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Radiography Faculty Perceptions of the Effectiveness of Asynchronous Online Courses

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by

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ABSTRACT

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The purpose of this study was to assess radiography faculty perceptions of the effectiveness of asynchronous online courses. Learning effectiveness in a web-based virtual learning environment (VLE) was the conceptual framework for this project (Piccoli, Ahmad, & Ives, 2001). For the purposes of this study, learning effectiveness was defined as the quality of learning being comparable between online and traditional courses (Moore, 2011).

Ten research questions were used to guide this study, and statistical tests were conducted to evaluate 17 null hypotheses. The statistical tests included use of one-way analysis of variance (ANOVA), Pearson correlations, and single-sample *t*-tests. Ten of the 17 null hypotheses were rejected.

Research findings indicate that the effectiveness of online courses is not significantly affected by faculty position, type of institution, faculty age, or years of teaching experience. Faculty perceptions of the effectiveness of online courses increase with years teaching online courses, number of online courses taught in the past 5 years, and perceived competence with use of technology.

Faculty satisfaction with interaction in online courses increases as the years teaching online courses increased. On the other hand, the number of years teaching online courses was not related to faculty satisfaction with teaching online courses or faculty satisfaction with institutional support. Online technology acceptance had a positive relationship with perceived ease of use and a strong positive relationship with perceived usefulness of online technology. Additionally, use of technology-enhanced learning methods had a strong positive relationship with technological self-efficacy.

Participants reported satisfaction with teaching online courses and institutional support but had nearly neutral responses regarding interactions in online courses. Overall, radiography faculty members perceived that online courses were effective to a significant extent.

DEDICATION

I dedicate my dissertation to my family. I owe a special gratitude to my dad, the late James Robert Varner Cherry and my mother, Louise Ann Cherry Muzuruk as well as my grandfather, the late James Woodruff Cherry. Throughout my childhood, my parents and grandfather instilled the values of integrity, dedication, commitment, motivation, and resilience in me. They encouraged me to pursue additional education and wanted me to find happiness in my work. I wish that my father and grandfather were still alive to see me graduate; however, I know that they have been watching and encouraging me from heaven for more than 20 years. I feel blessed that my Mom is still with me and forever grateful that she will see me graduate.

I also dedicate my dissertation to my sisters, brothers, nieces, and nephews. They have always inspired and supported me. I am grateful to my sisters, Cynthia Jones and Catherine Phillips, for believing in me and for their endless support during my difficult two year divorce. I love you both dearly. I dedicate my dissertation to my niece and best friend, Annette Phillips who passed away 31 years ago. You were a vivacious individual and had a huge impact on my life. I have missed you dearly Annette, but I will see you again in heaven.

I also dedicate my dissertation to Bill Pearce, my significant other and best friend. He provided me with love and encouragement while I worked on my dissertation. Thank you for your support, for believing in me, and for being my rock. Finally, I dedicate my dissertation to my dog and child, Sassy. She patiently sat by my side and on my lap while I typed and worked hundreds of late hours. Thank you my little Sassy for your patience and unconditional love. I love you too.

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CHAPTER 1

INTRODUCTION

The growth and expansion of online learning is occurring across the continuum of educational institutions beginning with grade schools and ending with graduate schools (Ferguson & DeFelice, 2010). Specifically, the number of students enrolled in at least one online course in U.S. institutions of higher education increased from 1.6 million in fall 2002 to 7.1 million in fall 2012 (Allen & Seaman, 2014). Within the last year of that study, online enrollments increased by 411,000 (Allen & Seaman, 2014).

Online learning is an integral and component of higher education. The number of senior academic officers in the U.S. report that online education is critical to their long-term strategy, increasing from 48.8% in 2002 to 66% in 2013 (Allen & Seaman, 2014). This growth of online education is increasing more rapidly within higher education institutions than inclusion of the educational methodology in strategic plans (Allen & Seaman, 2014).

Only 30.2% of academic leaders in 2012 indicate that faculty at their institutions consider online education as a valuable and legitimate learning option (Allen & Seaman, 2013). In contrast with the continued growth in online education, academic leaders' perception that faculty accept online education decreased from 32.9% in 2006. In 2007, 61.1% of academic leaders expressed concern that the lack of faculty acceptance of online courses represents a barrier to adoption of this mode of educational delivery. That number rose to 66.8% in 2012 (Allen & Seaman, 2013).

Academic leaders have mixed perceptions when comparing learning outcomes in online courses to those offered in the traditional classroom. The percentage of leaders reporting that

learning outcomes in online courses are inferior increased from 23% in 2012 to 26% in 2013 (Allen & Seaman, 2014). Nevertheless, academic leaders at large institutions of higher education offer the majority of online courses and have the highest opinion of the educational quality of the classes. The implications for higher education policy include that the online education delivery method must be evaluated as a viable learning option in the higher education environment (Allen & Seaman, 2014).

The relevance and importance of online learning raised national attention at the University of Virginia in June 2012 when the governing board forced President Sullivan to resign (Association of American University Professors (AAUP), 2013). The board of visitors accused the President of not establishing a strategic plan to address challenges facing the University within the next decade. The challenges included changes in both federal and state funding to the university, increased faculty workload with corresponding decreases in faculty compensation, and inclusion of online education. The board of visitors reinstated President Sullivan 2 weeks later and charged a strategic planning committee with developing a strategic vision and direction to address the issues facing the university (AAUP, 2013).

Several institutions of higher education define an online course as having 80% or more of the content delivered online, and generally, there are no face-to-face meetings (Allen & Seaman, 2014; Bejerano, 2008; Wasilik & Bolliger, 2009). Students in online courses are educated in a common virtual environment but a different physical space (Martino & Odle, 2008). Faculty use of active learning strategies and technology are used to shift students from passive to lifelong learners. Because the virtual classroom has lower levels of direct instructor or classmate presence, students become self-directed learners who benefit from time management skills. Indeed, instructors are charged with engaging students and designing the course with pedagogy

conducive to the online environment, and students are expected to be motivated and engrossed in the learning process (Martino & Odle, 2008).

The web-based virtual learning environment (VLE) effectiveness model is the conceptual framework for this study (Piccoli et al., 2001). The VLE is the learning community for faculty and students in an online course and has two dimensions: (1) the human dimension [faculty and students] and (2) the design dimension [technology] (Piccoli et al., 2001). Therefore, faculty, students, and technology are three elements that can be used determine online learning effectiveness. Because the purpose of the study is to assess radiography faculty perceptions of the effectiveness of asynchronous online courses, faculty, students, and technology are the variables used to operationalize the construct of online learning effectiveness.

Faculty are the first to consider with regard to learning effectiveness in the online environment. When teaching in the online environment, faculty shift from being at the front of the classroom to being facilitators, instructional designers, and guides on the side (Jones, 2006; Mashhadi & Kargozari, 2011). Faculty are facilitators of knowledge who design courses to provide effective and engaging learning experiences for students. Faculty teaching online courses express satisfaction with flexible schedules (Hodges, Way, & Shepherd, 2013; Shea, 2007; Wasilik & Bolliger, 2009), greater access to materials, increased student involvement (Wasilik & Bolliger, 2009), increased student access (Shea, 2007; Wasilik & Bolliger, 2009), and learning new technology (Shea, 2007). On the other hand, faculty dissatisfaction is expressed regarding technological problems, lack of personal contact with students (Hodges et al., 2013; Wasilik & Bolliger, 2009), increased workload (Bender, Wood, & Vredevoogd, 2004; Shea, 2007; Taft, Perkowski, & Martin, 2011), inadequate compensation for increased workload (Shea, 2007), and diminished student involvement (Wasilik & Bolliger, 2009). Overall,

increased workload in teaching online courses is generally the greatest area of concern for faculty (Barbera & Linder-VanBerschot, 2011; Bejerano, 2008; Bender et al., 2004; Britt, 2006; Hodges et al., 2013; Shea, 2007; Taft et al., 2011; Wasilik & Bolliger, 2009). Gender, age, employment status, type of institution (community college or university), and computer skills influence faculty motivation in teaching online courses (Shea, 2007). Instructor learning preferences do not impact faculty satisfaction with online learning, but faculty who are auditory learners have the lowest satisfaction with teaching online (McLawhon & Cutright, 2011).

