resources which promote the desired behavior, convenience in adapting the desired behavior, and the incentive or recognition for following through on the integration. CTE teachers will be left behind whereas they put their programs at risk because of low enrollment if they do not find ways to adopt online teaching methods. The innovation-decision process and perceived characteristics affecting the rate of adoption of the innovation as described above are the major concepts used as the framework for this research. These concepts will be used to investigate how CTE teachers are adopting the innovation of online teaching.

Teacher Beliefs

Research suggests teachers' beliefs about teaching and learning is profoundly associated with how teachers make curricular and instructional decisions (Fang, 1996; Kagan, 1992; Pajares, 1992). Teachers' beliefs have an impact not only on the depth and breadth of their instruction, but also on how students learn and how teachers approach teaching and learning. Teacher beliefs are contributed to many factors including the influence of discipline subculture, the quality of their pre-service experience in the classroom, and the chance to reflect on those pre-service experiences (Fang, 1996). Ertmer (2005) looked at how teacher beliefs have been defined and found there to be some confusion about how teacher beliefs are defined and labeled. Part of the confusion was due to the difficulty in studying teacher beliefs contributing to poor conceptualizations and mixed understandings of beliefs and belief structures (Pajares, 1992). He

claims that beliefs can often be disguised under pseudonyms such as – attitudes, values, judgments, axioms, opinions, ideology, perceptions, conceptions, conceptual systems, preconceptions, dispositions, implicit theories, explicit theories, personal theories, internal mental processes, action strategies, rules of practice, practical principles, perspectives, repertories of understanding, and social strategy, with many more often used in the literature. For the purposes of this research teacher beliefs will be defined as teaching practice that is based on evaluation and judgment (Pajares, 1992) and include a cognitive component, representing knowledge, an affective component with may include emotional impact, and a behavioral component, enlisted when action or task is required (Rokeach, 1968).

Another way to look at teacher beliefs was to see them within a broader context of teacher knowledge, teacher thinking, and the concept of teacher cognition (Calderhead, 1996). It can be difficult to define beliefs when beliefs often coincide with teacher knowledge (Pajares, 1992). Calderhead (1996) makes the distinction between the two, defining beliefs as "suppositions, commitments, and ideologies" and knowledge as "factual propositions and understandings (p. 715). Teachers can gain knowledge about something but not necessarily accept it to be true (believe in it). For example, a teacher may gain the knowledge and skills to teach online, and may also know other teachers who are successfully teaching online courses with high student achievement, but still not believe that teaching online is comparable to traditional, face-to-face teaching. Beliefs are seen as being a greater influence on how teachers (and people in general) organize and interpret tasks and problems (Ertmer, 2005; Griffin & Ohlsson, 2001; Kagan, 1992; Nespor, 1987; Pajares, 1992). Nespor (1987) argued that beliefs are a very important determining factor in how teachers organize their knowledge to arrange classroom tasks. Nevertheless, he claimed that the relationship between beliefs and tasks are

highly complex, since belief systems are "loosely bound with highly variable and uncertain linkages to events, situations, and a teachers' knowledge system" (p. 321). This is why beliefs are validated as being a stronger predictor of teacher behavior.

Beliefs Affect Classroom Practice

Beliefs have an impact on teacher attitudes towards classroom practice. They are the structure from which attitudes are formed about a particular topic. Pajares (1992) notes that attitudes are formed around groups of beliefs on a particular object or situation. He explains, "Beliefs within attitudes have connections to one another and to other beliefs in other attitudes, so that a teacher's attitudes about a particular educational issue may include beliefs connected to attitudes about the nature of society, the community, race, and even family." (p. 319). It is these connections between attitudes and beliefs that create values that guide a teacher's behavior, develop and maintain other attitudes, interpret information, and can overall affect instructional practice (Pajares, 1992).

Because beliefs affect teacher attitudes, and it is their attitudes that influence teachers' instructional practices, it can also have an effect on student learning. There is a significant relationship between teachers' perceptions of teachers who are effective at instruction and their attitudes towards implementing new instructional innovations. Those teachers who were the most receptive to implementing new instructional practices had a high level of self-efficacy, liked teaching, and felt confident about their ability to teach (Guskey, 1988). Personal efficacy is a teacher's belief that "I can make this happen" (Guskey, 1989) and has been correlated with teacher attitudes about classroom instruction and their roles as teachers. The higher teacher self-efficacy, the better their attitudes toward implementing new instructional practices. These

teachers see these new innovations as a good fit with their current teaching practice and easy to implement into current classroom practice (Guskey, 1988).

Take this example of one teacher's experience (Guskey, 1989). He remembers being excited about his first teaching position and started with "unlimited energy and enthusiasm" (p. 440). He was convinced that his teaching methods were sure to make all of his students achieve success (this was his belief). But as his first year as a teacher progressed his attitude changed and what he found was that classroom teaching was "harder and more complicated" (p. 440) than he had thought it would be. He soon realized that in order to manage his classroom he had to be flexible with his lesson plans and quickly think about a new plan of action when something was not working for his students. His optimistic attitude changed to an acceptance of the "real-world" classroom life that he had not been privy to during his pre-service training. This shift in attitude initially bothered him but as time went on, and he became more settled with his new perception of teaching (this new adapted belief), he was able to develop effective teaching strategies that worked for him and his students. If someone had suggested a change in his instructional practice he would have resisted because that would have meant he would have to risk the level of effectiveness and student success he had worked so hard to achieve (Guskey, 1989). Teacher change is often correlated with student achievement. When teachers see an increase in student learning outcomes their attitudes toward teaching become more positive (Guskey, 1989). They have to see it to believe it. In order to promote change of teacher attitudes and acceptance of new innovations, teachers have to witness a change in student behavior.

In practice, a teacher's beliefs are embodied in their expectations of their students' performance or their theoretical perspective about a particular content area's teaching and learning. Additionally, beliefs often shape a teacher's expectations of their students in ways that

affect students' behavior and academic performance (Fang, 1996). Teachers' beliefs are identified as models that influence teachers' classroom practices (Ernest, 1989). They affect how teachers choose learning tasks, how they treat students' incorrect responses, the acceptance of student ideas, and how closely they follow the presented curriculum in a textbook. Their beliefs may also be modeled after a memory of a past teacher and this behavior can also be included in a teachers' pedagogy. Ernest (1989) found that a teachers' belief might also affect the way in which they present their material. For example, whether they follow a meaning, understanding, and unified body of knowledge view versus a facts and skills mastery view of teaching, which tends to focus on response correctness and learner performance (Ernest, 1989).

Knowledge is the cognitive result of thinking and beliefs hold both a cognitive and affective component. This supports the idea that a teacher's belief structure is closely tied to their teaching knowledge (whether it be pedagogical or subject-matter). Not only is it important for teachers to have pedagogical and curriculum knowledge to teach (Shulman, 1994), but possessing the knowledge of organizing classes also affects classroom instruction. This knowledge includes knowing how to organize students into groups, individually, or as a whole class; questioning and discussion in the classroom; management of hands-on activities, as well as field trips; control of the classroom, including keeping order and getting students' attention; managing classroom testing, class routines, and getting access to educational resources; in addition to managing classroom materials such as furniture, textbooks, and instructional technology (Ernest, 1989). Knowledge of student learning also contributes to diagnosing learning problems and matching students to specific learning tasks. In this context, the teacher's knowledge about student learning and instructional methods contributes highly to the success of her students (Ernest, 1989).

Gaining knowledge about a new innovation and adapting it to current beliefs often leaves teachers with concern over adopting the innovation. Concerns are a major influencer in adopting and integrating educational technologies for classroom instruction (Liu & Szabo, 2009). Often times implementing new innovative classroom instruction provokes concern over student learning and success. As defined by Hall and Hord (1987), concerns are a combination of "feelings, preoccupation, thought and consideration given to a particular issue or task" (p. 59) and each teacher will react to a new innovation differently depending on their "personal make-up, knowledge and experience" (p. 59) with the innovation. Teachers want to make sure that a change in classroom instruction will promote a better understanding of the content without limiting student creativity and allow for effective scaffolding strategies to promote critical thinking (Barmberger & Cahill, 2013). Teacher concerns can have an impact on their instructional strategies and curriculum development, and can inform or alter their perceptions of students understanding (Brickhouse, 1990).

Through review of various empirical studies on teacher beliefs, consistent findings revealed two recurring themes concerning teacher beliefs (Kagan, 1992). First, beliefs seem to be consistently stable and resistant to change. And second, a teacher's beliefs are often associated with a consistent style of teaching that is clearly evident across various classes and grade levels (Kagan, 1992). There are various internal (e.g. knowledge, value) and external (e.g., teaching environment, administrative support, time and resources) factors that affect beliefs as it relates to practice (Fives & Buehl, 2012). A teacher's beliefs about classroom practice shape their goals for technology use in addition to the weight they assign to various barriers to implementing that technology (Ertmer, Addison, Lane, Ross, & Woods, 1999).

Beliefs have two important uses for teachers (Nespor, 1987). Teachers use beliefs for task definition and facilitation of memory process. Teacher beliefs affect task definition by framing or defining the task at hand. Task definition affects internal processing, resources of thought, and control or metacognitive processes (Nespor, 1987; Pajares, 1992). For example, teachers teach for different reasons. Some teach for money and some teach because they believe they have a moral obligation to develop the future citizens of the world. Teacher beliefs also affect the facilitation of memory processes whereas emotion and affect have implications for how teachers learn and use what they learn in the classroom (Nespor, 1987).

Beliefs, knowledge, attitudes, and concerns – they all affect a teacher's classroom instruction. Teachers hold knowledge about their subject area but knowledge also affects their cognitive thinking. Beliefs hold both a cognitive and affective component (Ernest, 1989), with the affective component influencing a teacher's attitude toward her classroom and students. This supports the idea that teacher beliefs are tied to classroom instruction and practice.

No Change in Beliefs about Online Teaching

Considering the extensive research on how teacher beliefs affect classroom practice, there is a lack of research on teacher beliefs surrounding teaching online. In fact, faculty utilization of innovative technologies continues to remain low and most faculty at most colleges make very little use of available educational technologies (Surry & Land, 2000). Because beliefs are a strong influencer on teacher attitudes, concerns, and knowledge gain they have the potential to affect Career and Technical Education (CTE) teachers' attitudes, or knowledge gain towards teaching hands-on, face-to-face courses in an online environment. It is difficult to establish the reasons why some faculty are resistant to teaching online. It is presumed that a lot of the resistance comes from their beliefs, attitudes, and concerns about teaching online. We know that

faculty beliefs limit their ability to change classroom practice (Sunal et al., 2001). When we experience something that does not coincide with our beliefs, such as online teaching, we reject it, add it to our existing beliefs, learn a new belief, transform our point of view, or transform our habits of mind. In order to adopt new innovative approaches to teaching faculty will need to evaluate their assumptions and beliefs about teaching (McQuiggan, 2012).

There is reason to believe that faculty do not possess adequate online teaching skills, which prevents them from transitioning to the online environment. For instance, industrial and technical teacher education programs (which often fall within CTE) were surveyed to collect data on their willingness or unwillingness to teach online. Respondents were willing to use the technology to teach online because they believed it would improve their teaching skills and help increase enrollment by offering remotely located students the opportunity to enroll. On the other hand, the same respondents conceded that it was difficult to do hands-on demonstrations while teaching, whereas 88.6% lacked the training needed to teach online. Not having the necessary knowledge and skills to teach online impedes teachers from moving to this type of teaching environment (Ndahi, 1999). The results of this study show the importance of training, and almost all of the participants (94.9%) believed that training was vital for being able to use the technology effectively (Ndahi, 1999). In order for faculty to really buy-in to using technology to teach online they have to perceive that it is consistent with their existing values, past experiences, and needs. Even if a teacher believes in the value of teaching online, they may be dissuaded if they do not believe they are capable of implementing new pedagogical content and technology skills.

In order for these teachers to accept new innovative approaches to teaching, a change in their beliefs has to happen. To change classroom teaching practices we have to examine the

teachers themselves and the beliefs they hold about teaching, learning, and technology (Albion & Ertmer, 2002; Ertmer, 2005; Ertmer & Leftwich-Ottenbreit, 2010). To successfully implement a new technological tool or innovation (like online teaching), we have to consider what the implementation will mean to teachers' personal beliefs and values (Angers & Machtmes, 2005). In one study, three participants were observed to gain a better understanding of teacher practice in a technology rich classroom (Angers & Machtmes, 2005). The primary focus of the study was on how teacher beliefs affected instructional practice as it related to integrating technology into class teaching. Results showed that the adoption of technology in the classroom was determined by the participants' attitudes and beliefs. All three participants believed that technology is a tool that could be used to enhance lessons and engage students in learning. One of the teacher participants, Sabrina, believed in "teaching the curriculum, not the technology" (Angers & Machtmes, 2005, p. 784), and this was evident in the research whereas students had learned the technology skills necessary to engage in authentic tasks within the context of the lesson objectives. The results of this research proved that teachers who believe in using technology for classroom learning have the power to enable and engage students in active learning environments. Just like in online learning, students in this study took ownership and responsibility of their work and learning and, just like in an online environment, there were opportunities for students to work collaboratively, solve problems, and share knowledge and responsibility with peer-to-peer interaction. These teachers believe technology adds value to student learning and have changed their instructional practice to allow more opportunities for their students to be successful.

Specific to teaching hands-on online, CTE faculty beliefs have to be identified in order to establish a way to change their beliefs about teaching online. There is little to no research on the

topic of CTE teacher beliefs surrounding teaching hands-on online. In another study by Ndahi (2002), the author suggests that further research needs to be explored concerning the delivery of online, lab-based, hands-on courses. There are multiple barriers to teaching online that impede faculty from accepting online teaching for hands-on, lab-based courses as a viable option for teaching these types of courses. Those barriers often include training and professional development, administrative and technical support, incentives and time needed (Kopcha, 2012) for developing online courses, but little to no research has been done on faculty beliefs.

CTE and Graphic Communications Teachers

Hands-on teaching: The Challenge of Online Teaching

It is apparent that a big obstacle to delivering hands-on, lab based courses online is the fact that the students are required to develop hands-on skills on equipment. Just like with challenges to the science and engineering programs (Mawn et al., 2011; Reuter, 2009), it is difficult to conduct experimental work because a lot of the experiments are limited by issues of safety for students and the cost and complexity of tools and devices required for lab activities (Katsioloudis et al., 2013; Ndahi, 2006). The same is true for delivering a hands-on course that requires students to setup a printing press, adjust ink and water balance, feed paper, and make adjustments to achieve a quality print. It seems that there are elements of problem solving that can only be done by "touching" a printing press and "experiencing" what it is like to troubleshoot issues in real-time, on real equipment.

The question is not whether the course is too complex to be offered online, but whether or not there are methods in place to offer the content in a comparable environment without risk to the student. Safety in these types of courses is often considered the biggest obstacle or barrier to moving a hands-on course online. In traditional, face-to-face courses the instructor is

observing student practice on equipment and can take corrective action immediately where there is risk of harm or injury to students (Ndahi, 2006). To circumvent this issue, hands-on labs have the opportunity to use computer simulation and virtual laboratories to teach the same concepts, skills, and problem solving that is taught in a traditional lab. In some instances, practice in a virtual environment is often ideal before real-world learning takes place because it eliminates the risk, not only to the student, but also to clients and customers that the student may eventually be serving. Take for example flight simulation. Pilots are required to practice using flight simulation software to gain hands-on experience before being allowed to operate a plane in real-time, real-world conditions. This type of opportunity allows the aviators-in-training to troubleshoot and problem solve without damaging equipment (namely, crashing planes) or harming themselves or others. Another good example is where nurses and surgical doctors are using simulation exercises to respond to patient emergencies and practice complicated surgeries (Satava, 2001). Additionally, online instructional technology may be limited in offering a real-world, simulated experience that is comparable to the hands-on, face-to-face, experience in developing skill in certain subject areas, on certain types of equipment. But those technologies are improving every day and understanding how to combine certain technologies and using innovative teaching strategies is key to making these types of courses accessible to all students (Ndahi, 2006).

CTE and the Challenge to Teach Online

CTE includes sixteen Career Clusters: Science, Technology, Engineering & Mathematics; Law, Public Safety & Security; Agriculture, Food & Natural Resources; Human Services; Transportation, Distribution, & Logistics; Finance; Architecture & Construction; Education & Training; Arts, A/V Technology & Communications; Health Science; Government & Public Administration; Manufacturing; Business, Management & Administration; Marketing,

Sales & Service; Information Technology; and Hospitality & Tourism (Association of Career and Technical Education, 2013). CTE programs are known for their "hands-on" approach to teaching and learning and their curriculum focuses on "hands-on activities, project- and problem-based learning, laboratory and field work, simulations, and internships (ACTE, NASDCTEc, & P21, 2010, p. 17). Most teachers in these programs bring their previous experience in their trade, craft, or occupation into the classroom where they use "hands-on" experiences to teach their students "real-world" skills that promote problem solving, critical thinking, and other skills that help students gain employment in their respective industries.

CTE teachers teach primarily hands-on classes and moving to an online environment has been a challenge to them (Dubois, 2002; Johnson et al., 2003; Zirkle, 2003, 2009; Zirkle & Fletcher, 2009). One particular area that has not transitioned to the online environment is graphic communications. This area is also known as "Printing Graphics" within the Arts, A/V Technology and Communications Career Cluster within CTE (ACTE, 2013). This program area is particularly challenged due to the hands-on nature of their courses. The motto of these programs is that students "learn by doing" and programmatic mission statements often promote the "hands-on" nature of teaching and learning within their laboratories. Students are required to learn the software and hardware associated with prepress, mount plates and run a mechanical printing press troubleshooting for any technical issues, and complete the project by applying any finishing or bindery processes, all of which often require specialized equipment and machinery. Designing and developing these types of skill-based for online teaching would require a tremendous amount of time, resources (Githens et al., 2012, Johnson et al., 2003), not to mention a modification in pedagogy, curriculum, and instructional strategies.

Acceptance of Online for CTE

Through the years, students in Career and Technical Education (CTE) programs were trained for the workforce through internship opportunities, classroom teaching, and mostly post-graduation, on-the-job training. These teaching methods are based on personal contact between the teacher and the student. But in a precarious job market and an unsteady economy, coupled with rising tuition and housing costs, students may no longer have the opportunity to seek degrees at institutions that are not local to them.

With the availability of high speed Internet and multimedia technologies, students can earn degrees from home. Not only are higher education institutions incorporating distance education into their strategic mission for the future, but industry organizations, who provide training, are using distance education as a way to improve the skills and competencies of their workforce without having to pay for expenses like travel and hotel accommodations (Asunda, 2010). In the United States, Canada, and European countries, there has been steady demand for online degree programs, continuing education, and workplace training and this demand has increased on average around ten percent every year for the past eighteen years (Asunda, 2010). The credibility of online schools has increased as distance education accreditation bodies have accredited online schools on the same level as traditional on-campus institutions (Asunda, 2010).

Research suggests that there are ways for CTE educators to incorporate technologies into online course delivery for hands-on courses. One good example is in a study done by Katsioloudis et al. (2013) where the instructor was able to teach students how to use a lathe in an industrial technology course through video modeling. Video modeling was provided through three main points of view, which were recorded for instructional videos for a hands-on, online industrial technology course. The researcher felt that online instruction has great potential for

offering hands-on instruction and can be enhanced with the use of innovative technology such as video modeling (Katsioloudis et al., 2013).

CTE educators are becoming more accepting to online teaching as a way to offer hands-on courses in order to increase student enrollment in courses like technology education (Ndahi, 2006) and other hands-on, technology focused courses. Instead of trying to find students to come to you, you deliver the program to prospective students no matter their location. According to Zirkle (2002), it is a matter of *convenience* to the student. Zirkle explains students who are *time bound* due to family or job commitments, or those who are *place bound* in a location where they have no access to continue their education, can now participate in quality learning at their convenience. This has led many institutions to develop instructional tools needed to support and promote faculty who teach hands-on courses to transition to an online environment.

A study done by the Department of Education (DOE) in 2002 asked the question "To what extent have 'leading-edge' developments been able to go beyond reading and writing instruction to integrate simulations and other "hands-on" experiences that are critical components of vocational education" (p. 20). They found that technological innovations using online multimedia tools are becoming the future of online instructional methods, including simulations. Virtual training using simulations have been successfully accomplished historically by the military, the nuclear, transportation, and space industries on large place-bound simulators. The "Link Trainer" flight simulator was created to train military aviators before and during World War II (Feisel & Rosa, 2005). The military is still one of the largest users of virtual-based training. The Army uses photo-realistic simulation to train students on the operation of equipment and the Navy is using an expert-based simulation program designed to train ship handling in the Navy (Dubois, 2002). The results from students using the simulation program in

the Navy found the program to perform well above a conventional course (Dubois, 2002). And when the Air Force used a computer-based practice environment to train aviation technicians in a realistic context, they were more competent at troubleshooting than technicians with four or more years of on-the-job experience (Wisher, Macpherson, Abramson, & Thornton, 2001). A thirty-five percent increase in learning using virtual-based platforms made it apparent that well-designed, learner-centric training environments offer huge advantages to the possibilities of learning with this type of instructional technology (Wisher et al., 2001).