Students are the second component to consider with regard to learning effectiveness in the online environment. In the virtual environment, students become active, self-directed learners who experience increased interaction with classmates as well as with the instructor (Jones, 2006; Mashhadi & Kargozari, 2011). Variables that predict student satisfaction with online education and learning effectiveness include student interest and attitude in performing learning tasks, perceived instructional quality (Artino, 2007), self-efficacy (Artino, 2007; Barbera & Linder-VanBerschot, 2011), and workload. Nevertheless, workload is not a concern among students if course expectations are addressed during course enrollment (Barbera & Linder-VanBerschot, 2011). The factors that influence student perceptions of learning effectiveness are: Grade Point Average (GPA) and American College Testing (ACT) scores (Altmyer & Yang, 2010), attrition (Willging & Johnson, 2009), appropriate interactions among students (Chao, Hwu, & Chang, 2011), multiple activities used in online courses, instructor presence, and meaningful interaction between students and the instructor (Dixson, 2010). Furthermore, employment status, distance from home, prior experience with taking an online course, and current enrollment in an online course impact student enrollment in additional online courses (Changchit & Klaus, 2008)

Technology is the third component related to learning effectiveness in the online environment. Technologies and media can support and enhance instruction, learning, increase student satisfaction, decrease attrition, and lead to a student-centered learning environment (Revere & Kovach, 2011). Some studies found that effective use of technology increases student engagement (Donathan & Hanks, 2010; Khan, 2009; Revere & Kovach, 2011), improves interaction between students and faculty (Khan, 2009), and enhances experiences and collaboration among students (Boulos, Maramba, & Wheeler, 2006). Implications for higher education policy include that faculty training improves Internet self-efficacy and increases use of technology. Appropriate investments in technical infrastructure and support should be made to increase use of technology (Buchanan, Sainter, & Saunders, 2013).

Online course effectiveness is the fourth component. Faculty-related factors critical to online learning effectiveness are instructional design elements and instructor presence (Lockee, Burton, & Potter, 2010; Sheridan & Kelly, 2010). Assessment of online instruction at institutions of higher education enable faculty to maintain educational quality standards (Parietti & Turi, 2011). Furthermore, faculty use a complement of formative and summative evaluation strategies to determine effectiveness of online courses (Lockee, Moore, & Burton, 2002).

Student-related factors critical to online learning effectiveness include active learning, student-student interactions, and student-instructor interactions (Ferguson & DeFelice, 2010; Hu & Gramling, 2009; Kirtman, 2009; Pate, Smaldino, Mayall, & Luetkehans, 2009). Self-monitoring, setting goals, effective time management skills, and seeking help of classmates or the instructor also improve online learning (Hu & Gramling, 2009). Finally, instructor-generated media (Mandernach, 2009), interactive media, simulations, and tools (Means, Toyama, Murphy, Bakia, & Jones, 2010) are technology-related factors critical to online learning effectiveness. In

summary, three elements that determine online learning effectiveness in the VLE are faculty, students, and technology.

Effectiveness of online education in the radiologic sciences is not a topic that has been evaluated frequently. The research projects in this profession explored faculty and student attitudes regarding online education (Britt, 2006), compared effectiveness of two online radiologic science courses (Johnston, 2008), considered the prominence of online education in the radiologic sciences, and explored course management systems, course design, and technology used in the online course environment (Martino & Odle, 2008). Findings from these prior studies are not applicable to all radiologic science programs in the U.S. because there is a limitation of radiography education studies conducted nationally and that study had a size of 102. Only 26 of the respondents in the sample completed the study and taught at program that offered online courses (Kowalczyk & Copley, 2013). Thus, there is a sampling gap in the existing literature related to the effectiveness of online education in the radiologic sciences. This study addresses the sampling gap by examining the perceptions of radiography educators regarding the effectiveness of online courses using a national sample.

Statement of the Problem

Academic leaders at higher education institutions who rated online learning outcomes as the same or superior to those in the classroom environment increased from 57% in 2003 to 77% in 2012; however, the percentage decreased slightly to 74 in 2013 (Allen & Seaman, 2014). Clearly, there remains a minority, but still a strong number of academic leaders who are not confident in student learning outcomes from online courses taught in higher education.

There is a preponderance of research that has been conducted on the effectiveness of online education in various disciplines; however, the vast majority of these studies were conducted locally. Moreover, the literature is rich with online learning experiences and best practices, but a limited number of research projects were conducted on the effectiveness of online education in the radiologic sciences. This establishes the need for a national survey of radiography faculty perceptions of the effectiveness of asynchronous online courses.

Research Questions

The research questions below guided the line of inquiry into faculty perceptions of the effectiveness of asynchronous online courses:

1. Is there a significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by faculty position and type of institution?
    a. Is there a significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by faculty position?
    b. Is there a significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by type of institution?
2. Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and age, years of teaching experience, years teaching online courses, number of online courses taught in the past 5 years, and perceived competence with use of technology?
    a. Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and age?

b. Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and years of teaching experience?
c. Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and years teaching online courses?
d. Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and number of online courses taught in the past 5 years?
e. Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and perceived competence with use of technology?

3. Is there a significant relationship between the number of years teaching online courses and selected aspects of faculty satisfaction with online courses?
    a. Is there a significant relationship between the number of years teaching online courses and faculty satisfaction with teaching online courses?
    b. Is there a significant relationship between the number of years teaching online courses and faculty satisfaction with interaction in online courses?
    c. Is there a significant relationship between the number of years teaching online courses and faculty satisfaction with institutional support while teaching online courses?
4. Is there a significant relationship between perceived ease of use of technology and online technology acceptance?
5. Is there a significant relationship between perceived usefulness of technology and online technology acceptance?

6. Is there a significant relationship between technological self-efficacy and use of technology-enhanced learning methods?
7. Are radiography faculty satisfied to a significant degree with teaching online courses?
8. Are radiography faculty satisfied to a significant degree with interaction in online courses?
9. Are radiography faculty satisfied to a significant degree with institutional support while teaching online courses?
10. Do radiography faculty perceive to a significant degree that online courses are effective?

Significance of the Study

The study was used to assess radiography faculty perceptions of the effectiveness of asynchronous online courses and contributes to the current body of knowledge. Effectiveness of teaching and learning in online courses was examined in this study and serves to benefit both faculty and students. Faculty, students, and technology were the constructs used to explore online effectiveness in this research project.

This study employed a national sample of faculty from 615 radiography programs located throughout the U.S. The research findings inform online education in the field of radiography and may be transferable to other disciplinary areas within online higher education.

Definitions of Terms

Specialized terms that are specific to asynchronous online education in higher education are included in the study. The following terms are defined for the purpose of clarity and understanding in reading this study:

Asynchronous learning - Exchange of information and ideas that occur at different times and location (Bejerano, 2008).

Course Management System (CMS) - System (e.g., Blackboard, WebCT, D2L, Moodle, etc.) that provides a virtual learning environment for online courses (Kowalczyk & Copley, 2013).

Faculty satisfaction - The degree to which faculty enjoy teaching online courses. Faculty members continually improve their pedagogical methods in the online environment, benefit from interacting with students, and receive institutional support while teaching online courses (Wasilik & Bolliger, 2009).

Learning effectiveness – quality of learning as comparable between online and traditional courses (Moore, 2011).

Nontraditional students - Undergraduate students who are 25 or older and/or have responsibilities that affect their lives. These individuals tend to receive no assistance or aid from a parent or guardian (Altmyer & Yang, 2010).

Online learning - Educational delivery method that is independent of location (Bejerano, 2008). Online learning is a form of distance education.

Synchronous learning - Exchange of information and ideas that occur in real time (Bejerano, 2008)

Technology-enhanced learning - Process by which technology is used within teaching practices to support the learning processes (Buchanan et al., 2013).

Traditional classroom instruction - Face-to-face instruction with a teacher and a group of students (Kirtman, 2009).

Traditional students - Undergraduate students who are 19 to 24 years of age. These students tend to receive assistance from a parent or guardian (Altmyer & Yang, 2010).

Limitations and Delimitations

One limitation of the study is the use of self-reported data to capture the perceptions of radiography faculty. Despite this limitation, self-reported data is frequently used in social science research, particularly in the field of educational evaluation and effectiveness (Simon & Goes, 2013). Another limitation is that the method of data collection limited the sample size. Therefore, the results may not be generalizable to the population of online radiography educators (Simon & Goes, 2013).

The purpose and research questions delimited the study to online radiography educators (Simon & Goes, 2013). The criteria limited the sample size by excluding a large number of radiography educators. Radiography program directors and clinical coordinators; didactic instructors were not included in the sample. Thus, caution should be made when generalizing the findings of this research to radiography programs that include online components taught by didactic faculty.

Overview of Study

The purpose of this study is to assess radiography faculty perceptions of the effectiveness of asynchronous online courses. The study examines the effectiveness of teaching and learning that occurs in online courses; findings benefit both faculty and students. This dissertation is organized into five distinct chapters. The introduction, statement of the problem, research questions, significance of the study, definition of terms, limitations, and delimitations of the study are included in Chapter one. Chapter two contains a review of the literature. Chapter three explains the methodology used in the study. Findings and data analyses are presented in Chapter

four. Chapter five provides the summary, findings, conclusions, and recommendations for this study.

CHAPTER 2

LITERATURE REVIEW

Learning effectiveness in a web-based virtual learning environment (VLE) is the conceptual framework for this research project. Ideally, a VLE is the setting for an online course that involves interaction within a learning community. Furthermore, the learning environment has a wide range of resources that increase learning effectiveness (Piccoli et al., 2001). The appropriate design of courses in the VLE facilitates learning, engages students, and enhances social presence (Dunlap & Lowenthal, 2009). Specific elements of the VLE that include the faculty perspective, student perspective, technology, and effectiveness were examined in the research project.

Virtual Learning Environment

The VLE has human and design dimensions that lead to effectiveness in online courses. The human dimension is composed of faculty and students; the design dimension incorporates the learning model, technology, learner control, content, and interaction. Effectiveness consists of performance, self-efficacy, and satisfaction.

Faculty serve as managers, technical advisors, facilitators, social directors, and educators in the online environment (Mayes, Ku, Akarasriworn, Luebeck, & Korkmaz, 2011). The instructor must facilitate a collaborative and student-centered environment as well as engage online learners (Mayes et al., 2011). Attitudinal measures of effective learning include the instructor's positive attitude toward technology, interaction with students, and control of technology (Piccoli et al., 2001). Instructor self-efficacy is another contributing factor that

enhances learning in the VLE. The instructor must be available to students and willing to devote time and energy to enhance the learning experience. An instructor's attitude, self-efficacy, and availability enhance students' reactions (Piccoli et al., 2001).

Students are the primary focus in the educational environment, and the VLE enables students to assume control and responsibility for learning (Piccoli et al., 2011). Characteristics of successful online learners include self-motivation and self-direction. Furthermore, online students must accept responsibility for learning and actively participate in the virtual environment (Mayes et al., 2011). Students who have work or family-related responsibilities eagerly participate in the online environment because of its flexibility (Piccoli et al., 2001). Comfort with technology and a positive attitude toward use of technological tools lead to student success. Prior experience in completing online courses is an element related to success in the VLE. As students gain practical experience, they develop learning strategies that reduce anxiety and enhance performance (Piccoli et al., 2001).

The design dimension is the second construct that contributes to learning effectiveness in the VLE (Piccoli et al., 2001). An effective online course includes the appropriate technology, addresses the social community, focuses on pedagogy with a constructivist approach, incorporates frequent online assessment with clear expectations, and includes student-centered course content. Therefore, strategies to enhance online learning include quality instructional technology, an online community built by collaborative activities, and educational content (Mayes et al., 2011).

The human and design dimensions lead to learning effectiveness (Piccoli et al., 2001). Faculty members measure performance, self-efficacy, and student satisfaction to evaluate learning effectiveness in the VLE. Student performance in an online course is measured by

achievement on exams and assignments. Self-efficacy can be evaluated through the assessment of information technology skills. Finally, satisfaction can be evaluated with the factors of student evaluation of the learning experience, attrition, and anxiety levels (Piccoli et al., 2001).

The Human Dimension: Faculty

Faculty are the facilitators of knowledge in the online environment. Several researchers explored the faculty perspective related to teaching courses in the online environment and discovered consistent findings. This section includes a review of literature related to the human dimension of VLE: faculty.

Wasilik and Bolliger (2009) conducted a study of faculty satisfaction with online education at a public research university in the United States. They developed and administered the Online Faculty Satisfaction Survey (OFSS) with questions related to students, teaching, and institutions. Participants included 102 online educators. Faculty expressed moderate satisfaction with teaching online. After collecting data, the researchers divided the faculty members into two groups based on whether they were more or less satisfied with online teaching to conduct further data analysis. Discriminant analysis was conducted to evaluate levels of satisfaction between the two groups of faculty based on teaching, student, and institutional-related variables. Faculty in the more satisfied group disclosed that they had greater incidences of faculty-student interaction in their online courses (Wasilik & Bolliger, 2009).

Faculty described technological problems, lack of personal contact with students, and diminished student involvement as major frustrations. Moreover, a few educators reported dissatisfaction with student involvement. Faculty expressed satisfaction with flexible schedules, greater access to materials, and increased access for students who were unable to attend classes

in the traditional classroom. There were contradictory findings in the 2009 study. Researchers discovered that a lack of personal contact with students was an area of frustration for some faculty while other educators were pleased with student involvement. Online faculty possessed only a moderate interest in teaching online. The minority (38.2%) of respondents stated they were more satisfied with teaching online than in other delivery methods. The majority (93.1%) of participants were eager to teach another online course (Wasilik & Bolliger, 2009).

Hodges et al. (2013) examined faculty satisfaction with online education at a university in the U.S. Faculty completed Wasilik and Bolliger's Online Faculty Satisfaction Survey, and the researchers used both quantitative and qualitative methods to analyze data. Findings revealed that convenience and flexibility of teaching online courses were areas of faculty satisfaction; areas of dissatisfaction were the increased workload and decreased interaction with students. Further data analysis prompted the researchers to recommend that institutions provide faculty with current and reliable technology as well as technical support, course librarians, library resources, and online training (Hodges et al., 2013).

Shea (2007) examined factors that motivate and demotivate faculty to teach in the online learning environment. This research utilized a broader sample of 386 faculty in 36 different colleges within one university system. Confirming prior findings at single institutions, flexibility was cited by faculty as the greatest motivating factor to teach online courses. Other benefits identified were learning new technology and increased access for students. Inadequate compensation for increased workload was cited as the greatest barrier for faculty. Gender, age, employment status, type of institution (community college or university), and computer skills influenced faculty members' motivation to teach online courses. Faculty most motivated to teach online courses were younger (under 45), female instructors with part-time status at

community colleges. Furthermore, the institution motivated computer savvy faculty to serve as mentors (Shea, 2007).

A study of online instructors in a community college utilized the National Study of Postsecondary Faculty (NSOPF) job satisfaction survey and the READI Assessment (McLawhon & Cutright, 2011). Findings indicated that instructor learning preferences (auditory, verbal, and kinesthetic) do not impact faculty satisfaction with online teaching; however, faculty who were auditory learners reported the least satisfaction with teaching online courses. Therefore, auditory learners may need accommodations, such as synchronous meetings, in the online environment (McLawhon & Cutright, 2011).

Bender et al. (2004) compared workload for teaching the same course using two delivery methods. The study was used to assess the time to teach the course in the traditional classroom compared with the online environment. The courses had the same objectives, assignments, tests, and grading criteria. Classroom courses had 111 students and 38 undergraduate teaching assistants. On the other hand, there were 18 students and five undergraduate teaching assistants in the asynchronous online course. The instructor and teaching assistants maintained a log of time and tasks committed to each section to permit consistent data collection. The classroom course required more total teaching time than the online version of the same course. Further analysis corrected for the difference in enrollment per course, and workload was two times greater for the online course. Teaching courses asynchronously increased workload (Bender et al., 2004).

A literature review linked higher faculty workload to online courses than courses taught in the classroom (Taft et al., 2011). Faculty perceived that the quality of learning decreased with increased enrollment because less time is available for interaction and engagement with students

in the online environment. Research from various disciplines revealed that course enrollment impacts interactions among students as well as between faculty and students, and large course section enrollment negatively impacts student learning. The researchers disclosed that course with a student to faculty ratio of greater than 30:1 resulted in one-way communication from faculty to students unless the instructor assigned students to discussion groups. Overall, the literature recommended approximately 25 students per section. Other than in doctoral education, there is little support for extremely small class sizes of 3 to 10 students. Nevertheless, the researchers encouraged administrators to collaborate with faculty to determine course section enrollments (Taft et al., 2011).

Faculty members design courses to provide effective and engaging learning experiences for students. These individuals expressed satisfaction with flexible schedules (Hodges et al., 2013; Piccoli et al., 2001; Shea, 2007; Wasilik & Bolliger, 2009), greater access to materials, higher student involvement (Piccoli et al., 2001; Wasilik & Bolliger, 2009), increased student access (Shea, 2007; Wasilik & Bolliger, 2009), and learning new technology (Shea, 2007). Gender, age, employment status, type of institution (community college or university), and computer skills influenced faculty members' motivation in teaching online courses (Shea, 2007). Instructor learning preferences do not impact faculty satisfaction with online learning, but faculty who are auditory learners expressed the least satisfaction with teaching online courses (McLawhon & Cutright, 2011).