A good example of a successful, industry-specific, online training application is in the medical field where surgeons are using simulators to become certified in specific surgical procedures. As surgical simulation has advanced to using virtual reality, with the power to use three-dimensional (3D) visualization, professional organizations have adopted these new educational tools to provide new innovative training and certification in surgical procedures (Satava, 2001). The opportunity for advancement in surgical simulation is evident based on the success of simulation applications in the flight industry. Simulated surgical technical skills emphasize known tasks and procedures that surgeons practice repeatedly using the simulator before using these procedures in real-world contexts. There are currently surgical simulators that measure hand motion, precision, pressure application and similar surgical maneuvering (Satava, 2001). The challenge in developing future surgical simulators is to base the certification process on tasks that are more representative of hands-on abilities. Additionally, a curriculum has to be created that promotes the individuality of the surgical simulation and integrates the simulation as one piece of the curriculum to train a specific technical skill (Satava, 2001).

Another good example of a successful industry-specific online training application is in the aviation industry, including both airline training and military training. Since 1955, the

Federal Aviation Administration (FAA) has required pilots to re-certify their flight skills by using a flight simulator. Parts of the simulation exercise test cognitive ability which is essential to testing technical competency, but the majority of the flight examination focuses on manual skills (Satava, 2001). To measure the effectiveness of using simulators to prepare aviators, researchers looked at the transfer of training as a ratio representing the time saved in an airplane relative to the time spent training in a simulator (Koonce & Bramble, 1998). As technology advanced, and simulation fidelity improved, the airline industry had pilots-in-training spend more time in the training simulator and less in an actual airplane. This allowed the airline industry to save money and improve safety in the training programs (Koonce & Bramble, 1998). Because of the improvement in flight training performance using PC-based simulators the regulatory environment is becoming more accepting of these type of simulators in flight training programs (Koonce & Bramble, 1998).

Community colleges in particular have become important for providing job skills training to transfer students and students with jobs looking for retraining (Benson et al., 2005). A series of studies were conducted that compared student achievement and skill development in equivalent online and face-to-face courses. Student achievement was the focus in this study because it is more complex in CTE than in other fields of study due to the importance of hands-on and technical skill development. Additionally, it is required that CTE students be able to apply their learning in the workplace. The study examined five models for distance CTE courses: on-campus skill acquisition where students come to campus to learn hands-on skills in labs; licensed apprenticeships, clinical mentoring; student as independent contractor to practice skills, and computer simulations (Benson et al., 2005). The types of courses researched were in Funeral Service Education, Veterinary Technology, and Landscape and Horticulture Technology.

There has been much debate on how online classes compare to traditional brick-and-mortar classes. There is often a concern that focuses on the quality of online learning education, but research shows that online is just as effective, and that it is the design of the course and not necessarily the delivery format that is important (Hanson et al., 1997; Johnson et al., 2003). Online learners have a better attitude towards online learning than traditional learners, and online learners feel their learning is the same whether it is online or in a traditional classroom. Additionally, successful online learners are typically intrinsically motivated and can situate better control of their learning and each type of online learning technology has its advantages and disadvantages, which greatly contribute to the overall quality of the online learning experience (Hanson et al., 1997).

Research suggests there is no single delivery model for online CTE classes, and all are equally successful in helping students achieve the learning objectives (Benson et al., 2005). Online programs offer students flexible options, especially in the case where the face-to-face and online programs were offered simultaneously. There is no difference in student achievement between online and face-to-face CTE courses (Benson et al., 2005; Ernst, 2008), and students are comfortable with the online learning environment, find the content covered is the same for both the traditional and online format, and they can communicate effectively with their instructor and classmates during the course (Ernst, 2008). And yet because of the importance of the lab component for these types of courses, teaching it online presents challenges due the importance of skill-based learning through hands-on practice (Asimopoulos, Nathanail, & Mpatzakis, 2007; Ernst, 2008).

Workplace experiences are key in creating opportunities for students to develop contextualized hands-on learning. Students in both the face-to-face and online courses are

equally motivated and satisfied, and online CTE offers an advantage in allowing students at a distance to enroll in programs of interest that are not available to them locally (Benson et al., 2005). Over 500 participating institutions selected from colleges listed with the American Association of Community Colleges were questioned on their distance learning courses in CTE (Johnson et al., 2003). Colleges offer CTE online to reach new students and increase student access to CTE courses. Eighty-four percent of colleges in this study indicated that skill development was being addressed in online CTE courses. Although the hands-on nature of these courses is seen as a barrier to offering CTE online, colleges are overcoming this barrier by blending online with traditional approaches to teaching hands-on to develop technical skills.

CTE Program Areas Not Teaching Online

CTE program areas that require manipulating equipment and tools are not being offered online because they require learning hands-on skills (Dubois, 2002; Johnson et al., 2003). CTE programs such as business, information technology, and health information systems have been able to easily transition to the online environment, whereas CTE programs which require hands-on skills have not been able to do so (ACTE, 2013). Academic institutions have found that they do not have the resources or staff required to support faculty in designing online hands-on labs and field experiences (Dubois, 2002; Johnson et al., 2003; Shumer, 2001; Zirkle, 2003). CTE faculty who teach these courses are not trained to teach in the online environment (Johnson et al., 2003). CTE faculty concerns and anxiety over learning the technologies needed to teach online often impede their motivation to implement these types of technologies for online teaching (Kotrlik & Redmann, 2009). Although CTE courses in business programs have been successful in transitioning to the online environment (Githens et al., 2012), subject areas that are not easily taught online are those that require the development of hands-on skills in a lab setting (Dubois,

2002; Johnson et al., 2003; Zirkle, 2003, 2009; Zirkle & Fletcher, 2009). The teacher's role in a hands-on lab must be investigated to move forward with exploring and developing more online options for students in lab-based, technology courses (Ernst, 2008). These teachers have to be willing and prepared to develop hands-on, online courses in order to provide more learning opportunities for these types of courses.

Hands-on teaching in the online environment is perceived as a relatively new idea by CTE teachers and the industry as a whole. Currently, there is no research on Graphic Communications programs that are offering hands-on classes online. The majority of these courses focus on hands-on teaching and learning in a laboratory environment, using specialized equipment. Although there are printing simulators available for a variety of printing process technologies, and various international schools have implemented these simulators into their face-to-face courses, there is currently no research which has shown where printing simulators are being used to deliver graphic communications and printing courses online. For this study Rogers adoption/diffusion theory provides a theoretical framework with which to identify key characteristics affecting implementation of online teaching in hands-on Graphic Communications classes.

Research Directions

The current study investigates how teacher concerns and beliefs may influence a CTE teacher's adoption of online teaching. The key phenomenon in this study is the extent to which concerns and beliefs affect a CTE teachers' decision to adopt online teaching methods, whereas online teaching is considered the innovation. Thus, prior studies investigating teachers' concerns and beliefs toward an innovation should be reviewed regarding the research methodology. For

the purposes of this study, the diffusion of innovations in educational settings using quantitative methods will be reviewed.

Quantitative methods have been used in various research studies focusing on the diffusion of innovations in education, specifically to measure the constructs related to the phenomena. Subsequently, the instrument and statistical analysis chosen for the study require the researchers to establish a sound theoretical background for the phenomena. In a study by Ndahi (1998), teacher beliefs and attitudes were examined to determine whether characteristics of diffusion and adoption of distance learning were similar between faculty who adopted and those who were resistant to adopting distance learning methods. A three-part questionnaire was used to collect quantitative data to identify the innovativeness of faculty and determine reasons for utilization and resistance to distance learning. Part one of the survey consisted of statements that were positively correlated with Rogers (2003) characteristics of innovations (Ndahi, 1998). Shea et al. (2005) investigated faculty satisfaction with online teaching using quantitative data collected via a 35-item survey. The survey was correlated with Rogers' five factors that affect adoption of an innovation in order to understand faculty engagement and persistence with online teaching. Gannon-Cook (2003) studied faculty motivation in participating or refusing to participate in online teaching. The study focused on the conceptual framework of diffusion of technology with respect to faculty participation in distance education. A 53-item Likert-scale survey was distributed to identify faculty perceptions of how motivating or inhibiting certain working conditions were in distance education. The findings were organized based on nine motivating or inhibiting factors and were aligned with Rogers adopter categories. The findings suggested early adopters were highly motivated, whereas late adopters had the opportunity to observe early adopters and had concerns over the lack of time and resources available for

teaching online (Gannon-Cook, 2003). Tabata and Johnsrud (2008) used Rogers diffusion of innovation theory to investigate faculty perception as it relates to their technology use, attitudes toward technology and distance education, and their adoption of these innovations. The researchers suggest the diffusion theory identifies multiple perceptual characteristics to explain differences in adoption rates and provides a basis for examining faculty traits associated with their use of distance education. The quantitative methods used in this research study also helped identify barriers to adoption of an innovation, whereas survey responses from the "Adoption of Innovation" dimension indicated decreased participation with distance education. In a study by Ball (2013) a self-reported questionnaire was used to gather information on which constructs in Rogers' diffusion of innovations theory were more likely to contribute to adoption and diffusion of distance education in heath education. The quantitative survey instrument was developed to measure factors affecting adoption and diffusion of distance education and addressed the main constructs of Rogers' diffusion theory including the innovation, communication channels, social system, and time.

Research shows that quantitative data from similar instruments have been used to investigate and measure the major constructs of Rogers' theory in supportive and fundamental ways using multiple statistical techniques. These studies and more indicate the prevalence of these types of quantitative instruments for identifying faculty innovativeness in technology use and online teaching (Hixon et al., 2012; Kotrlik & Redmann, 2009; Nicolle & Lou, 2008; Park, 2003; Soffer, Nachmias, & Ram, 2010).

Measuring Teacher Concerns About Adopting an Innovation

Researchers have also found the importance of recognizing and assessing concerns from the teacher's perspective to assess how concerns impact the adoption of an innovation. In 1969,

Fuller conducted interviews and research studies, which coined the concept of teacher concerns. Concerns are defined as the motives, perceptions, attitudes, and feelings that are experienced by teachers related to implementing an innovation (Hall, 1979). A Concerns-Based Adoption Model (CBAM) (Figure 3) was developed and used to assess and list different teacher concerns and describes how schools can use change facilitators to implement change and innovation (Fuller, 1969; Hall & Loucks, 1978).

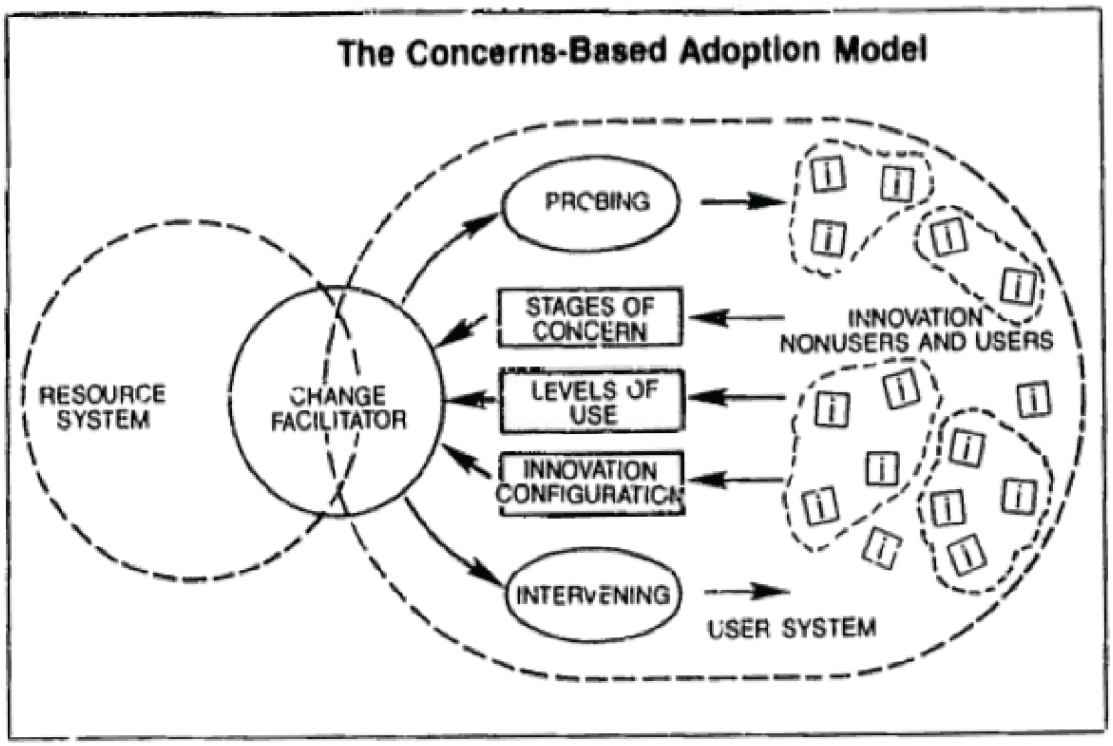


Figure 3. The Concerns-Based Adoption Model (Hord, Rutherford, Huling-Austin, & Hall, 1987)

The model recognizes change as a process and focuses on the facilitators that can promote innovative practice through professional development. The Stages of Concern (SoC) instrument was designed to measure levels of concern at different stages in the adoption of an

educational innovation. At Stage 0, teachers are in the *awareness* stage, whereas they have no concerns about the introduction of an innovation. At Stage 1, teachers have *informational* concerns and begin to show interest in the proposed innovation. At this stage they start to ask how and why the innovation is being implemented. At Stage 2 teachers will start to show *personal* concerns about how the innovation will affect their personal lives. Stage 3 concerns are centered on the *management* of change. Teacher concerns at this stage revolve around how much time and resources are required to implement the innovation. At Stage 4 teachers are concerned about the *consequences* of the innovative change with respect to their students. Stage 5 concerns are *collaborative*, whereas teachers want to know how the innovation fits in with how other teachers are implementing and using the innovation. And the final stage, Stage 6, teachers are *refocusing* their concerns in order to reflect on ideas for tweaking and improving the innovation for their teaching preference. The SoC is used widely in educational research to describe teacher change (Straub, 2009; Wells & Anderson, 1997) and can be assessed through quantitative measures (survey). The SoC instrument contains 35 Likert scale items addressing four stages focusing on internal concerns (awareness, informational, personal, management) and three stages focusing on external concerns (consequence, collaboration, and refocusing) (Wells & Anderson, 1997). In the original instrument "innovation" is used as the variable word, whereas researchers may substitute this word with a variable. For the purposes of this study the "innovation" is online teaching. Hall, George, and Rutherford (1977) established reliability for the SoC questionnaire by distributing it across eleven studies on educational innovations and found that it accurately measures the stage of concern about the innovation being studied. Reliability is established when scores from the instrument are internally consistent across the items on the instrument (Creswell, 2012). If the items are scored in a Likert-type fashion (i.e. strongly agree to strongly disagree),

Cronbach's (1984) alpha provides a coefficient for estimating consistency of instrument scores (Creswell, 2012).

Teacher concerns develop across time in three developmental stages: 1) concern about self, 2) concern about task, and 3) concern about impact. Self-concern focuses on teaching adequacy and survival. Initially teachers are concerned about how the innovation is affecting them directly (Wells, 2000). Task concern focuses on instructional duties and management, and impact concern is concern about student learning (Lin et al., 2012). The later stages of concern indicate teacher concerns surrounding how learning a new innovation may affect those on the receiving end of their newly acquired knowledge (Wells, 2000). For example, a teacher may later be concerned about how adopting a new teaching method may affect student learning and achievement.

A teacher's attitude or belief is one of several important factors that impacts their adoption and implementation of innovative instructional practice (Liu & Szabo, 2009). Additionally, a teacher's concern about the impact of technology is a major influencer toward the integration of educational technology. A number of studies have used the SoC instrument to collect quantitative data relevant to the Concerns-Based Adoption Model (CBAM) and Rogers theory of diffusion. Wells and Anderson (1997**)** studied the effects of web-based instruction on the attitudes of learners toward a new innovation. The study used quantitative statistics in a descriptive and correlational research design, collecting data before, during, and after instruction to determine learner attitudes toward the innovation. In particular, the SoC questionnaire developed by Hall et al. (1977) was used in the research to measure student attitudes toward web-based instruction. One of the benefits to using the SoC questionnaire is that it offers the ability to represent attitudes of those who are presently involved with the innovation. The SoC

questionnaire was also used in another quantitative study where course and teacher characteristics were correlated with attitudinal changes over time (Wells, 2000). In this study, the innovation was the Internet, an educational technology to be integrated into the teachers' instructional practices. The SoC instrument was chosen to measure changes in attitude toward the innovation, recognizing that the developmental stages of teaching (pre-teaching, early-teaching, late-teaching) parallel the stages addressed by the SoC. Liu and Szabo (2009) used the SoC questionnaire to assess teachers' seven stages of concern: Awareness, Informational, Personal, Management, Consequence, Collaboration, and Refocusing. They measured teachers' concern over implementing the innovation, in this case the integration of technology in the classroom. As evidenced by numerous studies conducted over the past two decades (Bailey & Palsha, 1992; Christou, Eliophotou-Menon, & Philippou, 2004; Harris, 2005; Liu & Szabo, 2009; Wells & Anderson, 1997; Wells, 2000) the SoC has been widely used to measure educator concerns and attitudes at the introduction and throughout the diffusion of an innovation.

The final section of the literature review detailed the direction of the study by reviewing the research goals and identifying those research methodologies that have been found to be best suited to the phenomena this study intends to investigate. Studies in education settings related to the adoption and diffusion of innovations (Rogers, 2003) frequently used quantitative data to meet their investigative goals and conclude their findings. This theoretical background has been used in prior studies to meet conclusive research goals. Particularly, studies focusing on teacher beliefs, attitudes, and concerns regarding an educational innovation (Bailey & Palsha, 1992; Christou et al., 2004; Harris, 2005; Liu & Szabo, 2009; Wells, 2000) have been used in quantitative research designs, using the SoC instrument, to measure the phenomena. Thus, this

investigation has adopted a quantitative design with which to study the extent to which teacher beliefs have on Graphic Communications teachers' decision to adopt online teaching methods.

Summary of the Literature Review

The review of literature sought to present and discuss four areas determined to be relevant to the research questions. The first section of this chapter reviewed the educational reform in online teaching and learning and the growing importance of online education. Many studies have pointed out the need for continued offerings of online courses in higher education, and the need for faculty to offer courses to accommodate flexible scheduling for students (Allen & Seaman, 2014; Kang, 2012; Lokken & Mullins, 2014; Parsad & Lewis; 2007). In section two Rogers' (2003) diffusion of innovations theory was outlined as the necessary theoretical framework intended to be used to investigate Graphic Communications teachers' beliefs and their influence on adopting online practices. The adoption and diffusion theory provides a context with which to determine how teacher beliefs, attitudes, or concerns may impact the diffusion of online teaching. Teacher beliefs and other related concepts were defined, and beliefs were discussed according to their influence on teacher attitudes, knowledge, and concerns about classroom practice. The third section of the literature review defined CTE and Graphic Communications teachers, which were identified within the CTE career cluster of Arts, A/V Technology and Communications Career Cluster (ACTE, 2013). Of particular interest in this study is the type of courses in which Graphic Communications teachers teach (hands-on) and the challenge to transition those types of courses to the online environment. Finally, in the fourth section, the research methodologies best suited to investigating this type of study were reviewed. Studies show that diffusion of educational technologies has primarily followed a quantitative approach to provide a theoretical framework for collecting data. Previous studies on teacher

attitudes toward innovation adoption (Bailey & Palsha, 1992; Christou et al., 2004; Harris, 2005; Liu & Szabo, 2009; Wells, 2000) asserted the use of the relevant theoretical background utilizing a specific instrument. The CBAM (Hall et al., 1977) is widely used to provide a perspective on how a teacher's concerns impact her decision to implement an innovation. A key instrument in the CBAM model is the SoC questionnaire. A number of studies have used this instrument to collect relevant data on studies related to the adoption of innovations in educational settings. Thus, this study agrees with the concept of the CBAM model and uses the SoC questionnaire to collect data on Graphic Communications teachers' concerns surrounding teaching in the online environment.

CHAPTER THREE

Research Method

This chapter describes the method used to conduct this study and includes the following sections: research design, participants, instrument, data collection, data analysis, and summary. Rogers (2003) theory of the diffusion of an innovation is the theoretical framework that underpins this research study and categorizes those faculty who adopt the educational innovation. Quantitative and qualitative methods were used to determine how graphic communications teachers' concerns and beliefs influence their decision to adopt online teaching practices. The research question and sub-questions this study sought to answer were:

RQ: What associations can be revealed between concerns and beliefs held by Graphic Communications teachers regarding their online teaching of Graphic Communications hands-on classes?

SQ-1: What are Graphic Communications teachers' concerns related to teaching hands-on online?

SQ-2: What are Graphic Communications teachers' beliefs related to teaching hands-on online?

Research Design

This study investigated graphic communications teachers' concerns toward teaching online (the innovation) and beliefs toward teaching online that influence their decision to adopt online teaching. This study used a correlational design with two independent variables and one dependent variable. This research design was used to correlate concerns and beliefs for non-adopters of the innovation (Figure 4).

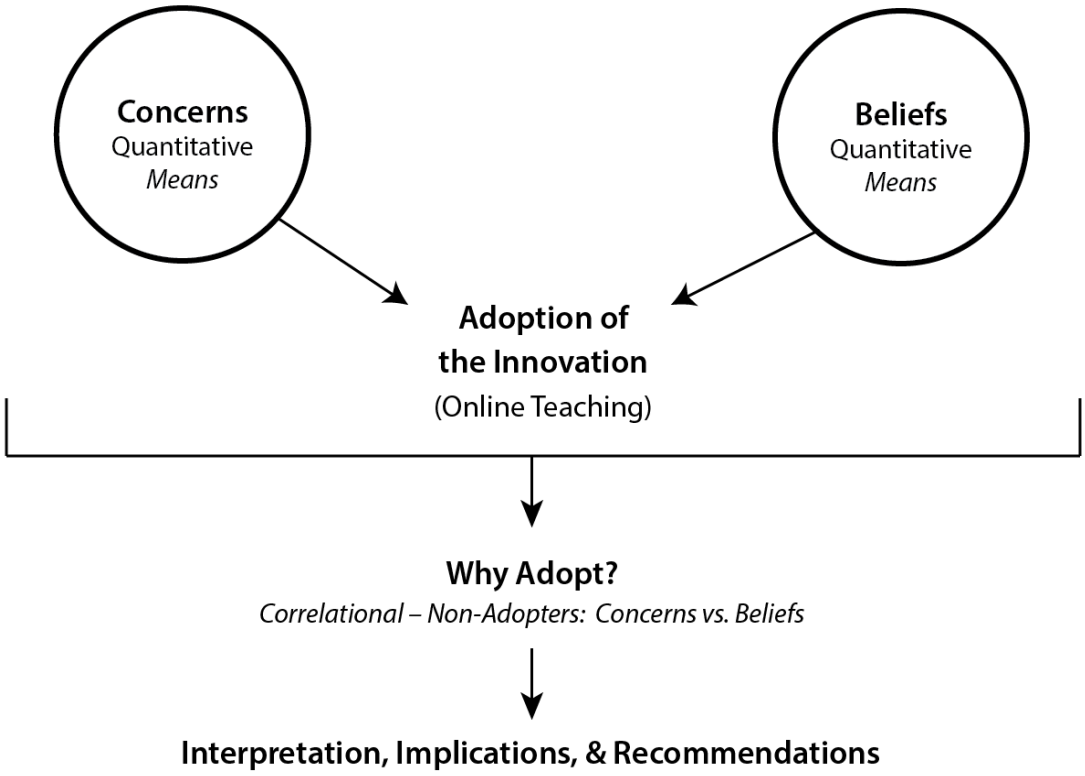


Figure 4. Triangulation of data between dependent and independent variables

The independent variables in this study were the following: (1) graphic communications teachers' concerns toward online teaching and (2) graphic communications teachers' beliefs toward online teaching. The dependent variable in this study was the adoption of online teaching.

To achieve this study's research goals and answer the research questions and sub-questions, this study utilized the Graphic Communications Teachers Beliefs Toward Teaching Online (GCTBTTO) instrument to collect data on the adoption of online teaching, teacher concerns, beliefs, and select demographic variables. The researcher developed a database of graphic communication educators who were invited to participate in the study. Graphic communications educators were identified through the Print and Graphics Scholarship Foundation (PGSF) Directory of Schools and through membership with Graphic

Communications Educators Association (GCEA). Permission to use current GCEA member emails was granted from the current GCEA president via a personal email. The data were collected using Survey Monkey, an online survey tool. Data collected using Survey Monkey were exported as a spreadsheet and imported into SPSS, a statistical analysis program.

Participants

The participants needed for this study were graphic communications educators at higher education institutions. This population can be accessed via listserv databases for graphic communications educators and graphic communications programs from graphics and printing-related associations. Subject areas within CTE that are not easily taught online are those that require students to develop hands-on skills, labs, or fieldwork (Dubois, 2002; Johnson et al., 2003; Zirkle, 2003, 2009; Zirkle & Fletcher, 2009). Graphic communications is a hands-on subject area that falls within the CTE career clusters (ACTE, 2013). For the purposes of this study, graphic communications educators were chosen due to the hands-on nature of their courses, and based on the following criteria: (1) they were practicing education faculty in the field of graphic communications, (2) they currently held a position in higher education, and (3) their institute and/or program offered online courses. A purposeful sample of graphic communications educators were chosen based on the contacts listed with the PGSF 2014-2015 Directory of Schools for Graphic Communications programs across the United States and current GCEA members. GCEA includes educators nationally and internationally teaching graphic communications at both high school and higher educational institutions. The researcher created a database of Graphic Communications teachers combined from both the PGSF Directory of Schools and the GCEA member listserv to distribute the survey to participants in this study.

Instrument

This study sought to collect data on graphic communications teachers' concerns and beliefs toward online teaching. The GCTBTTO survey (Appendix A) combined four questionnaires, which included a section of online teaching questions, the Stages of Concern (SoC) questionnaire, the Children's Self and Task-Perception (CSTP) questionnaire, and select demographics questions. The GCTBTTO is comprised of the following four questionnaires: Part I collected data on online teaching support offered at the institution, online teaching within the program, whether the teacher had a decision on choosing to teach online, and whether the participant had taught online courses (dependent variable) in graphic communications. Participants who answered "No" to teaching graphic communications courses online were redirected to answer questions on what graphic communications classes they had taught and why they chose not to teach online. Participants who answered "Yes" to teaching graphic communications courses online were redirected to answer questions on when they started teaching, which graphic communications courses they had taught and out of those classes, which classes had been taught online, and why they adopted online teaching for their hands-on classes. Part II collected attitudinal data using a modified Stages of Concern (SoC) questionnaire (Hall et al., 1977), Part III collected teacher beliefs data using a modified Children's Self- and Task Perceptions (CSTP) questionnaire (Eccles & Wigfield, 1995), and Part IV collected data on select demographics. The following sections provide details regarding each of the individual parts that comprised the GCTBTTO survey.

Part I: Online Teaching in Graphic Communications

Part I of the survey collected data pertaining to online teaching support offered at the institution, online teaching within the program, if the participant had taught hands-on online

courses within graphic communications, and why they chose to teach hands-on online or not. Online instruction was defined as teaching on the World Wide Web through the Internet where 80 percent or more of the course is offered online (Allen & Seaman, 2014). Asynchronous online instruction was defined as online instruction where teacher and students are not online at the same time. Synchronous online instruction was defined as instruction where teacher and students were online at the same time (Parsad & Lewis, 2008). Web facilitated instruction, where content is posted on Blackboard or Moodle, but face-to-face meetings in a classroom with the teacher are required (Allen & Seaman, 2014), was not included in this study because it is not taught 80 percent or more online. Asynchronous, synchronous, and web-facilitated instruction was defined in the directions for *Part I: Online Teaching in Graphic Communications*.

Part II: Concerns Toward Teaching Online

Part II of the survey, *Concerns Toward Teaching Online*, was a modified version of the Stages of Concern (SoC) questionnaire (Hall et al., 1977). The SoC questionnaire was used to evaluate graphic communications teachers' concerns toward online teaching, the innovation. Following the original Hall, et al. (1977) guidelines for modifying the instrument to reflect the current study, the term "innovation" in an item was replaced with "online teaching", or reworded to make sense to address online teaching as the innovation (Table 1). The Stages of Concern (SoC) questionnaire consisted of 35-item Likert-type questions that offered the opportunity to assess the extent to which concerns influenced graphic communications teachers' decision to adopt online teaching.

Table 1

Item modifications from Hall et al. (1977) SoC

	SoC Original Items (35 Items)	Item Modification (35 items)
STAGE 0	3. I don't even know what the innovation is.	3. I don't even know what ***online teaching*** is.
	12. I am not concerned about this innovation.	12. I am not concerned about ***teaching online***.
	21. I am completely occupied with other things.	21. I am completely occupied with other things.
	23. Although I don't know about this innovation, I am concerned about things in the area.	23. Although I don't know much about ***teaching online***, I am concerned about it.
	30. At this time, I am not interested in learning about this innovation.	30. At this time, I am not interested in learning about ***teaching online***.
STAGE 1	6. I have a very limited knowledge about the innovation.	6. I have very limited knowledge about ***online teaching***.
	14. I would like to discuss the possibility of using the innovation.	14. I would like to discuss the possibility of ***teaching online***.
	15. I would like to know what resources are available if we decide to adopt this innovation.	15. I would like to know what resources are available if ***teaching online*** is to be integrated into my job.
	26. I would like to know what the use of the innovation will require in the immediate future.	26. I would like to know what ***teaching online*** will require in the immediate future.
	35. I would like to know how this innovation is better than what we have now.	35. I would like to know how ***teaching online*** is better than the teaching methods I presently use.

Note. Original phrase underlined, modified term in bold

Table 1 (continued)

Item modifications from Hall et al. (1977) SoC

	SoC Original Items (35 Items)	Item Modification (35 items)
STAGE 2	7. I would like to know the effect of reorganization on my professional status.	7. I would like to know how ***teaching online*** might affect my professional status.
	13. I would like to know who will make the decisions in the new system.	13. I would like to know who will make decisions about my ***teaching online***.
	17. I would like to know how my teaching or administration is supposed to change.	17. I would like to know how my teaching is supposed to change because of ***online teaching***.
	28. I would like to have more information on time and energy commitments required by this innovation.	28. I would like to have more information on time and energy commitments required to ***teach online***.
	33. I would like to know how my role will change when I am using the innovation.	33. I would like to know how my job will change when I start ***teaching online***.
STAGE 3	4. I am concerned about not having enough time to organize myself each day.	4. I am concerned about not having enough time to organize myself each day.
	8. I am concerned about conflict between my interests and my responsibilities.	8. I am concerned about conflict between my interests and my responsibilities.
	16. I am concerned about my inability to manage all the innovation requires.	16. I am concerned about my inability to manage ***online classes***.
	25. I am concerned about time spent working with non-academic problems related to this innovation.	25. I am concerned about the time needed to resolve non-instructional problems related to ***online teaching***.
	34. Coordination of tasks and people is taking too much of my time.	34. Coordination of tasks and people is taking too much of my time.

Note. Original phrase underlined, modified term in bold

Table 1 (continued)

Item modifications from Hall et al. (1977) SoC

	SoC Original Items (35 Items)	Item Modification (35 items)
STAGE 4	1. I am concerned about students' attitudes toward this innovation.	1. I am concerned about students' attitudes toward ***online teaching***.
	11. I am concerned about how the innovation affects students.	11. I am concerned about how my ***online teaching*** might affect students.
	19. I am concerned about evaluating my impact on students.	19. I am concerned about evaluating my impact on students.
	24. I would like to excite my students about their part in this approach.	24. I would like to excite my students about ***online learning***.
	32. I would like to use feedback from students to change the progress.	32. I would like to use feedback from my students to change how I ***teach online***.
STAGE 5	5. I would like to help other faculty in their use of the innovation.	5. I would like to help other faculty ***teach online***.
	10. I would like to develop working relationships with both our faculty and outside faculty using this innovation.	10. I would like to work with colleagues and other faculty who are ***teaching online***.
	18. I would like to familiarize other departments or persons with the progress of this new approach.	18. I would like to familiarize my colleagues about ***online instruction*** as I learn about it and work with it more.
	27. I would like to coordinate my effort with others to maximize the innovation's effects.	27. I would like to coordinate my efforts with my colleagues to learn more about ***online teaching***.
	29. I would like to know what other faculty are doing in this area.	29. I would like to know what other faculty are doing in relation to ***teaching online***.

Note. Original phrase underlined, modified term in bold

Table 1 (continued)

Item modifications from Hall et al. (1977) SoC

	SoC Original Items (35 Items)	Item Modification (35 items)
	2. I now know of some other approaches that might work better.	2. I now know of several approaches for how I might go about ***teaching online***.
	9. I am concerned about revising my use of the innovation.	9. I am concerned about revising what I presently know about ***teaching online***.
STAGE 6	20. I would like to revise the innovation's instructional approach.	20. I would like to change how ***online instruction*** might be used as I learn more about it.
	22. I would like to modify our use of the innovation based on the experiences of our students.	22. I would like to modify our use of ***online teaching*** based on students' experiences.
	31. I would like to determine how to supplement, enhance, or replace the innovation.	31. I would like to determine how to supplement, enhance, or replace ***online instruction***.

Note. Original phrase underlined, modified term in bold

Hall et al. (1977) developed this instrument to provide a quantitative measure of intensity for seven stages of concern. The SoC questionnaire measures the following stages of concern: (1) 0- Awareness, (2) 1- Informational, (3) 2- Personal, (4) 3- Management, (5) 4- Consequence, (6) 5- Collaboration, and (7) 6- Refocusing. The SoC has been repeatedly demonstrated to be a reliable instrument in assessing concerns toward an innovation. Hall et al. (1977) reported reliability across the seven SoC scales with coefficients ranging from .64 to .83, a high internal consistency. Others have reported similar coefficients ranging from .42 to .79 (Bailey & Palsha, 1992), .75 to .84 (Cheung, Hattie, & Ng, 2001), and .65 to .82 (Christou et al., 2004).

Part III: Beliefs Toward Teaching Online

Part III of the *GCTBTTO* was a modification of the Children's Self- and Task Perceptions (CSTP) questionnaire (Eccles & Wigfield, 1995). The Children's Self- and Task Perceptions questionnaire was originally developed to collect data on student perceptions surrounding the value they placed on, and their expectancy for success in, mathematics courses. In this study, items were modified to collect data on graphic communications teachers' *Beliefs Toward Teaching Online.* For the purposes of this research, task value is the value graphic communications teachers place on online teaching and their expectancy for success in teaching online. The survey items in Part III were modified items from the CSTP questionnaire (Table 2) reflecting both the task value and ability/expectancy-related items. The task value items were divided into four separate constructs including: intrinsic interest value, attainment value, extrinsic utility value, and cost (Eccles & Wigfield, 1995; Eccles & Wigfield, 2002; Eccles, 2005).

The Expectancy-Value model has been used in other studies on beliefs, where the word "mathematics" has been modified to accommodate studies on engineering education (Jones, Paretti, Hein, & Knott, 2010) or music teaching (Parkes & Jones, 2012), for example. In the current study the word "mathematics" was changed to reflect "online teaching" and items were reworded as necessary to collect data on the research questions. A total of 12 Likert-type questionnaire items were asked on a scale of 1 to 7, on the following domain-specific constructs: intrinsic interest value (2 items), attainment value (2 items), extrinsic utility value (2 items), expectancy/ability (4 items), and cost (2 items).

In the Expectancy-Value model, cost was added as the fourth component of the task value construct (Eccles, 2005). A person's beliefs affect the way they value a particular task and

how they associate the cost of engaging in a particular activity. Costs can include the time and effort it takes to participate in an activity, or the emotional impact of participating. Cost can also be associated with what an individual has to give up to do a task (Eccles, 2005). Although cost is included in the *CSTP* (Eccles & Wigfield, 1995), in order to better capture this construct as it relates to teaching online two cost items in Part III of the survey were designed after items used on the Expectancy-Value Questionnaire for Teaching Classroom Music and Music Performance questionnaire (Parkes & Jones, 2012).

Table 2

Modification of items selected from Eccles & Wigfield (1995) CSTP and Parkes & Jones (2012) Expectancy-Value Questionnaire

	CSTP Original Items (12 Items)	**Modified Items** (12 items)
Expectancy/Ability	1. Compared to other students, how well do you expect to do in math this year? *(much worse than other students, much better than other students)*	1. Compared to other teachers, how well do you expect to do ***at teaching online***?
	2. How well do you think you will do in your math course this year? *(very poorly, very well)*	2. How well do you think you will do ***at teaching online***?
	3. How good at math are you? *(not at all good, very good)*	3. How good ***at teaching online*** are you?
	4. If you were to order all the students in your math class from the worst to the best in math, where would you put yourself? *(the worst, the best)*	4. If you were to order all of your colleagues from the worst to the best ***at teaching online***, where would you put yourself?

Note. Original phrase underlined, modified term in bold

Table 2 (continued)

Modification of items selected from Eccles & Wigfield (1995) CSTP and Parkes & Jones (2012) Expectancy-Value Questionnaire

	CSTP Original Items (12 Items)	**Modified Items** (12 items)
Intrinsic Interest Value	5. In general, I find working on math assignments *(very boring, very interesting)*	5. In general, I find ***teaching online*** *(very boring, very interesting)*
	6. How much do you like doing math? *(not very much, very much)*	6. How much do you like ***teaching online***?
Attainment Value	7. Is the amount of effort it will take to do well in advanced high school math courses worthwhile to you *(not very worthwhile, very worthwhile)*	7. Is the amount of effort it will take to do well ***at teaching online*** worthwhile to you *(not very worthwhile, very worthwhile)*
	8. I feel that, to me, being good at solving problems which involve math or reasoning mathematically is *(not at all important, very important)*	8. I feel that, to me, being good ***at teaching online*** is very important.
Extrinsic Utility Value	9. How useful is learning advanced high school math for what you want to do after you graduate and go to work? *(not very useful, very useful)*	9. How useful is ***online instruction*** for helping your students graduate and go to work?
	10. How useful is what you learn in advanced high school math for your daily life outside school? *(not at all useful, very useful)*	10. How useful is what your students learn ***in online courses*** for their daily life outside of school?
Cost	11. Is the amount of effort it takes to do well at teaching classroom music worthwhile to you?	11. Is the amount of effort it takes to do well at teaching ***online*** worthwhile to you?
	12. Is the amount of stress involved with being a good classroom music teacher worthwhile to you?	12. Is the amount of stress involved with being a good ***online*** teacher worthwhile to you?

Note. Original phrase underlined, modified term in bold

The Children's Self and Task Perception instrument, being modified for this research, has been shown to be a reliable and valid instrument in previous research. In a study on music teaching (Parkes & Jones, 2012), alpha coefficients were shown to be reliable at the following levels for specific questions in the following constructs: for expectancy ($\alpha = .81$), ability ($\alpha = .89$), intrinsic interest value ($\alpha = .92$), attainment value ($\alpha = .91$), social (extrinsic) utility value ($\alpha = .88$), and for cost ($\alpha = .89$). Abrami et al. (2004) found the instrument to be reliable with expectancy at $\alpha = .86$, value at $\alpha = .74$, and cost at $\alpha = .87$; Peterson (2014) found the instrument to also be reliable with expectancy at $\alpha = .82$. value at $\alpha = .89$, and cost at $\alpha = .75$; and Abrami et al. (2004) reported alphas for expectancy at $\alpha = .86$, value at $\alpha = .74$, and cost at $\alpha = .87$.

Part IV: Demographic Data

Part IV of the instrument, *Demographic Data*, collected demographic data, including gender, level of teaching (high school, two and/or four-year institution), total number of years teaching graphic communications, current institutional rank or title, and location of institution. The questions were a combination of multiple choice, multiple answer, and open-ended questions.

Data Collection

The following section outlines the procedures used to collect data and a timeline for obtaining that data (Table 3). After receiving IRB approval on July 27, 2015 (Appendix B), the current president of GCEA was contacted for permission to access current member emails. Permission was granted via a personal communiqué with the president of GCEA, and a list of GCEA member emails was obtained on August 14, 2015.

Table 3

Timeline for collecting data

July 2015	Virginia Tech IRB Approval
August 2015	Request Email asking for GC Listservs
	Invitation Email and Follow-up Email to GC Teachers
December 2015	Data Collection Completion and Analysis

A database of graphic communications educators were sent an email letter, which included informed consent (Appendix C), inviting them to participate in the study. The email letter included a link to the online survey. The list of email addresses received from GCEA included national and international higher education graphic communications educators who were currently teaching graphic communications courses (i.e. librarians, student members, retirees, etc. were excluded). These members were included in the database of graphic communications educators and were asked to participate. To increase the response rate, the researcher sent a follow-up email to non-respondents asking them to respond to the survey.