The Human Dimension: Students

Most successful online students are self-directed learners who have a virtual environment

to interact with fellow classmates and the instructor. Several authors explored the student perspective related to learning in the online education and discovered consistent findings. This section includes a review of literature related to the human dimension of VLE: student.

Artino (2007) explored personal motivation, perceptions of instructional quality, and student satisfaction with an online course. The greatest predictors of student satisfaction were student interest and attitude in performing learning tasks, self-efficacy, and perceived instructional quality (Artino, 2007).

Altmyer and Yang (2010) analyzed student learning outcomes in undergraduate business courses delivered in both traditional lecture and asynchronous online learning methodologies at a small mid-western university. GPA and ACT scores were the best predictors of learning outcomes for both delivery methods. Students with higher GPAs had better study habits and were self-motivated in the online environment, and students with lower GPAs struggled in online courses and benefited from the structured format and interaction with an instructor in a traditional classroom course. Online students outperformed the traditional students on tests by a minimal margin. Overall, successful online students were nontraditional, motivated, independent learners who appreciated the convenience and flexibility of online courses (Altmyer & Yang, 2010).

Barbera and Linder-VanBerschot (2011) explored factors related to learners, instructors, institutions, instruction, and learning outcomes at three universities located in the United States, Spain, and China. The authors sent precourse and postcourse surveys to 921 online students and their instructors. Students and instructors from different cultures were satisfied but had different perceptions of this educational methodology; self-efficacy was directly related to online learning outcomes; and course expectations addressed during enrollment assured that students were not

distressed about the increased workload in online courses (Barbera & Linder-VanBerschot, 2011).

Willging and Johnson (2009) evaluated attrition of students enrolled in an online master's degree program at a university in the U.S. The majority of students withdrew from the program after completing the first few courses. Regression analysis was conducted to evaluate independent variables that included age, gender, cohort, ethnicity, occupation, location, and GPA; however, the researchers concluded that these factors did not impact attrition. Reasons for attrition were categorized into personal, job, program, and technology-related reasons. The most common documented reason for withdrawing was full-time employment as a graduate student. Overall, the results did not vary greatly from students who withdrew from traditional programs (Willging & Johnson, 2009).

Changchit and Klaus (2008) assessed student perceptions of factors that influenced their decision to take additional online courses. Two hundred twenty-five students enrolled in a traditional class at a mid-sized university completed a survey. Two groups of participants were created based on student preference for online or traditional courses. Then, *t*-tests were used to evaluate the impact of student demographics and perceptions of online courses on preference. Two factors impacting student preferences were perceived usefulness and perceived difficulty. Employment status, distance from home, prior experience with taking an online course, and current enrollment in an online course impacted students' preference to enroll in additional online courses (Changchit & Klaus, 2008)

Chao et al. (2011) investigated interactions among participants in an online course to discern learning effectiveness. An infrastructure named Knowledge Sharing (KS) was developed, used as the methodology in the research study, validated in an experiment, and

reported in the data analysis. Participants included 128 students between 16 and 18 years of age at a junior college in Taiwan. Students were randomly selected into three teams and used only one teaching method throughout the online course. Students in team A used the KS system, team B employed blogs, and Team C used a fundamental learning system without external support. The researchers evaluated the data and verified the success of the KS system. Appropriate student interactions using the KS concept facilitated learning effectiveness. Accordingly, interactions are crucial in the teaching and learning process (Chao et al., 2011).

Dixson (2010) explored student engagement in completing online activities. Participants included 186 students from six campuses in 38 courses in two universities. No single type of activity independently engaged students, but a combination of multiple activities together engaged them. Announcements, e-mails, discussion forums, online lectures, and/or chat sessions provided instructor presence in the online course as well as meaningful student-instructor interaction (Dixson, 2010).

Research studies revealed numerous variables that predicted student satisfaction with online education. Variables that predicted student satisfaction were student interest and attitude in performing learning tasks, perceived instructional quality (Artino, 2007), self-efficacy (Artino, 2007; Barbera & Linder-VanBerschot, 2011), and workload. Workload was not a concern among students if course expectations were addressed during enrollment (Barbera & Linder-VanBerschot). GPA and ACT scores (Altmyer & Yang, 2010), attrition (Willging & Johnson, 2009), appropriate interactions among students (Chao et al., 2011), multiple activities incorporated in an online course, instructor presence, and meaningful interaction between students and the instructor influenced student perceptions of learning effectiveness (Dixson, 2010). Furthermore, employment status, distance from home, prior experience taking an online

course, and current enrollment in an online course impacted students' preference to enroll in additional online courses (Changchit & Klaus, 2008).

The Design Dimension: Technology

Effective use of technology in the online environment enhances learning effectiveness. Several authors explored online technology and discovered consistent findings. This section includes a review of literature related to the design dimension of VLE: technology.

Mashhadi and Kargozari (2011) defined educational technology as a method to communicate with students without face-to-face contact. The use of technology to deliver online education became prominent in the 1990s and permeated higher education in both traditional classroom and online courses. Faculty learned to integrate technology in asynchronous online education to provide meaningful learning experiences and opportunities for students to interact and collaborate with classmates and the instructor. Therefore, faculty used technology as a platform to enhance the learning experience and support curricular development (Mashhadi & Kargozari, 2011).

DeMaria and Bongiovanni (2012) discussed that faculty should focus on technology that enhanced online courses rather than incorporating practices previously used to teach in the traditional environment. The authors stressed that students are more engaged in online courses that are designed with appropriate activities. Examples of engaging activities for online courses include analysis of case studies, discussion boards, blogs, and synchronous online meetings with text and chat. Online faculty who incorporated technology that increased engagement cultivated creativity and enriched the virtual classroom discussion. Furthermore, the virtual environment was a safe medium for quiet students to express themselves (DeMaria & Bongiovanni, 2012).

Gibson, Harris, and Colaric (2008) assessed faculty perception of online education using Davis' technology acceptance model (TAM). The researchers adapted the survey questions for use among faculty in higher education to address the perceived ease of use of online technology and perceived usefulness of online education. Faculty from the colleges of business and education at a large regional university were invited to complete the instrument, and a 46.8% survey response rate resulted in 110 participants. Findings revealed that perceived usefulness predicted use of technology in online education; however, ease of use was not a concern among participants. Types of technology and demographic characteristics such as gender and age were not variables in this study. The authors recommended repeating the study at other universities in various disciplines. It was also recommended that demographic characteristics and ease of use of various technologies be incorporated into future studies (Gibson et al., 2008).

Further research indicated that there was a relationship between faculty use of technology and internet self-efficacy as well as if there was a relationship between faculty use of technology and barriers with adoption of technology (Buchanan et al., 2013). The specific barriers identified were structural constraints within the university and perceived usefulness of the technology (Buchanan et al., 2013).

Bickle and Carroll (2003) examined tools used in designing online courses and outcomes for students, instructors, and the institution. An instructor developed a checklist of 24 suggestions to enhance quality of instruction in online courses. The checklist included elements such as providing an introductory welcome, templates for lectures, learning objectives for each lecture, technical directions, online quizzes, and copyright guidelines. Outcomes were beneficial to students, instructors, and the community. Students benefited from access to classes without concern about course schedules, capacity, or physically attending class. Instructors profited from

marketing their work, program, and the institution. Finally, online courses promoted the institution and provided a service to the community (Bickle & Carroll, 2003).

Salyers, Carter, Barrett, and Williams (2010) conducted a mixed method study to examine faculty and student perceptions and satisfaction with the Introduction, Connect, Apply, Reflect, and Extend (ICARE) framework. The ICARE framework provided an effective learning environment for both faculty and students. The participants recommended that that the framework be used to design online courses (Salyers et al., 2010).

Revere and Kovach (2011) explored online technology that included discussion boards, chat sessions, blogs, Wikis, group projects, peer assessment, Twitter, Google calendar, Google e-mail, Google tasks, Google documents, and Wimba Collaboration Suite. Faculty created podcasts and vodcasts to post on YouTube, iTunes or ITunes University and streaming media to provide lectures, instructions, or interviews to students in the online environment. Effective use of online technology supported and enhanced learning, increased student engagement and satisfaction, and decreased attrition. The appropriate integration of pedagogy and technology lead to a student-centered learning environment (Revere & Kovach, 2011).

Khan (2009) completed a study to explore the relationship between engagement and student perceptions of the use of computers. The researcher administered a survey to a sample of 690 students in 28 different classrooms in two community college districts. Students perceived that computers increased engagement in the learning process and also increased interactions with instructors and their fellow classmates (Khan, 2009).

English as a Second Language (ESL) and English as a Foreign Language (EFL) students completed a survey about perceptions of asynchronous instructional audio feedback used as an instructional tool in online courses (Olesova, Weasenforth, Richardson, & Meloni, 2011).

Researchers examined potential differences between the ESL and EFL students in perceptions of audio and text feedback as well as sense of presence when receiving audio feedback. Both groups of students perceived that the written and audio feedback were beneficial. Furthermore, the majority of students from both groups stated that the audio feedback was more personal and understandable. The audio feedback also increased students' interest, involvement, and motivation in the online course (Olesova et al., 2011).

Wikis, blogs, podcasts, and vodcasts are a new generation of web-based tools used for collaboration in the educational environment (Boulos et al., 2006). A wiki is a website with content that can be edited by multiple individuals and used to gather information or serve as a location for online collaboration. A blog is a web-based application enabling students to add content that cannot be edited by other use and involves the addition of content in reverse chronological order. Podcasts and vodcasts are downloadable audio and video files that can be stored and played from a portable electronic device or computer. Podcasts or vodcasts can be used to deliver educational material, are portable, can be downloaded at any time, and provide beneficial learning experiences for auditory and visual leaners. Professors create podcasts or vodcasts to make classroom lectures available for online students. If used in an effective manner, wikis, blogs, podcasts, and vodcasts can enhance learning experiences and collaboration between students, clinicians, and patients (Boulos et al., 2006).

Zingaro and Oztok (2012) evaluated potential predictors of interaction in an asynchronous graduate online course in education. Researchers evaluated 1166 weekly discussion posts related to course content. Posts that were introductory, private, initiated discussions, had no content other than in the subject line, and more than two dates late were eliminated for the purpose of this study. Students wrote a mean number of 53 posts, and the

instructor wrote 63 posts. The researchers discovered that responses to discussion posts increased when written earlier in the week, when they included at least one question, and when they were longer in length. Reading ease and the author of the posts had little to no impact on the number of responses. Study limitations included that it was narrowed to one online course. Therefore, results may not be generalized to all courses in various disciplines (Zingaro & Oztok, 2012).

Aleksic-Maslac, Magzan, and Juric (2009) reviewed synchronous discussions among 290 students in two online freshman courses at an institution of higher education to examine the impact of digital interaction on collaborative learning. Data analyses were conducted to assess the impact of student motivation, final course grades, and dominant participants on the quality of online discussions. Research findings revealed that students motivated to participate in discussion posts in one course were more likely to participate in another course. Secondly, faculty motivated students to actively participate when the quality of the response was correlated with a course grade. Finally, active involvement in discussion posts enhanced learning. Digital interaction created learning communities since faculty encouraged students to present ideas, contribute meaningful comments, debate issues related to the course topic, and collaborate to solve problems. Student dialogue was an essential component to comprehension of course content. Online educators must enhance interaction and collaboration among students to add meaning to courses (Aleksic-Maslac et al., 2009).

A radiography educator and instructional designer at one university created a group project as a method to induce active learning and ameliorate student interaction and engagement in online courses (Donathan & Hanks, 2010). The researchers designed a project for online courses in which radiography students were divided into groups with 5 or less members. The

professor provided the groups with access to discussion boards, e-mail, chat areas, and a location in which to exchange files. A topic was assigned to each group, and the project included preparing a summary, developing discussion questions, and leading a discussion with the entire class. Additionally, the authors discussed components of a rubric to grade the project. The authors recommended that faculty enlist the assistance of an instructional designer to develop tools for online courses. The authors identified that the benefit of assigning group projects in online courses was to prepare engaging activities (Donathan & Hanks, 2010).

Morgan, Cameron, and Williams (2009) evaluated student perceptions of group processes in the online classroom. The researchers sent an online survey with closed and open-ended items to 125 undergraduate students enrolled in 6 online courses with group projects. The response rate was 47%. Research findings revealed that instructors need to support students in the group process and facilitate social task development in online courses (Morgan et al., 2009).

Researchers considered types of technology and evaluated their impact on the virtual learning environment. Use of technologies and media can support and enhance learning, increase student satisfaction, decrease attrition, and lead to a student-centered learning environment (Revere & Kovach, 2011). Furthermore, effective use of technology supports delivery of online courses and may increase student engagement (Donathan & Hanks, 2010; Khan, 2009; Revere & Kovach, 2011), improves interaction between students and faculty (Khan, 2009), and enhances experiences and collaboration among students (Boulos et al., 2006). Implications for higher education policy include that faculty training may improve internet self-efficacy and increase use of technology. Therefore, appropriate investments in technical infrastructure and support should be made to increase use of technology (Buchanan et al., 2013).

Online Course Effectiveness

Online course effectiveness is related to faculty, students, and the use of appropriate technology. Numerous researchers evaluated online course effectiveness. This section is a review of studies that explored online course effectiveness concluding with a summary of findings.

Faculty implemented formative or summative strategies to determine online course effectiveness (Lockee et al., 2002). Formative evaluation included design review, one-on-one review, small group review, field trials, or ongoing reviews. Summative evaluation includes inputs, outcomes, and concerns related to course implementation. Evaluation was best achieved with a complement of both types of formative and summative strategies to garner information about the quality of online courses (Lockee et al., 2002).

In a later study, Lockee et al. (2010) employed qualitative methods to analyze standards related to online courses. This study was conducted to evaluate perceptions from twelve organizations that included accrediting agencies, professional organizations, and non-profit organizations. Data gathered included a review of each organization's website and policy manuals as well as phone interviews with employees and clients. Results of the study provided the educational community with information related to instructional design of distance education courses as well as informed researchers who wish to investigate online course effectiveness (Lockee et al., 2010).

Head, Lockee, and Oliver (2002) proposed a framework of three variables to evaluate the effectiveness of distance education. The three elements were the method, media, and mode. The instructional method included the various techniques used to disseminate course material to students. Examples of methods were lecture, discussion, group projects, etc. The second

element, media, referred to the technology or tools used to disseminate course material. Examples of media were verbal instruction, computer software, podcasts, etc. The final element was mode related to the instructional delivery at a specific place or time. Faculty members used asynchronous web-based instruction at a different place and time than students. The framework of method, media, and mode provided a systematic approach to evaluate online course effectiveness (Head et al., 2002).

A meta-analysis prepared for the U.S. Department of Education identified all research studies published between 1996 and 2008 that compared the learning effectiveness between online to face-to-face courses (Means et al., 2010). The researchers identified 45 studies with 50 independent effects; the majority of the studies were samples of medical higher education. Faculty taught the online courses using asynchronous, synchronous, and blended learning methodologies. Eleven studies revealed more effectiveness in the online learning environment, and three reported better outcomes in the face-to-face environment. Authors of the research studies identified various technology applications that supported learning; however, overall findings revealed that media incorporated in the online environment did not alter learning outcomes. Alternatively, use of interactive media, simulations, and tools increased reflection among students and positively supported their learning. Furthermore, self-regulation, and self-monitoring improved student learning outcomes. Overall, findings revealed that there were similar learning outcomes between fully online courses and face-to-face courses (Means et al., 2010).

A meta-analysis was used to analyze semester-length online courses and discuss implications for access and retention of low-income and underserved students. Findings indicated that the seven online courses had low enrollment of only 18 to 20 students and were

taught at mid-sized or large universities. Five of the universities had selective admission criteria. Over half of the studies were conducted to evaluate technology or electronic communication courses. Online courses have higher attrition rates but have comparable learning outcomes than face-to-face courses. Since less academically prepared students withdrew from online courses, those remaining were likely to earn a higher grade. The notion that learning outcomes were equal between fully online courses and face-to-face courses may be skewed because the outcomes were not applicable to less-prepared students who withdrew. Low-income students have barriers related to cost of tuition, lack of computers and software, and may not have internet access at home (Jaggars & Bailey, 2010).

Online learning was an attractive substitute to traditional courses offered on campus (Bejerano, 2008). Online learning enhanced interaction between students and the instructor in a virtual environment supported with a computer and is also flexible in both location and time. Both students and the instructor accessed the virtual classroom from any location, and learning could either be synchronous or asynchronous. Communication and exchange of information occurred among participants in both types of learning; however, synchronous learning transpired in real time, and asynchronous learning occurred at times convenient for participants and the faculty member.

Individual preference for online courses was generally related to nontraditional students who were employed, with families, and are unable to attend traditional courses offered on campus. Students who lived on campus enrolled in online courses to avoid difficulty in enrolling in traditional courses with limited capacities and the perception that online courses were less rigorous than traditional courses (Bejerano, 2008).