Data Analysis

Each section was analyzed independently and then the five beliefs constructs were correlated with the seven concerns constructs to describe the extent of their influence on the dependent variable, the adoption of online teaching. Theme analysis was used to analyze the data collected in Part I of the survey, simple means was used to analyze the data collected for Part II and Part III and to answer SQ-1 and SQ-2, and descriptive analysis was used to describe the demographics data collected in Part IV of the survey. Following these independent analyses, correlational analysis was used to describe the relationship between participant concerns and participant beliefs for online teachers and teachers not teaching online. Table 4 presents the

research questions, the instrument section, the factors addressed in each section of the GCTBTTO, the type of data gathered, and the method for analyzing the data.

Table 4

Research Question Data Analyses Matrix

Research Question	Instrument	Variables	Type of Data Gathered	Data Analysis
SQ-1. What are Graphic Communications teachers' concerns related to teaching hands-on online?	*Part II GCTBTTO (concerns)*	1) 0-Awareness 2) 1-Informational 3) 2-Personal 4) 3-Management 5) 4-Consequence 6) 5-Collaboration 7) 6-Refocusing	Quantitative	Means and correlational analysis
SQ-2. What are Graphic Communications teachers' beliefs related to teaching hands-on online?	*Part III GCTBTTO (beliefs)*	1) Intrinsic interest value 2) Attainment value 3) Extrinsic utility value 4) Expectancy/Ability 5) Cost	Quantitative	Means and correlational analysis

Sub-question 1: Graphic Communications Teachers' Concerns

Participants were asked to respond to 35 items indicating their degree of concern, on a 0-7 scale, about teaching online. High concern was indicated by high numbers and low concern or irrelevant items were indicated by low numbers. Five questions were asked in seven major areas of concern. Missing values were addressed by taking an average of the items marked and inserting it in place of the missing value in order to compute the raw score. Responses could be hand scored, according to the scoring procedure defined by Hall et al. (1991) using the Stages of Concern Quick Scoring Device (Appendix D) or input into a statistics application for scoring.

Highest stage scores could be done individually or as a group. In this study, scores were analyzed as a group. Simple means was used to analyze the data in all seven concern stages. The data for Part II (concerns) of the survey were analyzed independently and then correlated with data collected from Part III (beliefs) of the survey.

Sub-question 2: Graphic Communications Teachers' Beliefs

There were a total of twelve questions based on the five constructs in the Expectancy-Value model (Eccles & Wigfield, 1995; Eccles & Wigfield, 2002; Eccles, 2005; Parkes & Jones, 2012). Participants were asked to respond using a 7-point Likert scale where lower scores indicated a negative belief toward online teaching and higher scores indicated a positive belief toward online teaching. Mean scores for expectancy and ability-related beliefs and subjective task values in online teaching were calculated for participant responses in each of the five constructs in the Expectancy-Value (EV) model: intrinsic interest value, attainment value, social utility value, expectancy/ability, and cost. The data collected from Part III (beliefs) of the survey was analyzed independently to reveal positive and negative beliefs across each of the five constructs for online teachers and teachers not teaching online. After this independent analysis a correlational analysis was conducted with participant beliefs and concerns data collected in Part II of the survey.

Correlations

Concerns vs. beliefs. Sample correlation coefficients were used to measure the strength and direction of the correlation between seven concerns constructs and five beliefs constructs for online teachers and teachers not teaching online as shown in the sample correlation coefficient matrix (Table 5). Sample correlation coefficients were chosen based on a non-gaussian population and small sample size. The overall target population, graphic communications

educators, is a small population. The population being used for this study is also small, so the researcher expected a small sample. Based on this information the researcher assumed a non-normal distribution and chose non-parametric methods for analyzing the data. Sample correlation coefficients were chosen because it is a non-parametric method where ordinal data can be used.

Table 5

Sample Correlation Coefficient Matrix for Concerns and Beliefs of Graphic Communications Teachers

		Stages of Concern (SoC) - Concerns						
		Awareness	Informational	Personal	Management	Consequence	Collaboration	Refocusing
CSTP - Beliefs	Cost							
	Social Utility							
	Attainment							
	Intrinsic Interest							
	Expectancy/ Ability							

Summary

This chapter provided the methodology used to conduct this research study. The instrument, GCTBTTO, was used to collect data on graphic communications teacher adoption of online teaching, concerns, beliefs, and demographics. Data was analyzed independently for graphic communications teachers' participation in online teaching, participant concerns, beliefs, and demographics. A correlational research design was used to measure the strength and direction of data collected on graphic communications teachers' concerns and beliefs. Findings are presented in the following chapter.

CHAPTER FOUR

Results

This chapter presents the results of the data analyses from the GCTBTTO survey. The data gathered were analyzed through means and correlational analysis to answer the following research question and sub-questions:

RQ: What associations can be revealed between concerns and beliefs held by Graphic Communications teachers regarding their online teaching of Graphic Communications hands-on classes?

SQ-1: What are Graphic Communications teachers' concerns related to teaching hands-on online?

SQ-2: What are Graphic Communications teachers' beliefs related to teaching hands-on online?

Data Sources

Survey data collected on Graphic Communications teacher participants were analyzed using Google Sheets and SPSS statistical analysis software. Theme analysis was conducted on open-ended data collected in Part I: Online Teaching in Graphic Communications. The Stages of Concern Questionnaire (SoCQ) scoring device was used to analyze the data for Part II: Concerns Towards Teaching Online and simple means were used to analyze Part III: Beliefs Towards Teaching Online. Sample correlation coefficients were used to compare data gathered from both Part II (concerns) and Part III (beliefs) of the survey. The demographic data for the participants in this study are presented in the following order: general demographic data (gender), data gathered on Graphic Communications teaching experience (levels of teaching from high school to four-year college, years taught at each level), and data gathered on current post-secondary

positions and program location within the Graphic Communications field (current rank/title, location). A total of 423 Graphic Communications teachers were asked to participate in this study. A total of 111 responded to the GCTBTTO survey, 26 of which were incomplete and therefore removed, 5 of which had only taught at the high school level and were removed, and 1 who taught in a correctional setting and was removed. This resulted in 79 total usable responses representing an 18% response rate, which is an acceptable return rate (Dillman, Smyth, and Christian, 2014). The following Summary of Data section outlines the findings for demographic data based on the two subgroups of online teachers and those who had not taught online. The findings are further discussed based on research sub-questions and main research question.

Summary of Data

Demographic data. The population for this study consisted of 79 Graphic Communications teacher participants. This population was further split into two groups, those teachers who have taught online and those who have not taught online.

Online teachers. Thirty-two participants indicated they have taught Graphic Communications courses synchronously or asynchronously online. Participants who have taught online (Table 6) were mostly male (56%), with the majority of their teaching experience at 4-year colleges (Table 7). Their positions at these 4-year institutions were evenly distributed among titles of Lecturer (19%), Assistant Professor (19%), Associate Professor (19%), and Full Professor (19%) located in the Southeastern United States (31%).

Table 6

Summary of Participant Demographics for Online Teachers

Demographic Data		Participant n (%)
Gender	Male	18 (56%)
	Female	14 (44%)
Rank/Title	Adjunct	0
	Lecturer	6 (19%)
	Instructor	5 (16%)
	Assistant Professor	6 (19%)
	Associate Professor	6 (19%)
	Full Professor	6 (19%)
	Other	3 (9%)
Location of Institution	Southeast	10 (31%)
	Southwest	5 (16%)
	Northeast	6 (19%)
	Midwest	7 (22%)
	West	3 (9%)
	Canada	1 (3%)

Note: n=32

Table 7

Number of Years Online Teachers Taught at Different Levels

School Level	Ranges in Years				
	1-5 (%)	**6-10 (%)**	**11-15 (%)**	**16-20 (%)**	**21+ (%)**
High School	2 (6%)			1 (3%)	1 (3%)
2-Year College	3 (9%)	2 (6%)		4 (13%)	1 (3%)
4-Year College	7 (22%)	8 (25%)	3 (9%)	3 (9%)	6 (19%)

Note: n=32

Participants were asked if their institution had a support system and infrastructure in place for faculty who want to teach synchronously or asynchronously online. It is clear from the data (Table 8) that nearly all respondents (94%) had support systems in place, were in programs offering online courses (91%), and were the one who decides whether they teach online (81%). Over half of these teachers started teaching online between 2006-2011 (53%) (Table 9). Those

who did not make a personal choice to teach online indicated they did so because of a university directive (Appendix E). The findings also revealed that, although some of the participants had been teaching online since 1997, the majority of them had only taught 1-2 online classes (62%) (Table 10).

Table 8

Summary of Responses for Online Teaching

Online teaching	Participant responses n (%)	
	Yes	No
Support System	30 (94%)	2 (6%)
Program offers online	29 (91%)	3 (9%)
Makes the decision to teach online	26 (81%)	6 (19%)

Note: n=32

Table 9

Year Teachers Started Teaching Online

Range of Years	Started Teaching Online n (%)
1997-2001	6 (19%)
2006-2011	17 (53%)
2012-2015	9 (28%)

Note: n=32; no participants started teaching between 2002-2005

Table 10

Number of Classes Taught Online

Number of Online Classes Taught	Participant Responses n (%)
0 classes	4 (12%)
1-2 classes	20 (62%)
3-4 classes	3 (9%)
5+ classes	5 (16%)

Note: n=32

A list of 23 common Graphic Communications course topics were included in the survey and participants who have taught online were asked to indicate which courses they had taught and which ones they had taught online (Table 11). These findings indicate those courses, which are easier to teach online, are those that are not skill-based courses and require hands-on practice on machinery (Githens et al., 2012), as these findings represent courses that are either foundation courses or software-based courses.

Table 11

Courses Taught vs. Courses Taught Online

Course Topic	**Taught this Course n**	**Taught this Course Online n (%)**
Intro to Graphic Communications	23	12 (37%)
Digital Layout and Design	19	11 (34%)
Web Design/Development	14	9 (28%)
Digital Imaging/Photography	20	9 (28%)
Typography and Design	13	7 (22%)
Graphic Communications Seminar	11	5 (16%)
Graphic Communications Trends/Research	11	3 (9%)

Note: n=32

Table 11 (continued)

Courses Taught vs. Courses Taught Online

Course Topic	Taught this Course n	Taught this Course Online n (%)
Cross Media Design/Production	13	3 (9%)
Printing Estimating	9	3 (9%)
3D Imaging and Animation	6	2 (6%)
Graphic Communications Leadership	9	2 (6%)
Printed Electronics	4	1 (3%)
Graphic Communications Management/Sales	10	1 (3%)
Packaging Design/Production	14	1 (3%)
Color Management	10	1 (3%)
Substrates and Inks	9	1 (3%)
Screen Printing	11	1 (3%)
Offset Lithographic Printing	14	1 (3%)
Digital Printing	15	1 (3%)
Flexographic Printing	7	0
Gravure Printing	4	0
Bindery and Finishing	10	0
Specialty Printing	5	0

Note: n=32

Participants were asked to respond to an open-ended question on why they chose to teach Graphic Communications courses online. A theme analysis was conducted by coding the data to develop themes (Creswell, 2012). This process included reading participant open-ended comments where themes started to emerge and were coded during the first round of coding. After reading back through participant responses these codes were re-evaluated whereas some codes were consolidated to finalize themes for why online teachers adopted online teaching for their hands-on Graphic Communications classes. The theme analysis of the 32 participants who have taught online revealed that almost half of respondents chose to do so because it was convenient for their students (Appendix E).

Teachers not teaching online. Findings revealed that those participants who had not taught online were mostly male (72%) and Associate Professors (28%) located in the Southeast (38%) and Midwest (36%) (Table 12). Participants were asked to indicate whether they had taught at a high school, 2-year college, and/or 4-year college and how many years at each level. The findings indicate the majority of their teaching experience was between 1-5 years (13%) teaching at the high school level, 1-5 years teaching at the 2-year college level (23%), and over 21 years teaching at the 4-year college level (19%) as shown in Table 13. Whereas online teachers had more years experience teaching at the 2-year level (Table 7), these participants had more years experience teaching at a high school and a 4-year college.

Table 12

Summary of Participant Demographics for Teachers Not Teaching Online

Demographic Data		**Participant n (%)**
Gender	Male	34 (72%)
	Female	13 (28%)
Rank/Title	Adjunct	4 (8%)
	Lecturer	5 (11%)
	Instructor	3 (6%)
	Assistant Professor	5 (11%)
	Associate Professor	13 (28%)
	Full Professor	9 (19%)
	Other	8 (17%)
Location of Institution	Southeast	18 (38%)
	Southwest	1 (2%)
	Northeast	6 (13%)
	Midwest	17 (36%)
	West	2 (4%)
	Canada	3 (6%)

Note: n=47

Table 13

Number of Years Teachers Not Teaching Online Taught at Different Levels

School Level	Ranges in Years				
	1-5 (%)	**6-10 (%)**	**11-15 (%)**	**16-20 (%)**	**21+ (%)**
High School	6 (13%)	3 (6%)	2 (4%)	4 (8%)	
2-Year College	11 (23%)	5 (11%)	2 (4%)	2 (4%)	2 (4%)
4-Year College	7 (15%)	8 (17%)	5 (11%)	5 (11%)	9 (19%)

Note: n=47

Teachers not teaching online also responded to whether their institution had a support system and infrastructure in place for faculty who want to teach synchronously or asynchronously online as shown in Table 14. Similar to those participants who have taught online, the majority (83%) of these participants had a support system in place to teach online, whereas they make the decision to teach online (60%). Compared to online teachers (Table 8), a little more than half of these teachers teach in programs that do not offer online courses. These findings indicate that even though teachers in this sub-group had the authority to choose to teach online, neither themselves nor anyone else in their program were choosing to teach online.

Table 14

Summary of Responses for Teachers Not Teaching Online

Online Teaching	Participant responses n (%)	
	Yes	No
Support System	39 (83%)	8 (17%)
Program offers online	23 (49%)	24 (51%)
Makes the decision to teach online	28 (60%)	19 (40%)

Note: n=47

Table 15 shows a side-by-side comparison of face-to-face courses taught by teachers not teaching online and those taught by the online teaching sub-group. The majority of courses taught by teachers not teaching online were "printing" courses (i.e. Digital Printing, Flexographic Printing, Gravure Printing, etc.) compared to the types of courses taught by online teachers. It is evident that teachers not teaching online have taught more hands-on lab-based graphic communications courses than online teachers based on the number of printing courses they teach. These findings indicate the difficulty in exploring online teaching methods for hands-on courses that require manipulation of machinery.

Table 15

Number of Course Topics Taught by Teachers not Teaching Online vs. Online Teachers

Course Topic	Non-Online Teachers Courses (n=47) n	Online Teachers Courses (n=32) n
Intro to Graphic Communications	42	23
Digital Layout and Design	30	19
Web Design/Development	15	14
Digital Imaging/Photography	20	20
Typography and Design	22	13
Graphic Communications Seminar	8	11
Graphic Communications Trends/Research	6	11
Cross Media Design/Production	10	13
Printing Estimating	16	9
3D Imaging and Animation	5	6
Graphic Communications Leadership	5	9
Printed Electronics	3	4
Graphic Communications Management/Sales	5	10
Packaging Design/Production	16	14
Color Management	20	10
Substrates and Inks	19	9
Screen Printing	25	11
Offset Lithographic Printing	30	14

Note: N=79

Table 15 (continued)

Number of Course Topics Taught by Teachers not Teaching Online vs. Online Teachers

Course Topic	Non-Online Teachers Courses (n=47) n	Online Teachers Courses (n=32) n
Digital Printing	30	15
Flexographic Printing	17	7
Gravure Printing	8	4
Bindery and Finishing	21	10
Specialty Printing	10	5

Note: N=79

Teachers not teaching online were also asked to respond to an open-ended question on why they chose not to teach hands-on Graphic Communications courses online. A theme analysis was conducted by coding the data to develop themes (Creswell, 2012). This process included reading participant open-ended responses where themes started to emerge and were coded during the first round of coding. After reading back through participant responses these codes were re-evaluated to consolidate and finalize themes for why these teachers had not adopted online teaching for their hands-on Graphic Communications classes (Appendix E). The theme analysis revealed that over half of these teachers indicated they had not adopted online teaching because what they teach is hands-on. Specifically, three individual participants indicated that online teaching cannot "offer a hands-on lab experience" because "hands-on teaching is what makes our program unique and different" and that you cannot "teach physical skills without physical interaction" (Appendix E). Compared to the findings for online teachers, where their primary reason for teaching online was to offer convenience to students, it should be recognized that the

types of courses they were teaching online were courses that did not require teaching hands-on skill-based courses.

Research Question and Sub-Questions

This research study was guided by one research question and two sub-questions. The following section outlines the results of triangulating the open-ended questions about online teaching with participant responses to the Stages of Concern questionnaire to answer the main research question and two sub-questions.

Sub-Question 1: Concerns Towards Teaching Online

Data were collected on participant concerns using a modified SoCQ. Participants were asked to respond to a 7-point Likert scale to assess their level of concern relative to the innovation – online teaching. Findings for the two sub-groups, participants who have taught online and those who have not taught online, are presented below.

Online teachers. Mean scores for online teachers level out in the beginning stages of concern, but show a spike in external concerns. These findings suggest that Graphic Communications teachers who have adopted online teaching have higher external concerns based on the group data presented in Figure 5. Hall et al. suggest that as individuals move from little concern about an innovation to using the innovation their concerns move from being higher in internal concerns to higher in external concerns, especially if there is support for the innovation.

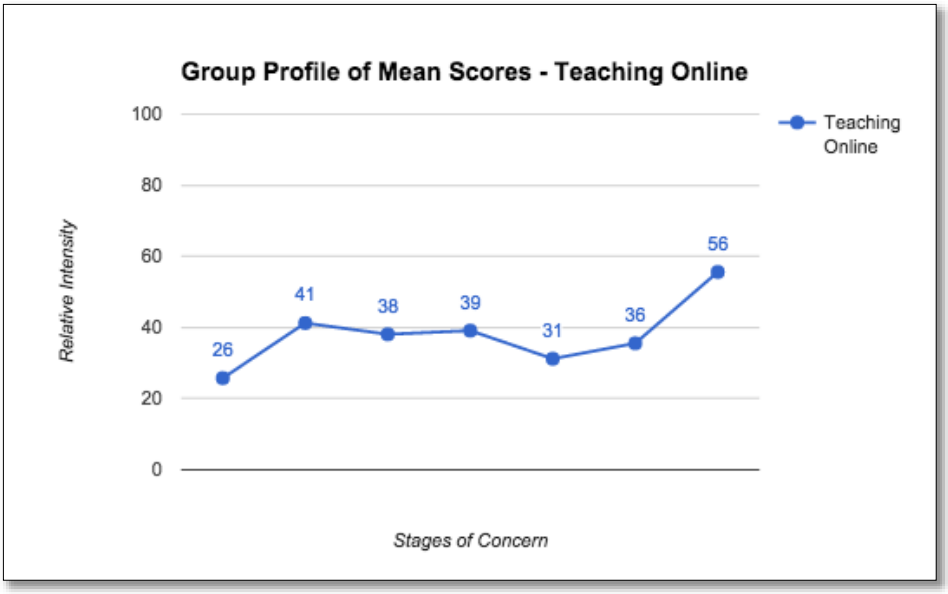


Figure 5. Group profile of mean scores for online teachers

Furthermore, the majority of participants who have taught online had a support system in place to teach online, their program offered online classes, and they made the decision to teach online (Table 8), yet further assessment indicated more than half of them had only taught 1-2 online classes (Table 10). It should be noted that the instrument asked participants to indicate whether they had taught synchronous or asynchronous online, not including web-facilitated or hybrid teaching. Open-ended questions about why teachers adopted online teaching for hands-on Graphic Communications classes revealed that online teaching was a good fit for certain courses, and although they responded "yes" to teaching synchronous or asynchronous online, multiple participants offered that their classes were hybrid and not fully online (Appendix E). One online teacher participant said "I would say that most graphic communications courses that are part of a hands-on program do not warrant themselves for full online learning", and this is evident in the level of concerns (Figure 5) for this sub-group. Online teachers had high levels of concern in the

Refocusing stages indicating they are looking for other ways to include or replace the innovation, or ideas about alternatives to using the innovation.

The SoC questionnaire and open-ended responses were used to determine the concerns of graphic communications faculty who were using or considering adopting online teaching methods. Overall, these findings reveal that Graphic Communications teachers teaching online are still somewhat new to teaching online and those courses that are primarily being taught online are courses that do not involve the manipulation of equipment, which constitutes the core of the curriculum in Graphic Communications.

Teachers not teaching online. The data revealed that almost all of Graphic Communications teachers who had not taught online had high internal concerns, which is consistent with concerns of non-adopters or early adopters of an innovation (Hall et al., 1991). A "tailing-up" was also noted in 63% (27/43) of individual SoC profiles of teachers who have not taught online. George, Hall, and Stiegelbauer (2013) suggest that a tailing-up of a non-user profile indicates "the respondent has ideas that he or she sees as having more merit than the proposed innovation" (p. 42) and is an indication that the participant is likely resistant to the innovation.

The group profile of mean scores for teachers not teaching online (Figure 6) reveals further evidence of high internal concerns. If we compare the group profile of mean scores for teachers who have not taught online (Figure 6) to the group profile for those who have taught online (Figure 5) we can see a difference in the shape based on scores in Stages 0-3 for teachers not teaching online versus online teachers. The profile curve for online teachers starts low in internal concerns and is higher in external concerns whereas the opposite is true for the profile curve for teachers not teaching online, indicating high internal concerns and low external

concerns. Both profile curves indicate a tailing-up in the Refocusing stage, indicating concern about alternatives to online teaching or a resistance to it.

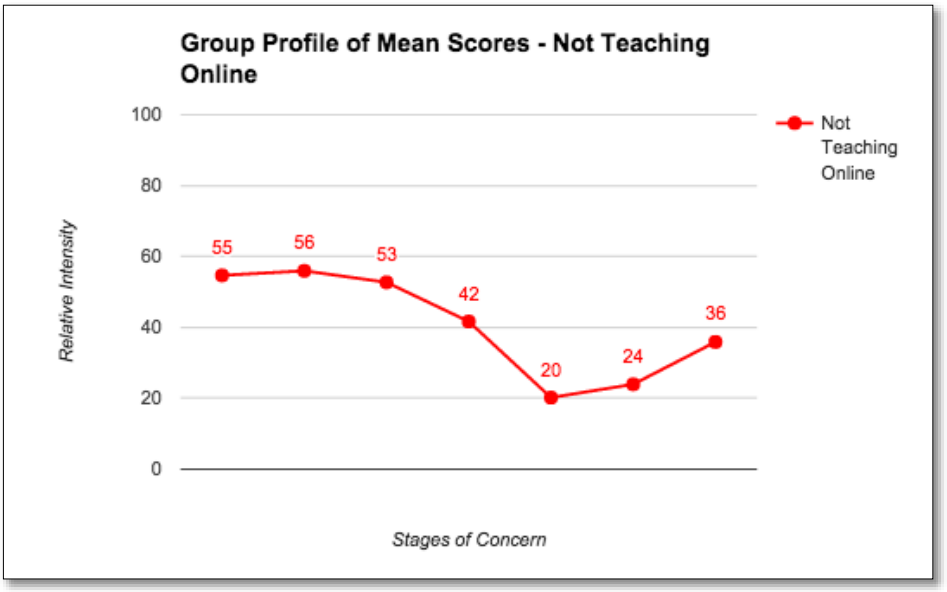


Figure 6. Group profile of mean scores for teachers not teaching online

To determine if the difference between the mean scores is large enough to be considered a significant difference, an independent *t*-test was conducted across the seven stages of concern within the two sub-groups of teachers. All stages of concern except Management were found to be significant at the 0.05 level (Table 16). A graphic comparison (Figure 7) of mean scores is provided to indicate the difference in scores between online teachers and teachers not teaching online across the stages of concern. The lack of significance between the two sub-groups on Management concerns indicates that both online and teachers not teaching online had very similar levels of concerns regarding the time, energy, logistics, and available resources needed to teach online.

Table 16

Mean comparison of Percentile Scores for Online and Teachers not Teaching Online

Stages of Concern	Online Teachers (n=32)	Teachers Not Teaching Online (n=47)	*t*	*Sig.*
Awareness	26	55	-4.29**	.00
Informational	41	56	-3.29**	.00
Personal	38	53	-2.61**	.01
Management	39	42	-0.42	.68
Consequence	31	20	2.66*	.01
Collaboration	36	24	2.24*	.03
Refocusing	56	36	3.78**	.00

Note: *Significant at the < 0.05 level
**Significant at the < 0.01 level; α = .890

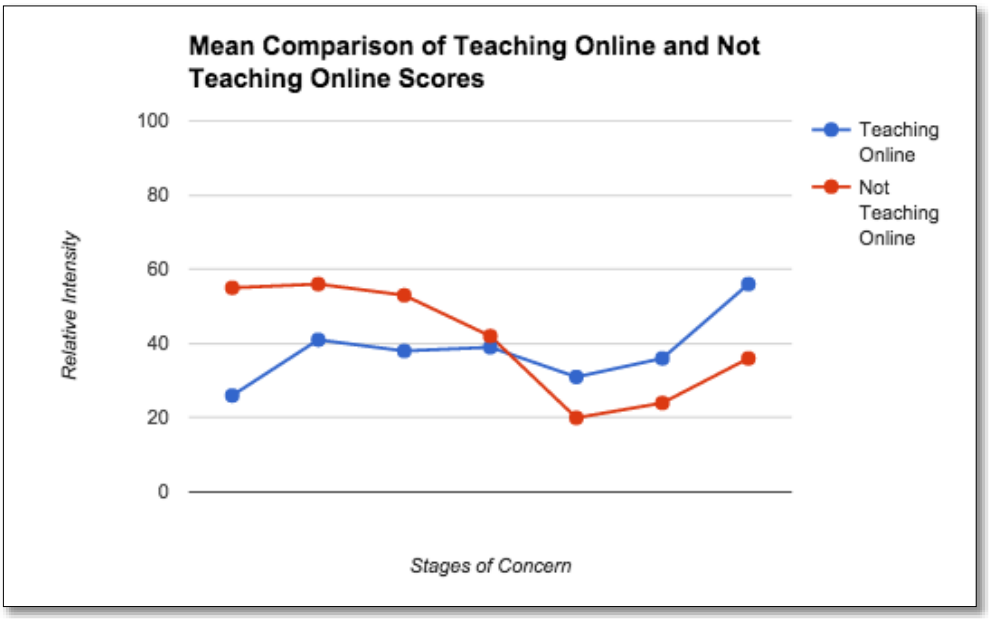


Figure 7. Mean comparison of scores for online teaching vs. not teaching online

Sub-Question 2: Beliefs Towards Teaching Online

The beliefs of 32 online teachers and 47 teachers who have not taught online were organized into the five following belief constructs: expectancy/ability, intrinsic interest value, attainment value, social utility value, and cost. There were 12 total questionnaire items ranked on

a 7-point Likert scale: expectancy/ability (4 questions), intrinsic interest value (2 questions), attainment value (2 questions), extrinsic utility value (2 questions), and cost (2 questions). Participant mean (μ) scores were calculated for each of these constructs and are shown in Table 17. The mean scores indicate online teacher beliefs are high for expectancy and ability to teach online, in addition to the high value they place on online teaching and how they associate the cost of engaging in online teaching. Independent t-tests on mean scores of online teachers and teachers not teaching online indicated a significant difference between beliefs for the two sub-groups.

For teachers not teaching online, expectancy and ability, task value, and cost mean values indicated these participants do not feel as confident about their success and ability to teach online. In addition, the value they place on online teaching in Graphic Communications and the cost to engage in online teaching is less important to them compared to those teachers who have taught online.

Table 17

Mean comparison of Scores for Participant Beliefs

Expectancy-Value Construct	Online Teachers Mean **(μ)** (n=32)	Teachers Not Teaching Online Mean **(μ)** (n=47)	*t*	*Sig.*
Expectancy/Ability	5.7	4.1	5.36*	.00
Intrinsic Interest Value	4.8	3.3	4.13*	.00
Attainment Value	5.1	3.7	3.67*	.00
Social Utility Value	4.6	3.1	3.53*	.00
Cost	5.1	3.4	4.80*	.00

Note: *Significant at the < 0.01 level; α = .955

Main Research Question: Concerns vs. Beliefs

Sample correlation coefficients were conducted to answer the main research question: *What associations can be revealed between concerns and beliefs held by Graphic Communications teachers regarding their online teaching of Graphic Communications hands-on classes?* The sample correlation coefficient measures the strength of the relationship between two ordinal variables, providing a correlation coefficient based on participant raw data. Evans (1996) suggests the following when interpreting correlational strength: 0-.19 (very weak), .20-.39 (weak), .40-.59 (moderate), .60-.79 (strong), and .80-1.00 (very strong). The sample correlation coefficient was also preferred based on the small sample size and non-normal distribution. Correlations for online and teachers not teaching online are presented below organized with each belief construct across each Stage of Concern.

Online teachers.

Cost beliefs. The correlations between Cost and the Stages of Concern suggest that there was a moderately strong relationship between these teachers' beliefs about the cost of teaching online and their awareness of online teaching, their concerns about managing online teaching, and collaborating with others about online teaching as shown in Table 18. The results indicate a negative relationship in the Awareness stage, which is based on how the questions for this stage were asked. For example, questions in this stage started with a negative statement "I don't even know" or "I am not concerned" or "I am not interested" whereas questions in other stages started with a positive statement like "I would like to know" or "I am concerned". Therefore, this negative relationship is due to double negative questioning and negative participant responses.

Table 18

Sample Correlation Coefficient Matrix for Beliefs and Concerns of Online Teachers

		Stages of Concern (SoC) - Concerns						
		Awareness	Informational	Personal	Management	Consequence	Collaboration	Refocusing
CSTP - Beliefs	Cost	-.469*	-.095	-.267	-.453*	-.014	.390*	.099
	Social Utility	-.465*	.153	.031	-.336	-.081	.431*	.148
	Attainment	-.557*	.003	-.176	-.381*	.077	.484*	.166
	Intrinsic Interest	-.521*	.009	-.162	-.395*	-.018	.507*	.177
	Expectancy/ Ability	-.249	-.004	-.137	-.249	.030	.099	-.159

Note: n=32; significant at the 0.05 level

Social utility beliefs. Graphic Communications teachers' social utility beliefs were found to have a moderately strong relationship with several Stages of Concern as shown in Table 18. These findings indicate a moderately strong relationship between beliefs about the usefulness of online teaching and concerns about managing online teaching and collaborating with others to teach online.

Attainment beliefs. Correlations between Attainment beliefs and the Stages of Concern indicate there is a moderately strong relationship between participant beliefs about doing well at online teaching and their concerns about online teaching as shown in Table 18. Participant beliefs about doing well at online teaching were also found to be moderately strongly related to their concerns about managing online teaching and collaborating with others to teach online.

Intrinsic interest beliefs. As shown in Table 18, correlations between Intrinsic Interest and the Stages of Concern found a moderately strong relationship between participant beliefs about their interest in teaching online, their concerns about online teaching, managing online teaching, and collaborating with others to teach online.

Expectancy and ability beliefs. Correlations between Expectancy and Ability beliefs and the seven stages of concern found weak relationships in all stages with no statistically significant findings (Table 18). These findings indicate that participant beliefs about expectancy for success and ability to teach online have no relationship to online teaching concerns.

Teachers not teaching online.

Cost beliefs. The correlations between Cost and the Stages of Concern for teachers not teaching online indicate a moderately strong positive correlation between Cost and Collaboration as shown in Table 19. These results indicate the strongest relationship is between these teachers' beliefs about stress and effort to teach online and their concern in collaborating with others to teach online.

Table 19

Sample Correlation Coefficient Matrix for Beliefs and Concerns of Teachers Not Teaching Online

		Stages of Concern (SoC) - Concerns						
CSTP - Beliefs		Awareness	Informational	Personal	Management	Consequence	Collaboration	Refocusing
	Cost	-.329*	.368*	.347*	.245	.424*	.530*	.522*
	Social Utility	-.436*	.376*	.368*	.251	.396*	.681*	.558*
	Attainment	-.436*	.400*	.366*	.309*	.437*	.598*	.549*
	Intrinsic Interest	-.395*	.233	.187	.139	.229	.483*	.391*
	Expectancy/ Ability	-.322*	.246	.246	.099	.269	.420*	.502*

Note: n=47; significant at the 0.05 level

Social utility beliefs. Similar to beliefs about Cost, the findings indicate a moderately strong positive correlation with statistical significance between Social Utility and Collaboration as shown in Table 19. This suggests there is a strong relationship between these teachers' beliefs

about the usefulness of online teaching and their concerns in collaborating with others to teach online courses.

Attainment beliefs. Similar to beliefs about Cost and Social Utility, Attainment had the highest positive correlation with Collaboration (Table 19) indicating the importance of doing well at online teaching was closely tied to Graphic Communications teachers' concerns about collaborating with others to teach online.

Intrinsic interest beliefs. The correlation between participant beliefs about Intrinsic Interest and concerns in Awareness, Collaboration, and Refocusing (Table 19) had moderately high correlations indicating a strong relationship between participants' interest in online teaching and their external concerns about teaching online. There was little to no relationship between Graphic Communications teachers' interest in online teaching and their concerns in Informational, Personal, Consequence, and Management. This is likely due to high internal concerns of teachers who had not taught online and their low interest in online teaching.

Expectancy and ability beliefs. Participants' Expectancy and Ability beliefs and concerns in Awareness, Collaboration, and Refocusing were moderately highly correlated as shown in Table 19. These findings indicate a strong relationship between Graphic Communications teachers' beliefs about expectancy for success and ability to teach online and their concerns about collaborating with others to teach online and other alternatives to online teaching. There was little to no relationship between Graphic Communications teachers' ability beliefs and expectancy for success in online teaching and their concerns Informational, Personal, Management, and Consequence. This finding suggests that whereas their concerns in these stages were high, they had low beliefs about being successful at online teaching and/or their ability to teach online.

Summary of the Findings

Analyses of findings collected from the GCTBTTO survey were presented in Chapter 4 to answer one main research question with two sub-questions. Questions on online teaching in Graphic Communications, a modified Stages of Concern (SoC) questionnaire, a modified Children's Self and Task Perception (CSTP) questionnaire, and demographic questions were analyzed using the SoC scoring device, simple means, and sample correlation coefficients to provide the following key findings.

Online Teaching in Graphic Communications: Key Findings

The 79 respondents in this study were asked a series of questions about online teaching at their institution, in their program area, and whether they had taught online. The majority of participants said their institution has an infrastructure in place to support online (87%), their Graphic Communications program offers online courses (66%), and they make the decision to teach online (68%), yet over half (59%) of them do not teach online.

Participants who have taught online were asked to indicate when they started teaching online, which courses they taught, and which of those were taught online. Of those participants who have taught online, the majority of them adopted online teaching between the years 2006-2011 (53%). Courses that were indicated as being taught online were courses that did not require hands-on manipulation of equipment. Those online courses taught the most included: Intro to Graphic Communications (37%), Digital Layout and Design (34%), Web Design/Development (28%), and Digital Imaging/Photography (28%). Courses that had never been taught online were those that require hands-on skill development on machinery and included courses such as: Flexography printing, Gravure printing, Specialty printing, and Finishing and Bindery. An open-ended question about online teaching revealed that the majority of Graphic Communications

teachers who had taught online did so because it was convenient to students (Appendix E) and the majority of those who had not taught online said it was because their courses were hands-on courses.

Concerns Towards Teaching Online: Key Findings

The SoCQ scoring device and manual were used to score participant responses on their concerns towards teaching online and to answer the sub-question: *What are Graphic Communications teachers' concerns related to teaching hands-on online?* Thirty-two online teacher profiles and 47 profiles for teachers not teaching online were interpreted based on high levels of internal or external concerns. The group profile for online teachers indicated higher levels of external concerns about online teaching. Teachers not teaching online had higher internal concerns towards teaching online. A "tailing-up" of profiles for teachers not teaching online indicates these participants are resistant to online teaching. An independent *t*-test revealed significant findings between both online and teachers not teaching online across all stages of concern except Management, which was not found to be significant between the two groups.

Beliefs Towards Teaching Online: Key Findings

Simple means were used to analyze the data collected from participant beliefs towards teaching online and to answer the sub-question: *What are Graphic Communications teachers' beliefs related to teaching hands-on online?* Data for both online teachers and teachers not teaching online were analyzed. Mean scores for online teachers in expectancy and ability-related beliefs (μ =5.7), task value beliefs (μ =4.8) (including intrinsic interest value, attainment value, extrinsic utility value), and cost (μ =5.1) were high. The results indicate Graphic Communications teachers have somewhat strong beliefs as it relates to their ability and expectancy for success in teaching online, as well as the value they place on online teaching and

the expected cost to engage in online teaching. Mean scores for teachers who had not taught online in expectancy and ability (μ =4.1), task value (μ =3.4), and cost (μ =3.4) beliefs were somewhat low indicating weak beliefs in these constructs.

Correlations Between Beliefs and Concerns: Key Findings

Sample correlation coefficients were used to examine the relationship between participant beliefs and concerns for both online and teachers not teaching online to answer the main research question: *What associations can be revealed between concerns and beliefs held by Graphic Communications teachers regarding their online teaching of Graphic Communications hands-on classes?* The findings from the sample correlation coefficients for online teachers suggest the strongest relationship exists between Graphic Communications teachers' task value and cost beliefs and their concerns in the Awareness stage, which were statistically significant at the 0.05 level. This indicates their beliefs in the value they place on online teaching and the costs associated with online teaching are closely related to their awareness of online teaching. There was little to no relationship between online teachers expectancy for success and ability beliefs and their concern towards online teaching.

The findings from the sample correlation coefficients for teachers not teaching online indicate the strongest positive relationship is between Graphic Communications teachers' task value and cost beliefs and their concerns about Collaboration (Stage 5). These results suggest their beliefs about the value of online teaching and their concern with coordinating and cooperating with others about the use of online teaching were closely tied and statistically significant. Expectancy and ability beliefs had a strong positive relationship with participant concerns in the Refocusing stage. These results indicate Graphic Communications teachers'

ability and expectancy for success in online teaching were closely tied to alternatives to online teaching, and most likely their resistance to it.

Demographic Data: Key Findings

Analyses of demographic data for this population revealed that this sample of participants, both online teachers and teachers not teaching online, were primarily male. Teachers not teaching online had more years experience teaching high school and four-year college, whereas online teachers had more years experience teaching at the 2-year college level. Data revealed that typical positions in higher education for online teachers were split between Lecturer, Assistant Professor, Associate Professor, and Full Professor, whereas the majority of teachers not teaching online were Associate Professors. Both online teachers and those who had not taught online were primarily located in the Southeastern United States, with a predominant number of teachers not teaching online located in the Midwest. Both subgroups indicated their institutions offered support and infrastructure to teach online, and that they made the decision to teach online. Furthermore, online teachers indicated their programs offered online courses, whereas slightly more than half of teachers not teaching online taught in programs that did not offer online courses. The findings discussed in this chapter clearly identify there are more teachers not teaching online than online teachers in Graphic Communications. It was evident in the data analyses that belief structures and concerns for both groups are clearly different with hands-on teaching cited as being the main reason why these teachers are not adopting online teaching methods for their hands-on courses. Interpretation, implications, and recommendations drawn from these analyses will be discussed in the following chapter.

CHAPTER FIVE

Conclusions, Implications, and Recommendations

This chapter will discuss the conclusions and implications drawn from this study and recommendations for future research. Conclusions of the findings in Chapter Four are presented to answer the two sub-questions and main research question in this study. Implications and recommendations are provided to further understand what influence online teaching has on Graphic Communications teaching practice and to offer suggestions for further research on facilitating change in teacher beliefs and concerns towards online teaching.

Summary of the Study

The purpose of this study was to examine how teacher concerns and beliefs might affect a Graphic Communications teacher's adoption of online teaching. The conceptual framework for this study was based on Rogers (2003) theory of the diffusion of an innovation. This study was directed by the following research question and sub-questions:

RQ: What associations can be revealed between concerns and beliefs held by Graphic Communications teachers regarding their online teaching of Graphic Communications hands-on classes?

SQ-1: What are Graphic Communications teachers' concerns related to teaching hands-on online?

SQ-2: What are Graphic Communications teachers' beliefs related to teaching hands-on online?

The Graphic Communications Teacher Beliefs Towards Teaching Online (GCTBTTO) survey comprised of questions on online teaching, a modified Stages of Concern Questionnaire, a modified Children's Self and Task Perception questionnaire, and select demographics

questions. Participants were asked to indicate online teaching at their institution, within their program, and whether they taught online. They were asked to indicate their level of concern and their beliefs towards online teaching. The SoC scoring device, simple means, and sample correlation coefficients were used to analyze the data collected. Participants were also asked to respond to an open-ended question on why they had chosen to adopt or not adopt online teaching within Graphic Communications. A theme analysis was conducted on these open-ended responses.