Some critics of online education questioned whether online courses are comparable in quality compared to traditional courses. Several disadvantages were identified for students in online courses. First, students were unable to socially integrate in the on-campus community and may feel a lack support and engagement in online courses. The isolation led to attrition. Secondly, online courses were structured to place the responsibility for learning on students. Therefore, online students must be motivated and responsible for their learning. Students must be prepared to seek assistance from instructors and ask questions as they would in the traditional classroom (Bejerano, 2008).

Another disadvantage was the impact of the virtual environment on faculty. Teaching online increased faculty workload during course design, organization, and selecting technology and tools. Additionally, faculty may not find teaching online rewarding because there is less interaction with students. The online environment may not offer faculty with the opportunity to display their passion and joy for teaching and limited faculty ability to motivate and engage students as in a face-to-face in the traditional classroom. Furthermore, online methodology may not be suitable for certain courses and content. Finally, the perception that employers found online degrees less desirable is a concern for students, graduates, and institutions of higher education (Bejerano, 2008).

Kirtman (2009) compared learning outcomes in three asynchronous online courses and three traditional courses for students enrolled in a master's program in a public university. The courses were taught over a 2 year period, and the study included 71 students in the online courses and 69 in the traditional sections. The instructor and pedagogy was the same for both courses. The data for the study were exam grades, paper (literature review and mini-literature review) grades, and an anonymous course evaluation at the end of the semester. Supporting Clark's

(1994) findings that instructional variables rather than deliver medium are the critical factors in learning outcomes, grade analysis of the papers revealed no difference in scores. The traditional students outperformed the online students on the midterm exam, and online students outperformed the traditional students on the final.

Students reported on surveys that there was no difference in learning between the two methods; however, online students indicated that they missed interactions with peers and learning from verbal discussions or questions asked during traditional classes. The online students self-reported a sense of responsibility for learning and used the opportunity to review course material as many times as necessary. The majority of online students reported the intention to listen to lessons more than once and ask more questions about material in future online courses. Finally, online students appreciated not having to allocate time or money traveling to class and were able to place full attention on learning the course material. Overall, active learning, student-student interactions, and student-instructor interaction were identified as key components of learning (Kirtman, 2009).

Quantitative analysis of performance indicators were used to highlight similarities and differences in learning outcomes between traditional and online delivery methods of a social science course taught in 85 sections over a period of 4 academic years from 2005 to 2009 (Sussman & Dutter, 2010). Factors explored were student demand, motivation, learning outcomes, student attrition, and delivery time for online courses. Enrollment was found to be statistically higher in the online sections. Even though traditional sections were cancelled more often due to low enrollment, more students withdrew from the online sections during the first week of the semester. Demand for the online delivery method was greater between nontraditional and employed students, and there was an overall a growth in online courses.

Findings revealed that the learning outcomes, mean issue paper and course grades were similar for both groups of students (Sussman & Dutter, 2010). Further analysis of grades revealed that the online sections had greater frequencies of students with extreme grades, including Ws, As, and Fs and less Bs and Cs. The findings affirmed that prepared students with greater discipline, organization, and time management earned higher grades. Other students who were less prepared either withdrew or earned lower grades in the online course sections. In summary, data analysis served to examine similarities and differences in student learning outcomes between the traditional classroom and online learning environments (Sussman & Dutter, 2010).

Ferguson and DeFelice (2010) evaluated the impact of online course format (5-week summer session versus 15-week semester) on student satisfaction, perceived learning, and academic performance. Participants for the first part of the study were 75 students enrolled in the same course with the same instructor using the same pedagogical strategies but in different length terms. The researchers learned that students from the 5-week session had greater satisfaction with student-student communication, and students from the 15-week term had higher satisfaction with student-instructor communication. Findings supported that student-student and student-instructor communications were critical to online student satisfaction. Therefore, faculty members need to apply different pedagogical approaches for courses taught in different formats to assure equivalent learning from one section to another (Ferguson & DeFelice, 2010).

Hu and Gramling (2009) examined self-regulated learning strategies and methods to enhance student success in an online course in a large research university. Twelve students enrolled in an online course participated in an online open-ended survey, and the researchers used software to code and analyze the data. The outcomes explored in the study were student

perceptions of success and final course grades for the 12 students. Students frequently reported strategies that increased effectiveness in the online environment. The strategies included self-monitoring, setting goals, effective time management skills, and seeking help of classmates or the instructor. On the other hand, discomfort with individual learning, low self-motivation, low self-efficacy, and lack of time management skills resulted in negative outcomes (Hu & Gramling, 2009).

Sheridan and Kelly (2010) conducted a study to explore indicators of instructor presence in online courses. Providing clear instructions and being responsive to student needs are the two most important indicators of instructor presence. Other important indicators are timeliness of information and in-depth feedback (Sheridan & Kelly, 2010).

Pate et al. (2009) examined interactions within discussion forums used in a hybrid instructional technology course to see if the interaction enhanced the community of learning in the virtual environment. Findings revealed that the majority of students did not participate in the optional forums. Students explained that the optional forums were good in theory but were not needed because social interaction was a component of the required discussion forums. Nevertheless, student perception of social presence was high in the two forums in which the instructor participated but low in the third one. Learning was enhanced in the online environment when a combination of both academic and social dialogue was incorporated into the course design. Overall, collaboration, interaction, and socialization were critical components of a successful online course (Pate et al., 2009).

Mandernach (2009) evaluated the impact of instructor-personalized multimedia on student engagement and learning outcomes in an online college-level general psychology course.

The researcher collected qualitative data from solicited student comments in course evaluations and unsolicited feedback from e-mails to further analyze if differences in student engagement existed among the four sections. The qualitative data analysis revealed that use of instructor-generated media served to increase students' level of engagement and satisfaction with the course. According to the quantitative data analysis, use of media did not impact student engagement or learning; however, the qualitative data analysis generated the theme that students benefited from the instructor-prepared technology. The discrepancy in research findings lead to an unanswered question as to whether faculty members should prepare their own media (Mandernach, 2009).

Grandzol and Grandzol (2010) evaluated effectiveness of online instruction in 359 undergraduate online business courses each with an enrollment size between 14 to 30 students. The researchers developed a model based on measures grouped into four variables: class size, faculty participation time, student participation time, and course completion. Course completion rates most determined online learning effectiveness because retention was critical to program success. Increased course enrollments served to reduce faculty participation time and improved student participation time in online courses; however they had no impact on course completion.

Grandzol and Grandzol (2010) discovered that less time intensive methods were used by faculty to teach larger online course sections and standardized content presentation and feedback; however, students invested more time when course enrollment increased. Increased student-student interactions decreased course completion rates; however, increased student participation served to improve student perceptions of learning. Finally, student-faculty interactions had no impact on course completion rates (Grandzol & Grandzol, 2010).

Parietti and Turi (2011) examined the process of monitoring online courses and peer evaluation at a private Catholic college. The authors explained that the institution at which they were employed established an online community of pedagogy. The full-time and part-time faculty members were required to complete a certification course in creating and teaching online courses. Faculty members received ongoing support while they taught online courses. An assessment process using a rubric was used to evaluate the course syllabus, access to campus services, online lectures, and assignments. Another rubric was used to evaluate elements related to online instruction that include the virtual office, interaction in online assignments, and timely, detailed grading of assignments. Ongoing assessment of online instruction maintained educational quality standards (Parietti & Turi, 2011).

In summary, numerous scholars have evaluated learning effectiveness in the virtual learning environment. Faculty-related factors critical to online learning effectiveness included components of instructional design and instructor presence (Lockee et al., 2010; Sheridan & Kelly, 2010). Assessment of online instruction at institutions of higher education enabled faculty to maintain educational quality standards (Parietti & Turi, 2011). Furthermore, faculty used a complement of formative and summative evaluation strategies to determine effectiveness of online courses (Lockee et al., 2002).

Student-related factors critical to online learning effectiveness included active learning, student-student interactions, and student-instructor interactions (Ferguson & DeFelice, 2010; Hu & Gramling, 2009; Kirtman, 2009; Pate et al., 2009). Self-monitoring, setting goals, effective time management skills, and seeking help of classmates or the instructor also served to improve online learning (Hu & Gramling, 2009). Finally, instructor-generated media (Mandernach,

2009), interactive media, simulations, and tools (Means et al., 2010) were technology-related factors critical to online learning effectiveness.

Online Radiography Education

There is a limited number of research studies that examined online radiography, with fewer focused on course effectiveness. This section provides an overview of the literature related to online education in radiography programs concluding with a summary of findings.

A community college in Boston used a labor shortage initiative grant to establish a 3-year distance associate degree radiologic technology program in 1990 to offer educational opportunities to a cohort of 11 students living in various locations throughout the state (Cauble & Chernow, 1996). Some radiography courses were taught in the traditional classroom while others were taken in an alternative format that included distance learning, experiential learning, or college-level examination program (CLEP). The program experienced challenges that included faculty workload, appointing and training clinical instructors, designating a distance education liaison at each clinical affiliate, and requesting and gaining approval for clinical education sites. Strategies to maintain effective communication with the seven clinical affiliates included appointing a liaison at each hospital to receive, monitor, and return all program materials, requesting that a college counselor have weekly conversations each student, providing a contact list to students, and resolving personnel, scheduling, staffing, and facility issues. Ten of the 11 students who enrolled in the program graduated, and 8 were certified in radiography by the American Registry of Radiologic Technologists (ARRT) (Cauble & Chernow, 1996).

The online associate degree radiologic technology program was beneficial; however, the researchers recommended that administrators evaluate faculty workloads, college personnel be

involved in the selection process, clinical instructors be identified prior to the program, more instructional aids be purchased for the clinical affiliates, and a fiber optics system be used to facilitate the distance learning component of the program. Two recommendations related to students were that students should pay a fee to gain ownership and commitment, and they should be educated about program expectations and requirements prior to enrollment (Cauble & Chernow, 1996).

Britt (2006) investigated attitudes regarding online education between faculty and students in radiologic sciences and nursing programs. Survey results indicated that faculty experienced barriers with increased preparation time, a lack of personal interaction with students, inexperience with technology, and an increase in e-mail correspondence with students. Advantages identified were increased access and convenience and the opportunity to teach online courses. Most student respondents stated they learned more in the traditional classroom than in online courses and reported barriers with online technology, time management, and delayed communication with online instructors. Students identified access, not attending class, and the experience of a new style of learning as advantages (Britt, 2006).

Johnston (2008) examined effectiveness of two online radiologic science courses that were converted from a traditional classroom format. Two years of data from each course taught in the traditional classroom were compared with 2 years of data for the same courses taught in the online environment. Course grades and national board results in two subject areas were compared across 317 participants. Online students had higher course grades than traditional students; however, the results were only significant for one of the course topics. These findings may indicate that online students are more engaged and learn material on a deeper level.

Conversely, the traditional students had higher national board results on both content areas (Johnston, 2008).

Self-directed learning characteristics of imaging science professionals who completed online continuing education (CE) activities were evaluated (Evans, Gallatin, Taylor, & Brodnik, 2008). Participants were imaging professional who previously completed an online CE activity. Responses from 640 imaging professionals included opinions on motivation, self-monitoring and self-management regarding completion of CE activities. Mandatory certification requirements, clinical competence, awareness of technological changes in the profession, and the possibility of changing jobs or being promoted motivated individuals to complete CE activities (Evans et al., 2008).

An ASRT task force prepared a report on educational delivery methods in online radiography courses (Martino & Odle, 2008). The task force recommended a revision of materials from the traditional classroom content to apply the appropriate pedagogy in the online classroom. Effective online instructional models include student-centered learning, problem-based learning, and lifelong learning. These models enable students to become active learners who assume personal responsibility for their learning and develop critical thinking skills to discern information in future educational experiences (Martino & Odle, 2008).

The task force recommended that educational technologies include Microsoft PowerPoint presentations, audio recordings, photos, images, videos, and podcasts that are transmitted over portable electronic devices (PEDs) including personal digital assistants (PDAs), smartphones, laptops, tablets, and MP3 or MP4 players. Other tools include virtual reality and simulation, audience response systems, and electronic portfolios (e-portfolios). Virtual reality and simulation enable students to apply knowledge in an environment that mirrors the real world

environment while audience response systems and e-portfolios can assess competency. The taskforce advised that new instructional technology methods and tools be used to deliver educational content be evaluated to assure effectiveness of online education (Martino & Odle, 2008).

Kowalczyk and Copley (2013) examined the prominence of online education in the radiologic sciences as well as explored course management systems, course design, and technology used to teach online courses. The researchers sent an electronic survey to a sample of 365 educators in accredited radiography, radiation therapy, and nuclear medicine programs. Of the 102 participants, only 38 previously taught online courses and 26 individuals completed the entire survey.

Findings from Kowalczyk and Copley's study revealed that even though there has been an increase in the number of online course offerings over the past 3 years in the radiologic sciences, the number of programs with these offerings was limited. The researchers discovered that BlackBoard was the most commonly used course management system, and PowerPoint was the most popular type of technology used to deliver online courses. Younger educators possessed greater technological self-efficacy, and university-sponsored programs were more likely to use synchronous technological tools. Educators reported having 1 to 4 hours of technological training prior to online course development; however, there was a lack of instruction after course design (Kowalczyk & Copley, 2013).

Kowalczyk and Copley (2013) stressed the need for a variety of technological tools and methods to be integrated into online courses to engage students and provide an interactive virtual environment. Additionally, online educators should request instruction in course design and technological tools prior to and after the course is developed to evaluate and improve online

learning strategies. Limitations of the study were the small response rate which resulted in a limited sample size, and the modest number of participants who reported that their program offered online courses (Kowalczyk & Copley, 2013).

Several studies were used to examine online education in the radiologic sciences but only three addressed online course effectiveness. The first research project explored the process of establishing a distance education project (Cauble & Chernow, 1996). The second study was conducted to evaluate faculty and student attitudes regarding online education (Britt, 2006). The effectiveness of two online radiologic science courses that were converted from a traditional classroom format was examined in the third study (Johnston, 2008). The fourth study was used to examine the self-directed learning characteristics of imaging science professionals who completed online CE activities (Evans et al., 2008). The next study was a report that detailed the various types of technological tools that radiography educators could incorporate in their online courses to enhance learning effectiveness (Martino & Odle, 2008). The final study was used to examine the prominence of online education in the radiologic sciences as well as explored the course management systems, course design, and technology used to teach online courses (Kowalczyk & Copley, 2013). Because the research topics for each of these studies were unrelated, no common these emerge among them. All of the studies had small sample sizes, so the results of the studies may not be applicable to all radiologic science programs in the U.S. Thus, there is a paucity of empirical studies of effectiveness of online education in radiography programs.

Chapter Summary

In conclusion, scholars have extensively studied student and faculty interactions and experiences in the online environment (Altmyer & Yang, 2010; Artino, 2007; Barbera & Linder-VanBerschot, 2011; Bender et al., 2004; Changchit & Klaus, 2008; Chao et al., 2011; Dixson, 2010; Dunlap & Lowenthal, 2009; Ferguson & DeFelice, 2010; Hodges et al., 2013; Hu & Gramling, 2009l; Kirtman, 2009; Mandernach, 2009; Mayes et al., 2011; McLawhon & Cutright, 2011; Pate et al., 2009; Piccoli et al., 2001; Shea, 2007; Taft et al., 2011; Wasilik & Bolliger, 2009; Willging & Johnson, 2009). Additionally, several researchers examined the technological factors related to the virtual learning environment, with key recommendations and best practices emerging (Aleksic-Maslac et al., 2009; Boulos et al., 2006; Bickle & Carroll, 2003; Buchanan et al., 2013; DeMaria & Bongiovanni, 2012; Donathan & Hanks, 2010; Gibson et al., 2008; Khan, 2009; Mashhadi & Kargozari, 2011; Morgan et al., 2009; Olesova et al., 2011; Revere & Kovach, 2011; Salyers et al., 2010; Zingaro & Oztok, 2012). Many scholars compared the online classroom to face-to-face classrooms leading to enhanced understanding of the nuances and variables leading to greater gains in learning outcomes (Bender et al., 2004; Ferguson & DeFelice, 2010; Jaggars & Bailey, 2010; Kirtman, 2009; Means et al., 2010; Sussman & Dutter, 2010). Moreover, scholars investigated elements that impact online course effectiveness (Bejerano, 2008; Ferguson & DeFelice, 2010; Grandzol & Grandzol, 2010; Head et al., 2002; Hu & Gramling, 2009; Jaggars & Bailey, 2010; Kirtman, 2009; Lockee et al., 2002; Lockee et al., 2010; Mandernach, 2009; Means et al., 2010; Parietti & Turi, 2011; Pate et al., 2009; Sheridan & Kelly, 2010; Sussman & Dutter, 2010). Overall, there have been few empirical studies of radiography online programs and limited studies conducted nationally to ascertain the effectiveness of online programs in radiographic sciences (Britt, 2006, Cauble & Chernow, 1996,

Evans et al., 2008, Johnston, 2008, Kowalczyk & Copley, 2013, Martino & Odle, 2008). Therefore, the present study addresses this void in the existing literature related to online teaching for radiography educators.