A purposeful sample was taken from Graphic Communications educator members of GCEA and educators listed with the PGSF directory of schools. This study included 79 Graphic Communications teacher participants teaching at post-secondary institutions across the United States and Canada. Participants were further divided into sub-groups based on whether they had taught online or not taught online Graphic Communications classes. A breakdown of demographic data included gender, how many years the participant had taught at high school, 2-year college, and/or 4-year college, current rank/title, and location of institution. Research sub-question one was answered from the data collected on the stages of concern towards online teaching in Graphic Communications. This sub-question was answered using the results of the SoC scoring device in which percentile scores were used to create a group profile of mean scores for concerns of online teachers and teachers not teaching online. Furthermore, *t*-tests for independent means was used to compare the mean scores from each sub-group of the sample. Sub-question two was answered by evaluating mean scores for each of five Expectancy Value belief constructs for both online and teachers not teaching online. The main research question was answered using the results of the sample correlation coefficients, which were used to

measure the strength of the association between Graphic Communications teachers' concerns and beliefs towards online teaching.

Conclusions

The following conclusions were made based on findings about Graphic Communications teachers' online teaching in Graphic Communications and demographics, followed by conclusions made from the findings on each of the sub-questions, and the main research question.

Demographics and Online Teaching

From the demographic data analyzed in Chapter 4, it can be concluded that despite having an infrastructure in place to teach online and teaching in programs that offered online teaching, Graphic Communications teachers are not teaching their hands-on classes online. The teachers not teaching online in this study had most of their teaching experience at the high school level, a teaching environment that is traditionally done face-to-face in a classroom. Their Associate Professor rank indicates they were not teaching online and suggests their priorities may be more focused on research than teaching. The biggest barrier keeping these teachers from teaching online, based on their responses to the demographics section, was the types of courses they teach are hands-on courses that require skill development on equipment.

Furthermore, it can be concluded teachers with more experience teaching at the community college level were more apt to teach online, as community colleges are known for offering job skills training to students where it is common for CTE classes to be offered online (Johnson et al., 2003). Because hands-on classes are more challenging to transition to the online environment online teachers are developing classes that offer hybrid methods for teaching their hands-on classes.

Sub-Question 1: Concerns Towards Teaching Online

The first sub-question for this study was *"What are Graphic Communications teachers' concerns related to teaching hands-on online?"* and was answered through triangulation of quantitative data and a theme analysis of open-ended responses for both sub-groups of teachers in this study. The following sections provide conclusions drawn from these analyses.

Conclusion: Online teachers. Online teachers had higher external concern, which fit the typical pattern of an adopter of an innovation. It can be concluded their concern is more on the impact of online teaching on student learning. Based on Rogers' (2003) diffusion model these teachers are early adopters and look for ways to be innovative and provide students with a flexible learning environment that is not only convenient for them but also preferable.

Conclusion: Teachers not teaching online. Teachers not teaching online had higher internal concerns, which fit the typical pattern of a non-adopter of the innovation. Graphic Communications educators are aware of online teaching, but they have no experience with it. It can be concluded that for these teachers, teaching online is not feasible for hands-on classes in Graphic Communications. As Rogers (2003) suggests, the idea of teaching hands-on online is not compatible with the way these teachers have traditionally taught hands-on classes. Additionally, the complexity with which to demonstrate the use of equipment in an online environment makes the innovation difficult to use.

Conclusion: Online vs. not online. It can be concluded that managing, scheduling, and organizing classes is a concern for all teachers, those teaching online and those not teaching online. Whether teaching online or not, the time constraints involved in developing online classes is a common concern among faculty (Ndahi, 1999), and particularly for these faculty who have the challenge of developing a hands-on experience in an online environment.

Sub-Question 2: Beliefs Towards Teaching Online

The second sub-question in this study was *"What are Graphic Communications teachers' beliefs related to teaching hands-on online?"* and was answered by triangulating open-ended responses with quantitative data. Participants were asked questions on their expectancy and ability for success in teaching Graphic Communications classes online and the task value they place on online teaching. For example, these questions included "How well do you think you will do at teaching online?" (expectancy/ability) and "I believe that being good at teaching online is very important" (task value). The following conclusions are drawn from the mean scores and participant open-ended responses for each sub-group in the sample.

Conclusion: Online teachers. It can be concluded that online teachers in this study are more receptive to implementing online teaching because they have higher levels of expectancy for success and feel confident about their ability to teach. Personal efficacy is a teacher's belief that "I can make this happen" (Guskey, 1989). Rogers (2003) notes that earlier adopters may be less dogmatic than later adopters, have a higher level of achievement motivation, and aspire to be better at what they do. That being said, these teachers are still trying to figure out ways to include online teaching with their face-to-face labs based on the required hands-on skills taught in their curriculum.

Conclusion: Teachers not teaching online. It can be concluded that these teachers' beliefs are associated with a consistent style of teaching and they resist changing their practice to try new innovative methods of teaching. According to Eccles (2005) these teachers make decisions based on the value they place on options available to them. Teaching hands-on online is not seen as an option available to them. The value they place on teaching online is closely tied to their confidence in being successful at teaching online. Their lack of information, no

understanding of other options, and/or inaccurate information leads them to make decisions against teaching online (Eccles, 2005). According to Rogers (2003) these teachers will not adopt online teaching until their uncertainty has been removed about how well they will do teaching online. Their uncertainty about the innovation has to be removed in order to promote change in teacher beliefs.

Main Research Question: Concerns vs. Beliefs

The main research question guiding this study was *"What associations can be revealed between concerns and beliefs held by Graphic Communications teachers regarding online teaching of Graphic Communications hands-on classes?"* and was answered through correlational analyses conducted on both beliefs and concerns of Graphic Communications teachers in this study. The following conclusions were made based on the findings for both sub-groups of the sample.

Conclusion: Online teachers. The following conclusions were drawn based on the relationship between beliefs and concerns for online teachers. It can be concluded that online teachers expect to do well at online teaching which impacts their beliefs in the value they place on online teaching and mitigates any concern they have about online teaching. Teacher concerns develop across time in three developmental stages 1) self concern, 2) task concern, and 3) impact concern (Lin et al., 2012). These teachers strong task beliefs and low task concern are a typical pattern for teachers teaching online.

As early adopters, it can be concluded that these teachers may have more access to change agents (support staff), seek information about online teaching more actively, and have a greater knowledge of online teaching (Rogers, 2003), all of which contribute to their low concern about managing online classes. Online teachers are confident in their beliefs, and as adopters of

the innovation they are leaders in teaching online Graphic Communications classes, and want to collaborate with others. Online teachers are empathetic towards non-adopters and look for ways to engage them (Rogers, 2003). Online teachers are more social and interconnected in the social system, which is why they are more inclined to collaborate with others to teach online (Rogers, 2003).

Conclusion: Teachers not teaching online. The following conclusions were drawn based on the relationship between beliefs and concerns for teachers not teaching online. It can be concluded that these teachers' weak beliefs about online teaching impact their external concerns towards online teaching. They do not believe in online teaching therefore they have no concerns about working with others to teach online or its impact on students. Beliefs lie at the heart of teaching and influence teacher decision-making about classroom practice (Nespor, 1987) and these teachers' beliefs are firmly held about teaching in a face-to-face environment.

It can be concluded that these teachers' beliefs about the impact of online teaching on their academic career were tied to their self-concern. They choose to teach face-to-face because it is what they want for their classroom and for what they plan to do in their academic career. Rogers (2003) suggests the innovation has to be compatible with a person's values, experiences, and needs. If online teaching is not seen as compatible with their academic goals, they will not adopt the innovation. Being unsuccessful at teaching online could lead to low student achievement and possibly affect teacher retention.

Additionally, it can be concluded that these teachers had weak beliefs about being effective online teachers, which impacted their concerns about student learning. A change in beliefs will not happen until teachers see a change in student learning (Guskey, 1989). The same is true for lowering concerns about impact on students; new practices (like online teaching) will

be accepted and retained once teachers believe these innovative practices are tied to successful student learning.

Implications

The findings of this study have implications for change facilitators and support staff interested in designing professional development opportunities to target teacher concerns and beliefs. First, change facilitators must be aware of the impact teacher beliefs have on their willingness to teach online. Guskey (2002) suggests that change in teachers' beliefs will only happen after they see improvements in student learning. This study showed a strong preference towards student-centered teaching for teachers teaching online. Teachers who have successful students have high expectancy and positive feelings about teaching, which makes them more confident about their teaching abilities (Guskey, 1988). It is not the professional development that changes their beliefs, but the experience of successful implementation of innovative practice. They believe it works because they have seen it work, and this experience is what changes their beliefs. Graphic Communications teachers' expectancy and ability beliefs should be considered when addressing change in teaching practice.

Second, change facilitators should consider the impact teacher concerns have on their willingness to teach online. This study showed a strong preference towards teacher-centered practices for teachers not teaching online. Faculty with high personal concerns (like the teachers not teaching online in this study) will not be receptive to professional development geared towards external concerns unless their internal concerns are targeted first (Hord et al., 1987). A change in concerns cannot be forced but can be adapted through support and assistance (Hord et al., 1987). Uncertainty about the innovation can be reduced through information-seeking activities (like professional development), which reduces expected consequences about using the

innovation and allows the teacher to make a decision about whether to adopt online teaching or not (Rogers, 2003). New innovative practices that can be "tried out" before full implementation offer opportunity for faster adoption (Rogers, 2003). Additionally, offering teachers the opportunity to "observe" their peers using the innovation and opening a communication dialogue between them proves faster adoption.

Recommendations

The conclusions and implications of this study provided for the following recommendations for researchers, Graphic Communications educators, and change facilitators.

Recommendations for Survey Modifications

The open-ended questions about teaching online provided a small snapshot of the reasons why Graphic Communications teachers are not teaching online. Further collection of qualitative data could provide answers as to why more teachers are not teaching online. Out of a total of 423 in the population, only 79 participants were included in the sample. In order to increase response rates an incentive should be offered in the initial invitation to participate in the survey, as the researcher noted an incentive helped increase responses during the second follow-up reminder.

The researcher determined that although 32 Graphic Communications educators answered "yes" to teaching hands-on Graphic Communications courses online, in actuality most of these participants were not teaching hands-on online. It is recommended that future research elaborate on this question by adding examples of "hands-on" classes. Additionally, most online teachers indicated they were actually teaching hybrid with face-to-face labs for hands-on activities. It is recommended that researchers ask participants to indicate which classes they have taught "hybrid" to separate out which are fully online and which are not.

The researcher could not derive from the demographic data whether participants were young or old. An additional demographic item should be added to collect data on the age of participants to determine their "innovativeness" according to Rogers (2003) theory of diffusion of an innovation and to provide supporting evidence for those teachers who teach online versus those who do not.

The survey should include questions about not only the year the participant started teaching online, but also the frequency with which the class is taught. For example, did the participant start teaching online in 2001, but only taught 2 classes that year and has not taught online since then? It is hard to determine if the participant can be considered an adopter of the innovation without including how often the course is taught.

Recommendations for Researchers

The sample correlation coefficients of online and teachers not teaching online only provided evidence of the relationship between Graphic Communications teachers' beliefs and concerns, but could not infer the reasons as to why the relationships were stronger in some areas than others. Further research should be conducted to investigate the causality of these relationships.

Additionally, the learning styles for this population should be researched further. The traditional apprenticeship model of acquiring practice should be examined to determine its influence on Graphic Communications teachers' teaching model for their classrooms.

Recommendations for Graphic Communications Educators

The findings revealed there were lots of classes within the curriculum where online teaching methods were being explored. Graphic Communications educators should work with their peers and curriculum committees to determine if the possibility exists to transition more of

their face-to-face courses to the online environment. Time is cited as one of the multiple barriers to teaching online (Kopcha, 2012), and findings revealed that both sub-groups had similar concerns about the time it takes to develop and manage online classes. Faculty should work with their department chairs to devise a plan to allow for release-time to develop online classes in their curriculum. Additionally, many colleges offer monetary incentives to participate in professional development activities geared towards developing online classes. Faculty should contact someone within their centers for teaching and learning to see what incentives and professional development opportunities are available for developing online classes.

Recommendations for Change Facilitators and Instructional Designers

The conclusions and implications in this study introduce a need to facilitate a change in beliefs towards teaching hands-on in the online environment. Change facilitators should use the findings from this study to design professional development opportunities geared towards teachers who teach hands-on on equipment. Instructional designers have the opportunity to work with Graphic Communications educators who are already teaching using hybrid methods and promote facilitation of their courses to asynchronous or synchronous online delivery as they see fit to accommodate their students. Research and case examples of other faculty at the institution could be used as guiding examples of ways other hands-on classes have transitioned to the online environment. Furthermore, change facilitators should address these teachers' concerns early on in the adoption process through peer-mentoring workshops and "trial-based" online teaching experiences.

References

Abrami, P. C., Poulsen, C., & Chambers, B. (2004). Teacher motivation to implement an educational innovation: Factors differentiating users and non-users of cooperative learning. *Educational Psychology, 24*(2), 201-216.

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

Allen, E., & Seaman, J. (2013). *Changing course: Ten years of tracking online education in the United States*. Babson Park, MA: Babson Research Group and Quahog Research.

Allen, E., & Seaman, J. (2014). *Grade change: Tracking online education in the United States.* Babson Park, MA: Babson Research Group and Quahog Research.

Asimopoulos, N., Nathanail, K., & Mpatzakis, V. (2007). A network-based electrical engineering laboratory. *International Journal on E-Learning, 6*(1), 41-53.

Association for Career and Technical Education, National Association of State Directors of Career Technical Education Consortium, & Partnership for 21st Century Skills. (2010). *Up to the challenge: The role of career and technical education and 21st century skills in college and career readiness.* Association for Career and Technical Education.

Association of Career and Technical Education. (2013). What is CTE? Retrieved from https://www.acteonline.org/

Asunda, P. (2010). Designing instruction for the distance learner. *Techniques: Connecting Education and Careers, 85*(6), 16-19.

Bailey, D. B., & Palsha, S. A. (1992). Qualities of the stages of concern questionnaire and implications for educational innovations. *The Journal of Educational Research, 85*(4), 226-232.

Ball, J. (2013). *Factors affecting adoption and diffusion of distance education among health education faculty* (Doctor of Philosophy).

Bamberger, Y. M., & Cahill, C. S. (2013). Teaching design in middle school: Instructors' concerns and scaffolding strategies. *Journal of Science Education and Technology, 22*(2), 171-185.

Benson, A., Johnson, S., Taylor, G., Treat, T., Shinkareva, O., & Duncan, J. (2004). *Distance learning in postsecondary career and technical education: A comparison of achievement in online vs. on-campus CTE courses.* St. Paul, MN: National Research Center for Career and Technical Education.

Benson, A., Johnson, S., Taylor, G., Treat, T., Shinkareva, O., & Duncan, J. (2005). Achievement in online and campus-based career and technical education (CTE) courses. *Journal of Research and Practice,29*(5), 369-394.

Blankenship, S. (1998). *Factors related to computer use by teachers in classroom instruction* (Doctor of Education).

Brickhouse, N. (1990). Teachers' beliefs about the nature of science and their relationship to classroom practice. *Journal of Teacher Education, 41*(3), 53-62.

Bussey, J., Dormody, T., & VanLeeuwen, D. (2000). Some factors predicting the adoption of technology education in New Mexico public schools. *Journal of Technology Education, 12*(1).

Calderhead, J. (1996). Teachers: Beliefs and knowledge. In D. Berliner, & R. Calfee (Eds.), *Handbook of research on teaching.* New York: Macmillan.

Cheung, D., Hattie, J., & Ng, D. (2001). Reexamining the stages of concern questionnaire: A test of alternative models. *The Journal of Educational Research, 94*(4), 226-236.

Christou, C., Eliophotou-Menon, M., & Philippou, G. (2004). Teachers' concerns regarding the adoption of a new mathematics curriculum: An application of CBAM. *Educational Studies in Mathematics, 57*(2), 157-176.

Creswell, J. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Upper Saddle River, NJ: Pearson Education.

Cronback, L. J. (1984). *Essentials of psychological testing* (4th ed.). New York: Harper and Row.

Dillman, D., Smyth, J., & Christian, L. (2014). *Internet, phone, mail, and mixed mode surveys: A tailored design method*. Hoboken, NJ: Wiley & Sons.

Dillon, C., & Walsh, S. (1992). Faculty: The neglected resource in education. *American Journal of Distance Education, 6*(3), 5-21.

Dooley, K., & Murphrey, T. (2000). How the perspectives of administrators, faculty, and support units impact the rate of distance education adoption. *Online Journal of Distance Learning Administration, 3*(4), 1-12.

Dubois, J. H. (2002). *The role of distance learning in vocational education.* Cocoa Beach, FL: Synergy Plus, Inc.

Eccles, J. S. (2005). Subjective task value and the Eccles et al. model of achievement-related choices. In A. J. Elliot, & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 105-121). New York: The Guildford Press.

Eccles, J. S., & Wigfield, A. (1995). In the mind of the actor: The structure of adolescents' achievement task values and expectancy-related beliefs. *Personality and Social Psychology Bulletin, 21*(3), 215-225.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53*(1), 109-132.

Ernest, P. (1989). The knowledge, beliefs and attitudes of the mathematics teacher: A model. *Journal of Education for Teaching, 15*(1), 13-33.

Ernst, J. (2008). A comparison of traditional and hybrid online instructional presentation in communication technology. *Journal of Technology Education, 19*(2), 40-49.

Ertmer, P. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25-39.

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

Ertmer, P., & Leftwich-Ottenbreit, A. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education, 42*(3), 255-284.

Evans, J. D. (1996). *Straightforward statistics for the behavioral sciences.* Pacific Grove, CA: Brooks/Cole Publishing.

Fang, A. (1996). A review of research on teacher beliefs and practices. *Educational Research, 38*(1), 47-65.

Feisel, L., & Rosa, A. (2005). The role of the laboratory in undergraduate engineering education. *Journal of Engineering Education, 94*(1), 121-130.

Fives, H., & Buehl, M. (2012). Spring cleaning for the "messy" construct of teachers' beliefs: What are they? Which have been examined? What can they tell us? In K. R. Harris, S. Graham & T. Urdan (Eds.), *APA educational psychology handbook* (Volume 2 ed., pp. 471-499). Washington, D.C.

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

Galusha, J. (1997). Barriers to learning in distance education. *Interpersonal Computing and Technology, 5*(3-4).

Gannon-Cook, R. (2003). *Factors that motivate or inhibit faculty participation in distance education: An exploratory study* (Doctor of Education).

George, A., Hall, G., & Stiegelbauer, S. (2013). *Measuring implementation in schools: The stages of concern questionnaire* (3rd ed.). Austin, TX: Southwest Educational Development Lab.

Githens, R., Sauer, T., Crawford, F., & Wilson, K. (2012). Online occupational education in community colleges: Prevalence, programming, and connection with workforce development needs. *Career and Technical Education Research, 37*(1), 35-56.

Graphic Arts Education and Research Foundation. (2014). The graphic communication industry overview. Retrieved from http://www.graphiccommcentral.org/gcc-advocates/graphic-communications-industry

Griffin, T. D., & Ohlsson, S. (2001). Beliefs vs. knowledge: A necessary distinction for predicting, explaining and assessing conceptual change. *23rd Annual Conference of the Cognitive Science Society: Edinburgh, Scotland*.

Guskey, T. (1988). Teacher efficacy, self-concept, and attitudes toward the implementation of instructional innovation. *Teaching and Teacher Education, 4*(1), 63-69.

Guskey, T. (1989). Attitude and perceptual change in teachers. *International Journal of Educational Research, 13*(4), 439-453.

Hall, G. E., George, A. A., & Rutherford, W. L. (1977). *Measuring the stages of concern about an innovation: A manual for use of the stages of concern questionnaire*. Austin, TX: Research and Development Center for Teacher Education, The University of Texas.

Hall, G. (1979). The concerns-based approach to facilitating change. *Educational Horizons, 57*(4), 202-208.

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

Hall, G., & Loucks, S. (1978). Teacher concerns as a basis for facilitating and personalizing staff development. *Teachers College Record, 80*(1), 36-53.

Hall, G., Newlove, B., George, A., Rutherford, W., & Hord, S. (1991). *Measuring change facilitator stages of concern: A manual for use of the CFSoC questionnaire*. University of Northern Colorado, Greeley, CO: Center for Research on Teaching and Learning.

Hanson, D., Maushak, N., Schlosser, C., Anderson, M., Sorenson, C., & Simonson, M. (1997). *Distance education: Review of the literature* (2nd ed.) Washington, CD, and Ames, IA: Association for Educational Communications and Technology and Research Institute for Studies in Education.

Harris, K. S. (2005). Teachers' perceptions of modular technology education laboratories. *Journal of Industrial Teacher Education, 42*(4), 52-71.

Hayes Jacobs, H. (2010). *Curriculum 21: Essential education for a changing world.* Association for Supervision and Curriculum Development.

Hixon, E., Buckenmeyer, J., Barczyk, C., Feldman, L., & Zamojski, H. (2012). Beyond the early adopters of online instruction: Motivating the reluctant majority. *The Internet and Higher Education, 15*(2), 102-107.

Hord, S. M., Rutherford, W. L., Huling-Austin, L., & Hall, G. E. (1987). *Taking charge of change.* Austin, TX: Southwest Educational Development Laboratory, ASCD.

Horgan, B. (January 1998). Transforming higher education using information technology: First steps. *The Technology Source.*

Jacobsen, M. (1998). Adoption patterns of faculty who integrate computer technology for teaching and learning in higher education. *World Conference on Educational Multimedia and Hypermedia & World Conference on Educational Telecommunications.* Ontario, CANADA. 1-8.

Jacobsen, M. (2000). Excellent teaching and early adopters of instructional technology. *World Conference on Educational Multimedia, Hypermedia and Telecommunications.* Montreal, CANADA. 486-491.

Johnson, S., Benson, A., Duncan, J., Shinkareva, O., Taylor, G., & Treat, T. (2003). *Distance learning in postsecondary career and technical education.* St. Paul, MN: National Research Center for Career and Technical Education.

Jones, B., Paretti, M., Hein, S., & Knott, T. (2010). An analysis of motivation constructs with first-year engineering students: Relationships among expectancies, values, achievement, and career plans. *Journal of Engineering Education, 99*(4), 319-336.

Kagan, D. (1992). Implications of research on teacher belief. *Educational Psychologist, 27*(1), 65-90.

Kang, H. (2012). Training online faculty: A phenomenology study. *International Journal of E-Learning, 11*(4), 391-406.

Katsioloudis, P., Fantz, T., & Jones, M. (2013). A comparative analysis of point-of-view modeling for industrial and technology education courses. *Journal of Technology Education, 25*(1), 70-81.

Koonce, J., & Bramble, W. (1998). Personal computer-based flight training devices. *The International Journal of Aviation Psychiatry, 8*(3), 277-292.

Kopcha, T. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers and Education, 59*(4), 1109-1121.

Kotrlik, J. W., & Redmann, D. H. (2009). Analysis of teachers' adoption of technology for use in instruction in seven career and technical education programs. *Career and Technical Education Research, 34*(1), 47-77.

Lin, H., Dyer, K., & Guo, Y. (2012). Exploring online teaching: A three-year composite journal of concerns and strategies from online instructors. *Online Journal of Distance Learning Administration, 15*(3).

Liu, Y., & Szabo, Z. (2009). Teachers' attitudes toward technology integration in schools: A four-year study. *Teachers and Teaching: Theory and Practice, 15*(1), 5-23.

Lokken, F., & Mullins, C. (2014). *Trends in elearning: Tracking the impact of elearning at community colleges.* Washington, DC: Instructional Technology Council.

Mawn, M. V., Carrico, P., Charuk, K., Stote, K., & Lawrence, B. (2011). Hands-on and online: Scientific explorations through distance learning. *Open Learning, 26*(2), 135-146.

McQuiggan, C. (2007). The role of faculty development in online teaching's potential to question teaching beliefs and assumptions. *Online Journal of Distance Learning Administration, 10*(3), 1-14.

McQuiggan, C. (2012). Faculty development for online teaching as a catalyst for change. *Journal of Asynchronous Learning Networks, 16*(2), 27-61.

Moore, M., & Kearsley, G. (2012). In Kerr M., Allen G. (Eds.), *Distance education: A systems view of online learning* (Third ed.). Belmont, CA: Wadsworth Cengage Learning.

Mullins, C. (2013). *Trends in elearning: Tracking the impact of elearning at community colleges.* Washington, DC: Instructional Technology Council.

Ndahi, H. (1998). *A study of industrial and technical teacher education faculty acceptance of distance learning technology* (Doctor of Education).

Ndahi, H. (1999). Utilization of distance learning technology among industrial and technical teacher education faculty. *Journal of Industrial Teacher Education, 36*(4), 21-37.

Ndahi, H. (2002). Distance learning in industrial teacher education programs. *The Journal of Technology Studies, 18*(1), 64-69.

Ndahi, H. (2006). The use of innovative methods to deliver technology education laboratory courses via distance learning: A strategy to increase enrollment. *Journal of Technology Education, 17*(2), 34-43.

Nespor, J. (1987). The role of beliefs in the practice of teaching. *Journal of Curriculum Studies, 19*(4), 317-328.

Nicolle, P., & Lou, Y. (2008). Technology adoption into teaching and learning by mainstream university faculty: A mixed methodology study revealing the "how, when, why, and why not". *Journal of Educational Computing Research, 39*(3), 235-265.

Pajares, F. M. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research, 62*(3), 307-332.

Palloff, R., & Pratt, K. (2000). Making the transition: Helping teachers to teach online. Nashville, TN. 1-8.

Park, B. (2003). *Faculty adoption and utilization of web-assisted instruction (WAI) in higher education: Structural equation modeling (SEM)* (Doctor of Philosophy).

Parkes, K., & Jones, B. (2012). Motivational constructs influencing undergraduate students' choices to become classroom music teachers or music performers. *Journal of Research in Music Education,* doi:0022429411435512.

Parsad, B., & Lewis, L. (2006-2007). *Distance education at degree-granting postsecondary institutions: 2006-2007.* Washington, D.C.: U.S. Department of Education.

Peterson, E. (2014). *Teacher beliefs about implementing project GLAD (Guided Language Acquisition Design): A quantitative study through the framework of expectancy-value theory* (Doctor of Philosophy).

Peterson, P., Fennema, E., Carpenter, T., & Loef, M. (1989). Teachers' pedagogical content beliefs in mathematics. *Cognition and Instruction, 6*(1), 1-40.

Redmann, D. H., & Kotrlik, J. W. (2004). Analysis of technology integration in the teaching-learning process in selected career and technical education programs. *Journal of Vocational Education Research, 29*(1).

Reese, S. (2002). Breaking the stereotype. *Techniques: Connecting Education and Careers, 77*(1), 24-25.

Reuter, R. (2009). Online versus in the classroom: Student success in a hands-on lab. *The American Journal of Distance Education, 23*(3), 151-162.

Rogers, E. (2003). *Diffusion of innovations*. New York: Macmillan Publishing Co., Inc.

Rokeach, M. (1968). *Beliefs, attitudes, and values: A theory of organization and change*. San Francisco: Jossey-Bass.

Sahin, I. (2006). Detailed review of Rogers' diffusion on innovations theory and educational technology-related studies based on Rogers' theory. *The Turkish Online Journal of Educational Technology, 5*(2), 14-23.

Sahin, I., & Thompson, A. (2006). Using Rogers' theory to interpret instructional computer use by COE faculty. *Journal of Research on Technology in Education, 39*(1), 81-104.

Satava, R. (2001). Accomplishments and challenges of surgical simulation. *Surgical Endoscopy, 15*(3), 232-241.

Shavelson, R., & Stern, P. (1981). Research on teachers' pedagogical thoughts, judgments, decisions, and behavior. *Review of Educational Research, 51*(4), 455-498.

Shea, P., Pickett, A., & Li, C. S. (2005). Increasing access to higher education: A study of the diffusion of online teaching among 913 college faculty. *International Review of Research in Open and Distance Learning, 6*(2), 1-27.

Shulman, L. S. (1994). Those who understand: Knowledge growth in teaching. *Teaching and Learning in the Secondary School,* 125-133.

Shumer, R. (2001). A new, old vision of learning, working, and living: Vocational education in the 21st century. *Journal of Vocational Education Research, 26*(3), 447-461.

Soffer, T., Nachmias, R., & Ram, J. (2010). Diffusion of web supported instruction in higher education - the case of Tel-Aviv university. *Educational Technology & Society, 13*(3), 212-223.

Straub, E. (2009). Understanding technology adoption: Theory and future directions for informal learning. *Review of Educational Research, 79*(2), 625-649.

Sunal, D., Hodges, J., Sunal, C., Whitaker, K., Freeman, M., Edwards, L., . . . Odell, M. (2001). Teaching science in higher education: Faculty professional development and barriers to change. *School Science and Mathemathics, 101*(5), 246-257.

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

Tabata, L. N., & Johnsrud, L. K. (2008). The impact of faculty attitudes toward technology, distance education, and innovation. *Research in Higher Education, 49*, 625-646.

United States Department of Education. (2010). *National education technology plan.* Washington, D.C.: U.S. Department of Education.

United States Department of Education. (2014). *Enrollment in distance education courses, by state: Fall 2012.* (No. NCES 2014-023). Washington, D.C.: United States Department of Education.

Wells, J. G. (2000). Effects of an on-line computer-mediated communication course, prior computer experience and internet knowledge, and learning styles on students' internet attitudes computer-mediated technologies and new educational challenges. *Journal of Industrial Teacher Education, 37*(3), 22-53.

Wells, J. G., & Anderson, D. (1997). Learners in a telecommunications course: Adoption, diffusion, and stages of concern. *Journal of Research on Computing in Education, 30*(1), 83-105.

Wilkins, J. (2008). The relationship among elementary teachers' content knowledge, attitudes, beliefs, and practices. *Journal of Mathematics Teacher Education, 11*(2), 139-164.

Wisher, R. A., Macpherson, D., Abramson, J., & Thornton, D. (2001). *The virtual sand table: Intelligent tutoring for field artillery training.* (No. 1768). Alexandria, VA: Army Research Institution for The Behavioral and Social Sciences.

Wolcott, L. (1999). Assessing faculty beliefs about rewards and incentives in distance education: Pilot study results. *Paper Presented at the Annual Meeting of the American Education Research Association (ERIC Document Reproduction no. 452 271),* Montreal, Quebec, Canada.

Wonacott, M. (2001). *Implications of distance education for CTE.* Columbus, OH: The National Dissemination Center for Career and Technical Education. (ERIC Document Reproduction No. 395 563).

Zirkle, C. (2002a). *Distance education and CTE: A good match?* (Columbus, Ohio ed.) The National Dissemination Center for Career and Technical Education.

Zirkle, C. (2002b). Identification of distance education barriers for trade and industrial teacher education. *Journal of Industrial Teacher Education, 40*(1), 20-44.

Zirkle, C. (2003). Distance education and career and technical education: A review of the research literature. *Journal of Vocational Education Research, 28*(2), 161-181.

Zirkle, C. (2004). Distance education programming barriers in career and technical education in Ohio. *Journal of Vocational Education Research, 29*(3), 157-179.

Zirkle, C., & Fletcher, E. (2009). Access barriers experienced by adults in distance education courses and programs. *Handbook of research on E-learning: Applications for career and technical education technologies for vocational training* (pp. 444-454) IGI Global.

Zirkle, C. (2009). Distance education: The state of the art in career and technical education. In R. Maclean, & D. Wilson (Eds.), (pp. 2003-2018) Springer Netherlands. doi:10.1007/978-1-4020-5281-1_136.

APPENDICES

APPENDIX A

Graphic Communications Teachers' Beliefs Toward Teaching Online (GCTBTTO)

Graphic Communications Teachers' Beliefs Toward Teaching Online

Graphic Communications Teachers' Beliefs Toward Teaching Online (GCTBTTO)

I invite you to complete this survey on Graphic Communications teachers' beliefs. The survey is 60 questions long and will take approximately 15 minutes to complete. There will be no compensation of any kind, and your participation is greatly appreciated.The risks to you by participating in this project are minimal. It is possible you may be frustrated by the questions asked or the time needed to participate. Your participation in this study is completely voluntary and you can opt out of the study at any time. No promise or guarantee of benefits has been made to encourage you to participate. Any personally identifiable data collected for this study will be kept confidential. The Virginia Tech (VT) Institutional Review Board (IRB) may view the study's data for auditing purposes. The IRB is responsible for the oversight of the protection of human subjects involved in research. By completing and submitting this survey, as a participant, you are providing your informed consent.

If you have any questions about this study or your participation, you can contact Hope Carroll at hopec@vt.edu or 864-986-8168. For questions on your rights as a human subject participant please contact Dr. Moore/IRB contact at moore@vt.edu or 540-231-4991.

The following survey is broken up into four parts. Part I includes questions on Online Teaching experience, Part II includes questions on Concerns Towards Teaching Online, Part III includes questions on Beliefs Toward Teaching Online, and Part IV includes questions on Demographics.

Graphic Communications Teachers' Beliefs Toward Teaching Online

PART I: Online Teaching in Graphic Communications

DIRECTIONS: The following questions will be addressing online instruction of Graphic Communications. Online instruction is defined as teaching on the World Wide Web through the internet where 80% or more of the content is delivered online (Allen & Seaman, 2014). Often referred to as a web-based or virtual environment, there is no scheduled face-to-face meetings in a physical classroom. This type of instruction is either synchronous (teacher and students are online at the same time) or asynchronous (teacher and students are not online at the same time). This does NOT include web facilitated courses where course content is posted on Blackboard or Moodle, but students are still required to meet face-to-face. Based on this definition, answer as truthfully as you can on the following questions.

* 1. Is there a support system and infrastructure in place at your institution for faculty who want to teach synchronously or asynchronously online?

- ◯ Yes
- ◯ No

* 2. Does your program area offer synchronous and/or asynchronous online courses?

- ◯ Yes
- ◯ No

* 3. Do you decide whether or not you teach a Graphic Communications course online?

- ◯ Yes
- ◯ No

* 4. Have you taught Graphic Communications courses synchronously and/or asynchronously online?

- ◯ Yes
- ◯ No

Graphic Communications Teachers' Beliefs Toward Teaching Online

Part I: Online Teaching in Graphic Communications

Please answer the following questions based on answering "YES" to teaching online.

* 5. What year did you start teaching synchronous or asynchronous online courses?

* 6. Please select all courses, with similar titles, from the list below that you have taught, and of those selected, indicate which classes you have taught online.

	Have taught this course	Have taught online
Intro to Graphic Communications	☐	☐
Offset Lithographic Printing	☐	☐
Flexographic Printing	☐	☐
Screen Printing	☐	☐
Gravure Printing	☐	☐
Digital Printing	☐	☐
Bindery and Finishing	☐	☐
Substrates and Inks	☐	☐
Color Management	☐	☐
Printing Estimating	☐	☐
Graphic Communications Seminar	☐	☐
Graphic Communications Leadership	☐	☐
Graphic Communications Management/Sales	☐	☐
Graphic Communications Trends/Research	☐	☐
Packaging Design/Production	☐	☐

	Have taught this course	Have taught online
Digital Layout and Design	☐	☐
Typography and Design	☐	☐
Web Design/Development	☐	☐
Cross Media Design/Production	☐	☐
3D Imaging and Animation	☐	☐
Digital Imaging/Photography	☐	☐
Printed Electronics	☐	☐
Specialty Printing	☐	☐

* 7. Why have you adopted online teaching for the hands-on Graphic Communications classes you teach?

Graphic Communications Teachers' Beliefs Toward Teaching Online

Part I: Online Teaching in Graphic Communications

Please answer the following questions based on answering "NO" to teaching online.

* 8. Select all courses from the list below you have taught.

- [ ] Intro to Graphic Communications
- [ ] Offset Lithography Printing
- [ ] Flexographic Printing
- [ ] Screen Printing
- [ ] Gravure Printing
- [ ] Digital Printing
- [ ] Bindery and Finishing
- [ ] Substrates and Inks
- [ ] Color Management
- [ ] Printing Estimating
- [ ] Graphic Communications Seminar
- [ ] Graphic Communications Leadership
- [ ] Graphic Communications Management/Sales
- [ ] Graphic Communications Trends/Research
- [ ] Packaging Design/Production
- [ ] Digital Layout and Design
- [ ] Typography and Design
- [ ] Web Design/Development
- [ ] Cross Media Design/Production
- [ ] 3D Imaging and Animation
- [ ] Digital Imaging/Photography
- [ ] Printed Electronics
- [ ] Specialty Printing

* 9. Why have you NOT adopted online teaching for the hands-on Graphic Communications classes you teach?

Graphic Communications Teachers' Beliefs Toward Teaching Online

PART II: Concerns Towards Teaching Online

DIRECTIONS: This section of the survey seeks to determine the concerns of graphic communications higher education faculty who are using or considering adopting online teaching methods. The items were developed from typical responses from higher education faculty who ranged from no knowledge about the innovation to many years experience in using it. Some of the items may be of little relevance or irrelevant to you currently. For the irrelevant items, please mark "0" for those items. Items that represent concerns you do have should be marked higher on the scale as per the example below:

For example:

0 1 2 3 4 5 6 (7) This statement is true of me at this time.
0 1 2 3 (4) 5 6 7 This statement is somewhat true of me now.
0 (1) 2 3 4 5 6 7 This statement is not at all true of me at this time.
(0) 1 2 3 4 5 6 7 This statement seems irrelevant to me.

You should respond to the items based on **your present concerns**, or how you feel about your involvement or potential involvement with ONLINE TEACHING. Thank you for taking time to complete this section of the survey.

0	1	2	3	4	5	6	7
	Not true of me now			Somewhat true of me now			Very true of me now

* 8. I am concerned about students' attitudes toward online teaching.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 9. I now know of several approaches for how I might go about teaching online.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 10. I don't even know what online teaching is.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 11. I am concerned about not having enough time to organize myself each day.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 12. I would like to help other faculty teach online.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 13. I have very limited knowledge about online teaching.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 14. I would like to know how teaching online might affect my professional status.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 15. I am concerned about conflict between my interests and my responsibilities.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 16. I am concerned about revising what I presently know about teaching online.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 17. I would like to work with colleagues and other faculty who are teaching online.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 18. I am concerned about how my online teaching might affect my students.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 19. I am not concerned about teaching online.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 20. I would like to know who will make decisions about my teaching online.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 21. I would like to discuss the possibility of teaching online.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 22. I would like to know what resources are available if teaching online is to be integrated into my job.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 23. I am concerned about my inability to manage online classes.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 24. I would like to know how my teaching is supposed to change because of online teaching.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 25. I would like to familiarize my colleagues about online instruction as I learn about it and work with it more.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 26. I am concerned about evaluating my impact on students.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 27. I would like to change how online instruction might be used as I learn more about it.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 28. I am completely occupied with other things.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 29. I would like to modify the integration of online teaching in my job based on students' experiences.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 30. Although I don't know much about teaching online, I am concerned about it.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 31. I would like to excite my students about online learning.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 32. I am concerned about the time needed to resolve non-instructional problems related to online teaching.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 33. I would like to know what teaching online will require in the immediate future.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 34. I would like to coordinate my efforts with my colleagues to learn more about online teaching.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 35. I would like to have more information on the time and energy commitments required to teach online.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 36. I would like to know what other people are doing in relation to teaching online.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 37. At this time, I am not interested in learning about teaching online.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 38. I would like to determine how to supplement, enhance, or replace online instruction.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 39. I would like to use feedback from my students to change how I teach online.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 40. I would like to know how my job will change when I begin teaching online.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 41. Coordination of tasks and people is taking too much of my time.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

* 42. I would like to know how teaching online is better than the teaching methods I presently use.

Irrelevant to me	Not true of me			Somewhat true of me			Very true of me
0	1	2	3	4	5	6	7
○	○	○	○	○	○	○	○

Graphic Communications Teachers' Beliefs Toward Teaching Online

PART III: Beliefs Towards Teaching Online

DIRECTIONS: The following statements ask about your beliefs toward teaching Graphic Communications online. There are no right or wrong answers. We are only interested in your honest opinion. Please choose one number for each statement that shows how you feel. Thank you for your honest opinion.

* 45. In general, I believe that teaching Graphic Communications online is

Very boring						Very interesting
1	2	3	4	5	6	7
○	○	○	○	○	○	○

* 46. Is the amount of effort it will take to do well at teaching Graphic Communications online worthwhile to you?

Not worthwhile						Very worthwhile
1	2	3	4	5	6	7
○	○	○	○	○	○	○

* 47. How useful is learning to teach Graphic Communications online for meeting your career goals?

Not useful						Very useful
1	2	3	4	5	6	7
○	○	○	○	○	○	○

* 48. Compared to other teachers, how well do you expect to do at teaching Graphic Communications online?

Much worse						Much better
1	2	3	4	5	6	7
○	○	○	○	○	○	○

* 49. Is the amount of stress involved with being a good online Graphic Communications teacher worthwhile to you?

Not worthwhile						Very worthwhile
1	2	3	4	5	6	7
○	○	○	○	○	○	○

* 50. How good at teaching Graphic Communications online are you?

Not good						Very good
1	2	3	4	5	6	7
○	○	○	○	○	○	○

* 51. If you were to order all of your colleagues from the worst to the best at teaching Graphic Communications online, where would you put yourself?

The worst						The best
1	2	3	4	5	6	7
○	○	○	○	○	○	○

* 52. How useful is learning to teach Graphic Communications online for what you plan to do in your academic career?

Not useful						Very useful
1	2	3	4	5	6	7
○	○	○	○	○	○	○

* 53. Is the amount of effort it takes to do well at teaching Graphic Communications online worthwhile to you?

Not worthwhile						Very worthwhile
1	2	3	4	5	6	7
○	○	○	○	○	○	○

* 54. I believe that being good at teaching Graphic Communications online is very important.

Not important						Very important
1	2	3	4	5	6	7
○	○	○	○	○	○	○

* 55. How much do you like teaching Graphic Communications online?

Not very much						Very much
1	2	3	4	5	6	7
○	○	○	○	○	○	○

* 56. How well do you think you will do at teaching Graphic Communications online?

Very poorly						Very well
1	2	3	4	5	6	7
○	○	○	○	○	○	○

Graphic Communications Teachers' Beliefs Toward Teaching Online

Demographic Data

57. Please indicate your gender

- ◯ Male
- ◯ Female

58. Please indicate all levels you have taught Graphic Communications courses. (check all that apply)

- ☐ High School
- ☐ Community/Technical College (2 year)
- ☐ University/College level (4 year)

59. Please indicate (by typing below) how many years you taught Graphic Communications at each level (high school, 2-year college, 4-year college) selected in the question above.

60. What is your current rank/title?

- ◯ Full Professor
- ◯ Associate Professor
- ◯ Assistant Professor
- ◯ Lecturer
- ◯ Instructor
- ◯ Adjunct
- ◯ Other (please specify)

61. In what state is your current institution located?

62. In what country is your current institution located?

16

APPENDIX B

Virginia Tech Institutional Review Board (IRB) Approval Form

Office of Research Compliance
Institutional Review Board
North End Center, Suite 4120, Virginia Tech
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-4606 Fax 540/231-0959
email irb@vt.edu
website http://www.irb.vt.edu

MEMORANDUM

DATE: July 27, 2015

TO: John Wells, Millicent Hope Carroll

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires April 25, 2018)

PROTOCOL TITLE: Graphic Communications Teachers' Beliefs Toward Teaching Online

IRB NUMBER: **15-208**

Effective July 27, 2015, the Virginia Tech Institution Review Board (IRB) Chair, David M Moore, approved the New Application request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

http://www.irb.vt.edu/pages/responsibilities.htm

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As:	**Exempt, under 45 CFR 46.110 category(ies) 2,4**
Protocol Approval Date:	**July 27, 2015**
Protocol Expiration Date:	**N/A**
Continuing Review Due Date*:	**N/A**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

APPENDIX C

Email Letter and Consent Form for Participants

Participant Cover Letter & Consent Agreement for Online Survey

Dear (Name),

Thank you in advance for your participation in this survey. I am a doctoral student at Virginia Polytechnic Institute and State University, in the Integrative STEM Education program. I am collecting data on Graphic Communications teachers' concerns and beliefs towards teaching in the online environment.

I invite you to complete this survey on Graphic Communications teachers' beliefs. The survey is 60 questions long and will take approximately 15 minutes to complete. There will be no compensation of any kind, and your participation is greatly appreciated.

By completing and submitting this survey, as a participant, you are providing your informed consent. To participate in this study, please click the following link to the online survey: (link here)

The risks to you by participating in this project are minimal. It is possible you may be frustrated by the questions asked or the time needed to participate. Your participation on this study is completely voluntary and you can opt out of the study at any time.

If you have any questions about this study or your participation, you can email Hope Carroll at hopec@vt.edu.

Sincerely,

Hope Carroll
Ed.D. Candidate
Integrative STEM Education
Virginia Polytechnic Institute and State University

Follow-Up Reminder to Participate

Dear (Name):
Earlier this week I sent you an email asking for your participation in collecting data on Graphic Communications teachers' concerns and beliefs towards teaching in the online environment.

You are invited to take this survey on Graphic Communications teachers' beliefs. To make it easier to participate I have provided the following link to the online survey:
(link here)

Please keep in mind that by completing and submitting this survey, as a participant, you are providing your informed consent. I sincerely appreciate your time and consideration for this request. If you have any questions about this study or your participation, you can email Hope Carroll at hopec@vt.edu.

Sincerely,

Hope Carroll
Ed.D. Candidate
Integrative STEM Education
Virginia Polytechnic Institute and State University

APPENDIX D

Stages of Concern Quick Scoring Device

Stages of Concern Quick Scoring Device

SoCQ 075

A

Date: _____

Site: _____ SS#: _____

Innovation: _____

B

Stage	0	1	2	3	4	5	6
	3 ___	6 ___	7 ___	4 ___	1 ___	5 ___	2 ___
	12 ___	14 ___	13 ___	8 ___	11 ___	10 ___	9 ___
	21 ___	15 ___	17 ___	16 ___	19 ___	18 ___	20 ___
	23 ___	26 ___	28 ___	25 ___	24 ___	27 ___	22 ___
	30 ___	35 ___	33 ___	34 ___	32 ___	29 ___	31 ___

C Raw Score Totals ___ ___ ___ ___ ___ ___ ___

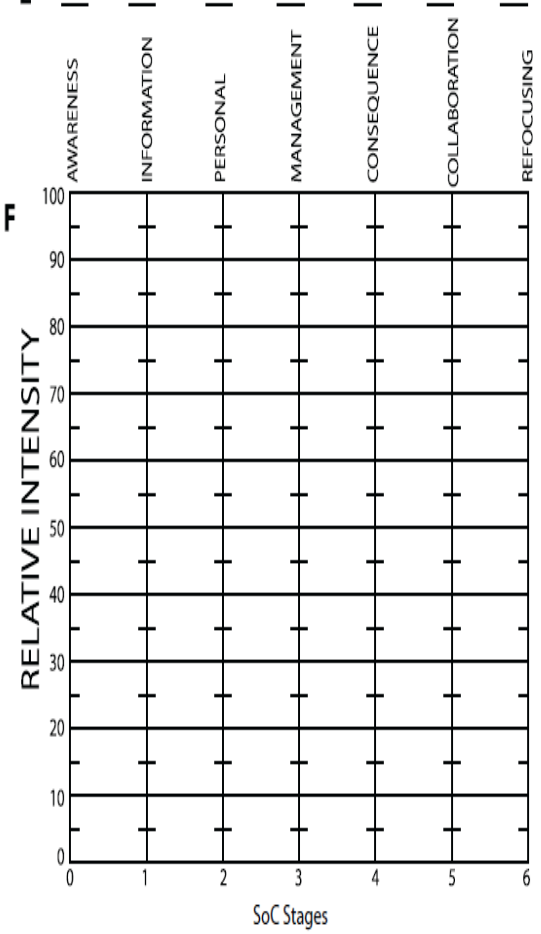
E Percentile Scores ___ ___ ___ ___ ___ ___ ___

D

Five Item Raw Scale Score Total	Percentiles for: Stage 0	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
0	0	5	5	2	1	1	1
1	1	12	12	5	1	2	2
2	2	16	14	7	1	3	3
3	4	19	17	9	2	3	5
4	7	23	21	11	2	4	6
5	14	27	25	15	3	5	9
6	22	30	28	18	3	7	11
7	31	34	31	23	4	9	14
8	40	37	35	27	5	10	17
9	48	40	39	30	5	12	20
10	55	43	41	34	7	14	22
11	61	45	45	39	8	16	26
12	69	48	48	43	9	19	30
13	75	51	52	47	11	22	34
14	81	54	55	52	13	25	38
15	87	57	57	56	16	28	42
16	91	60	59	60	19	31	47
17	94	63	63	65	21	36	52
18	96	66	67	69	24	40	57
19	97	69	70	73	27	44	60
20	98	72	72	77	30	48	65
21	99	75	76	80	33	52	69
22	99	80	78	83	38	55	73
23	99	84	80	85	43	59	77
24	99	88	83	88	48	64	81
25	99	90	85	90	54	68	84
26	99	91	87	92	59	72	87
27	99	93	89	94	63	76	90
28	99	95	91	95	66	80	92
29	99	96	92	97	71	84	94
30	99	97	94	97	76	88	96
31	99	98	95	98	82	91	97
32	99	99	96	98	86	93	98
33	99	99	96	99	90	95	99
34	99	99	97	99	92	97	99
35	99	99	99	99	96	98	99

Concerns Based Systems International

F



Wells Re-Make of Scoring Device Fall 2011

APPENDIX E

Analysis of Open-Ended Questions on GCTBTTO

QUESTION: Why have you **adopted** online teaching for the hands-on Graphic Communications classes you teach?

Participant	Response	1st Coding	2nd Coding/Themes
Participant 1	For certain into courses online teaching offers a great way to communicate with students. I would say that most graphic communication courses that are part of a hands-on program do not warrant themselves for full online learning, though a hybrid technique might work.	Good fit for certain courses Hybrid	Good fit for certain courses Hybrid
Participant 2	Convenient for me and the students.	Convenience to faculty Convenience to students	Convenience to faculty Convenience to students
Participant 3	It was offered to me by the administration. I took on the task given the distance that I live from campus.	~~Offered by admin~~ Faculty lives far from campus	University directive Convenience to faculty
Participant 4	Some software based classes are fine to teach online and also accommodate student schedule.	Good fit for certain courses Accommodates students	Good fit for certain courses Convenience to students
Participant 5	University directive	University directive	University directive
Participant 6	Enable students to learn at a time that is convenient for them, and to include external tools (like videos and simulations) that enhance learning	Convenience to students Instructional tools to enhance learning	Convenience to students Enhance student learning
Participant 7	Distance Education with community colleges.	University directive	University directive
Participant 8	Because of wanting to support distance students.	Convenience to students	Convenience to students
Participant 9	I was pulled in for an emergency for the department they needed a faculty member to teach GRC 101 Intro to GRC in the Fall of 2008. I	Hybrid (emergency situation)	Hybrid

	could only teach the class if it was a hybrid model, so that is what I did, I designed it as a hybrid. Since then I have not taught the class again. I would also like to convert my current class of Managing for Quality in the GA Industry to online for continuing education for professionals.		
Participant 10	I teach lecture only courses online, such as Intro to Visual Communication, Color Theory, Typography, and Marketing to allow more time for lab courses face-to-face.	Hybrid	Hybrid
Participant 11	Because my course is only offered online	~~Online course offering~~	University directive
Participant 12	Hands-on classes are taught as hybrid courses where lecture-based course material is pushed to the web but hands-on content is taught face-to-face in a lab setting. This flipped classroom concept theoretically allows for more efficient use of face-to-face time. We are seeing that students are not as successful in this type of course but the demand for online/hybrid courses is strong.	Hybrid	Hybrid
Participant 13	Convenience for students and financial considerations for the 3d Imaging course	Convenience to students	Convenience to students
Participant 14	content to be on students' computer monitors rather than projected on a screen	Convenience to students	Convenience to students
Participant 15	To understand it fully before making my judgement as to its validity	Faculty PD	Faculty PD
Participant 16	Lack of computer lab time available and student request.	Convenience to students	Convenience to students
Participant 17	Our printed electronics Certificate Program (for graduate studies) offers online asynchronous classes so that anyone in the world can participate - and it makes it easier on employers to get their employees	Convenience to students	Convenience to students

	some skills. Then, if the students want to complete the full graduate program, they come to our campus for the face-to-face "Learn by Doing" classes.		
Participant 18	On-line courses were required to meet the needs of a corporate client who provided financial support but no time off for full time employees enrolled in RIT degree programs.	~~Accommodate working students~~	Convenience to students
Participant 19	Web design and development lends itself well to be taught online. There also was a need to have a program that allowed students to study web design and development online.	Good fit for certain courses	Good fit for certain courses
Participant 20	free up classroom space, working students,	~~Accommodate working students~~	Convenience to students
Participant 21	I adopted online teaching for the course "Layout & Typography I" because I was asked to develop the course by our Continuing Education coordinator to attract students from further distances (who don't have to attend the university in-person), as well as make it more convenient for other students at the university to take this course from afar. This online version of the course was not intended for our full-time undergraduate students (who had to take this same mandatory course in-person during day school).	Attracts students Convenience to students	Attracts students Convenience to students
Participant 22	Only Typography and Graphic Design are taught 100% online; other Graphic Arts courses have an online component. Some classes are face-to-face with lecture notes, assignments, and testing available through Moodle interface for convenience and/or flexibility in scheduling, but hands-on lab hours are required.	Good fit for certain courses Hybrid	Good fit for certain courses Hybrid
Participant 23	The lecture part of our press class really lent itself to online delivery. By	Hybrid – lecture only online	Hybrid

	preparing intensely once, the class pretty much delivers itself every semester...with just maintenance by the faculty member involved. Also, of all our courses, it was the one that changes the least. So, the investment in time to create the class was worth it since it doesn't have to be changed every semester/year.		
Participant 24	Because not all students want to be in a classroom physically, some like to be virtual. It can hit more students than just our traditional ones.	Attracts students	Attract students
Participant 25	Our program has a completely online degree (along with on-the-ground) that we offer to increase access to students.	~~Accommodate students~~	Convenience to students
Participant 26	Accessibility for students.	~~Accommodate students~~	Convenience to students
Participant 27	all beginning students need some hands on in more expensive programs ie. After effects, Adobe Premiere,	Good fit for certain courses	Good fit for certain courses
Participant 28	Because it is the cultural base of how our students learn	~~Accommodate students~~	Convenience to students
Participant 29	conducive to distance learning	~~Accommodate students~~	Convenience to students
Participant 30	It was practical in the summer for a class that did not need to use equipment in our lab.	Good fit for certain courses	Good fit for certain courses
Participant 31	I have only taught a history if graphic design course online since there is no required skill set involved.	Good fit for certain courses	Good fit for certain courses
Participant 32	I haven't		

For **Adopters**:

- Convenience to students (15)
- Good fit for certain courses (7)
- Hybrid (6)
- University directive (4)
- Attracts students (2)

- Faculty PD (1)
- Enhance student learning (1)

QUESTION: Why have you **NOT adopted** online teaching for the hands-on Graphic Communications classes you teach?

Participant	Response	1st Coding	2nd Coding/Themes
Participant 1	My courses involve special software and shop equipment that are only available in a lab on campus. Students must be present for face-to-face instruction.	Hands-on	Hands-on
Participant 2	Program director does not feel online coursework is a viable way to teach graphics.	~~Not viable for Graphics~~	Hands-on
Participant 3	online classes can't offer hands-on lab experience.	Hands-on	Hands-on
Participant 4	Lab resources and scheduling.	~~Need for Lab resources Scheduling~~	Hands-on
Participant 5	Have never considered or been asked to create online classes	Not required	Not required
Participant 6	Hands-on teaching is what makes our program unique and different.	Hands-on	Hands-on
Participant 7	The point is "hands-on". You can not teach a physical skills without physical interaction. Skills that do not require working on actual lab equipment or producing physical results can be tought online (such as teaching adobe suite applications, sales, design & layout, web or cross-media).	Hands-on	Hands-on
Participant 8	No infrastructure	No infrastructure	No infrastructure
Participant 9	The modality does not efficiently allow for the implementation of the studio method of pedagogy.	Hands-on	Hands-on

Participant 10	Technology. Up until this point there was not a support system for project file size and students having access to the software needed.	No infrastructure	No infrastructure
Participant 11	Most classes has hands on component	Hands-on	Hands-on
Participant 12	Our students do not perform well online generally as undergraduates. Instructors lack the time needed to develop the large number of graphics required to offer graphic communication online. And, we lack a transition plan for switching. We have to do one or the other. Online will not make if face to face is running and visa versa.	Lack of time for development Students don't perform well in online classes	Lack of time for development Students do not perform well
Participant 13	I don't like online courses. I feel that they diminish the teacher-student interaction that I like to have in my classes.	~~Prefer F2F~~	Not required
Participant 14	Lab intensive activities requires direct contact with instructor.	~~Need for Lab resources~~	Hands-on
Participant 15	Most of the courses I have taught require access to equipment that is not available in an online only environment. Students would need to have access to press or prepress equipment to meet stated course learning objectives.	~~Need for Lab resources~~	Hands-on
Participant 16	I am not required to do it and I do not want to do it.	Not required ~~Prefer F2F~~	Not required
Participant 17	Our institution emphasizes a hands-on education experience, with close association to instructors with industry experience	Hands-on	Hands-on
Participant 18	- Development is time-consuming and costly - Concerns about how to demonstrate certain equipment in an online environment - Concerns	Lack of time for development of online	Lack of time for development Hands-on

	about Academic Integrity - Concerns about student engagement	How to demonstrate lab equipment in online Concern about Academic integrity Concern about student engagement	Concern about Academic integrity and Student engagement
Participant 19	We have an online support - called Brightspace by D2L, reading items are posted here, videos, readings, discussion boards ect..	Hybrid only	
Participant 20	I don't think it would be efficient or effective given the content being taught.	~~Not viable for Graphics~~	Hands-on
Participant 21	No need to do so. While I can envision teaching other courses online, I don't see any particular advantage to trying to offer this course online, and there's been no student demand for it.	Not required ~~No student demand for particular course~~	Not required
Participant 22	It is not required at the high school level.	Not required	Not required
Participant 23	Is not cohesive to a design education environment. No face to face feed back system in place or simulation of that works. No room to have the student truly grow.	~~Not viable for Graphics~~	Hands-on
Participant 24	Software licensing of external computers - Hands on experience in the pressroom	Hands-on ~~Need for Lab resources~~	Hands-on
Participant 25	I prefer to teach students in a classroom environment where I can integrate active learning strategies	~~Prefer F2F~~	Not required

	and student presentations.		
Participant 26	I'm ready to retire in 2016	~~Retiring~~	Not required
Participant 27	Haven't had the opportunity/request from the department.	Not required	Not required
Participant 28	Its not easy to provide one-on-one help.	Hands-on	Hands-on
Participant 29	Online classes at our University are usually taught during the summer and discouraged during the regular semester. We are not sure if enough students would enroll in the summer to keep the class active. Also some of the content does not lead itself to being taught in an online environment.	~~Not viable for Graphics~~	Hands-on
Participant 30	Because they are hands on.	Hands-on	Hands-on
Participant 31	difficult to deliver hands-on learning experiences without access to presses, measurement devices	Hands-on	Hands-on
Participant 32	Time for development is not included in a normal workload. Any development of online would be largely uncompensated and done in an 'overload' environment.	Lack of time for development of online	
Participant 33	Most all graphic communications courses require a lab component. I have not figured out how to deliver content on-line and have student participate in hands-on activities.	~~Need for Lab resources~~ Hands-on	Hands-on
Participant 34	Although, administrative support is in place for online teaching, it is a matter of developing content that can emulate printing lab experiences. The Sinapse companies have printing simulators that could be taught using an online format so that students can time-shift their learning based on the availability of the simulator. The cost	Hands-on	Hands-on

	per license is around $11,000 for the printing simulator. Having the course designed so that students can adjust their schedule so that they would have access to the simulator would be a great way for them to learn about concepts and then apply the concepts from the simulator to hands-on laboratory experiences using actual printing equipment.		
Participant 35	not sure why	Don’t know	Don’t know
Participant 36	This mode of instruction is inherently in opposition to "hands-on". In many respects it is too passive for the desired type of experience.	Hands-on	Hands-on
Participant 37	We are laboratory based, hands-on activities. The online content that is delivered doesn't meet your 80% criteria.	Hands-on ~~Need for Lab resources~~	Hands-on
Participant 38	Many students prefer face-to-face instruction. Some assignments can't be easily submitted and/or critiqued online. Many students do not have the equipment needed to complete assignments at their homes and purchasing the equipment would present an economic hardship.	~~Need for Lab resources~~ Student prefer F2F	Hands-on Students prefer F2F
Participant 39	Did not seem practical as my students needed hands on experience	Hands-on	Hands-on
Participant 40	I prefer teaching in front of my students.	~~Prefer F2F~~	Not required
Participant 41	The majority of students I teach are freshmen and they don't prefer online. They avoid online courses during their freshman year because they don't feel like they can handle the responsibility and time management.	Students prefer F2F	Students prefer F2F

Participant 42	I teach at a career High school. Students from 13 districts are sent to us daily for almost 3 hours.	Not required	Not required
Participant 43	Method not effective for lab instruction.	Hands-on	Hands-on
Participant 44	Not offered at the High School	Not required	Not required
Participant 45	In the printing courses I have taught, it is not possible to teach hands-on curriculum in an online environment. While it is possible to teach the theory portions of these classes strictly online, the hands-on part would require a hybrid course or face-to-face course.	Hands-on	Hands-on
Participant 46	Labs are with class, hands on experience is preferred	Hands-on	Hands-on
Participant 47	I feel that hands-on instruction is a core value of our program.	Hands-on	Hands-on

For Non-Online Teachers:

- Hands-on (29)
- Not required (11)
- No infrastructure (2)
- Lack of time (2)
- Students prefer F2F (2)
- Students don't perform well (1)
- Concern about academic integrity and student engagement (1)
- Don't know (1)