CHAPTER 3

RESEARCH METHODOLOGY

The purpose of this study was to assess radiography faculty perceptions of the effectiveness of asynchronous online courses. This chapter describes the research design, research questions with null hypotheses, the instrumentation, sample, data collection, and data analyses. Specific information is provided about the three instruments from which questions were amended and compiled for the purpose of this study.

A nonexperimental quantitative methodology with a survey research design was used to assess radiography faculty perceptions of the effectiveness of asynchronous online course (McMillan & Schumacher, 2010). Quantitative research designs emphasize objectivity in measuring and describing phenomena. The use of number, statistics, structure, and control maximize the objectivity of the study. The subclassifications of quantitative research are regarded as nonexperimental and experimental. Because there was no direct contact with the participants, this research study used the nonexperimental design. Instead, the data were used to describe, compare, and indicate relationships among the elements (McMillan & Schumacher, 2010).

A simple random sample was used to generalize results across the entire population. The quantitative survey had questions with Likert scales to measure the radiography faculty perceptions of the effectiveness of asynchronous online courses (McMillan & Schumacher, 2010).

Research Questions and Null Hypotheses

The following research questions and null hypotheses guided the study:

Research Question 1: Is there a significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by faculty position and type of institution?

H_o1_a: There is no significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by faculty position.

H_o1_b: There is no significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by type of institution.

Research Question 2: Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and age, years of teaching experience, years teaching online courses, number of online courses taught in the past 5 years, and perceived competence with use of technology?

H_o2_a: There is no significant relationship between radiography faculty perceptions of the effectiveness of online courses and age.

H_o2_b: There is no significant relationship between radiography faculty perceptions of the effectiveness of online courses and years of teaching experience.

H_o2_c: There is no significant relationship between radiography faculty perceptions of the effectiveness of online courses and years teaching online courses.

H_o2_d: There is no significant relationship between radiography faculty perceptions of the effectiveness of online courses and number of online courses taught in the past 5 years.

H_o2_e: There is no significant relationship between radiography faculty perceptions of the effectiveness of online courses and perceived competence with use of technology.

Research Question 3: Is there a significant relationship between the number of years teaching online courses and selected aspects of faculty satisfaction with online courses?

H_o3_a: There is no significant relationship between the number of years teaching online courses and faculty satisfaction with teaching online courses.

H_o3_b: There is no significant relationship between the number of years teaching online courses and faculty satisfaction with interaction.

H_o3_c: There is no significant relationship between the number of years teaching online courses and faculty satisfaction with institutional support.

Research Question 4: Is there a significant relationship between perceived ease of use of technology and online technology acceptance?

Ho4: There is no significant relationship between perceived ease of use of technology and online technology acceptance.

Research Question 5: Is there a significant relationship between perceived usefulness of technology and online technology acceptance?

Ho5: There is no significant relationship between perceived usefulness of technology and online technology acceptance.

Research Question 6: Is there a significant relationship between technological self-efficacy and use of technology-enhanced learning methods?

Ho6: There is no significant relationship between technological self-efficacy and use of technology-enhanced learning methods

Research Question 7: Are radiography faculty satisfied to a significant degree with teaching online courses?

Ho7: Radiography faculty are not satisfied to a significant degree with teaching online courses.

Research Question 8: Are radiography faculty satisfied to a significant degree with interaction in online courses?

Ho8: Radiography faculty are not satisfied to a significant degree with interaction in online courses.

Research Question 9: Are radiography faculty satisfied to a significant degree with institutional support while teaching online courses?

Ho9: Radiography faculty are not satisfied to a significant degree with institutional support while teaching online courses.

Research Question 10: Do radiography faculty perceive to a significant degree that online courses are effective?

Ho10: Radiography faculty do not perceive to a significant degree that online course are effective.

Instrumentation

The *Radiography Faculty Perceptions of Online Education Survey* was used to collect

data for the study. The electronic survey included components of the VLE conceptual framework. The *Radiography Faculty Perceptions of Online Education Survey* included elements of three established surveys: the *Online Faculty Satisfaction Survey* (Wasilik & Bolliger, 2009), the *Technology Acceptance Survey* (Gibson et al., 2008), and the *Factors Affecting Faculty Use of Technology Survey* (Buchanan et al., 2013).

The *Online Faculty Satisfaction Survey*, created by Wasilik and Bolliger in 2009, is comprised of 28 quantitative questions, 4 open-ended questions, and 4 demographic questions. This instrument was used to assess faculty satisfaction with online education related to faculty, students, and the institution. Cronbach's alpha of the quantitative part of the instrument was satisfactory ($\alpha = 0.87$) (Wasilik & Bolliger, 2009) (see Appendix A for permission to use and modify the *Online Faculty Satisfaction Survey*).

Gibson et al. (2008) modified the *Technology Acceptance in an Academic Context: Faculty Acceptance of Online Education* to prepare the *Technology Acceptance Survey* to assess technology acceptance by faculty and measure the intention to use technology. The survey contains 147 questions. Reliability measures of internal validity included perceived ease of use of online technology items ($\alpha = .594$) and perceived usefulness of online technology items ($\alpha = .859$) (Gibson et al., 2008) (see Appendix B for permission to use and modify the *Technology Acceptance Survey*).

The final instrument modified for the purposes of this research project was the *Factors Affecting Faculty Use of Technology Survey*, prepared by Buchanan et al. in 2013. This instrument has 58 quantitative questions and 6 open-ended questions. This survey is an assessment of faculty use of technological tools, using elements of Davis' *Technology Acceptance Model* from 1989. The instrument provides an evaluation of internet confidence,

technology-enhanced learning, internet expression, use of technological tools, and experiences with use of technological tools. Cronbach's Alpha measures for the two components of the survey used in the study were 0.79 and 0.71 (Buchanan et al., 2013) (see Appendix C for permission to use and modify the *Factors Affecting Faculty Use of Technology Survey*).

Select questions from the *Online Faculty Satisfaction Survey, Technology Acceptance Survey, and Factors Affecting Faculty Use of Technology Survey* were used to collect data for this study. The newly created instrument titled the *Radiography Faculty Perceptions of Online Education Survey* was a web-based survey with 76 items designed for completion in 15 minutes. Seven sections in the electronic instrument were demographic questions, technical competence, radiography faculty member perceptions of the effectiveness of online courses, selected aspects of faculty satisfaction with online courses, perceived ease of use and usefulness of technology, technological self-efficacy, and use of technology-enhanced learning methods.

The first two items on the *Radiography Faculty Perceptions of Online Education Survey* involved demographic information with closed-form questions. Item 1 was used to categorize faculty by position. The positions were the program director, clinical coordinator, and other. Item 2 was used to categorize faculty by the type of institution at which they were employed. The types of institutions were 4-year college-university, community college, technical college-institute, hospital, proprietary, and other.

The next four demographic items were open-ended questions. Item 3 was used to categorize the age of the faculty member. Item 4 was used to solicit the years of teaching experience, and item 5 was used to request the years teaching online courses. Finally, item 6 was used to inquire about the number of online courses the faculty member taught in the past 5 years.

Item 7 was used to categorize the participants into five groups by level of competency with technology. A 5-point Likert scale was associated with item 7 to enable the respondent to select an appropriate response based on agreement or disagreement with the statement (McMillan & Schumacher, 2010). The options were excellent, above average, average, poor, and none.

Items 8 through 76 had a 5-point Likert scale. The ordinal scale ranged from strongly disagree (1) to strongly agree (5) for positively-keyed items and ranged from strongly agree (1) to strongly disagree (5) for reverse-keyed items. Items 8 through 14 were used to assess radiography faculty perceptions of online courses. Items 15 through 40 were used to request information about selected aspects of faculty satisfaction with teaching online courses.

Questions 41 through 50 were used to evaluate perceived ease of use and perceived usefulness associated with online technology. Items 51 through 76 were used to report technological self-efficacy of faculty. Items 63 through 76 were used to request information about use or potential use of technology-enhanced learning methodologies. Table 1 displays a description of items and instrument from which each item originated.

Table 1

Development of Radiography Faculty Perceptions of Online Education Survey Instrument

Survey Items	Description	Instrument
1 - 2	Demographic: position and type of institution	New items

Table 1. (continued)

3	Demographic: age	Online Faculty Satisfaction Survey (Wasilik & Bolliger, 2009) Technology Acceptance Survey (Gibson et al., 2008) Factors Affecting Faculty Use of Technology Survey (Buchanan et al., 2013)
4	Demographic: years teaching	Technology Acceptance Survey (Gibson et al., 2008)
5	Demographic: years teaching online courses	Online Faculty Satisfaction Survey (Wasilik & Bolliger, 2009) Technology Acceptance Survey (Gibson et al., 2008)
6	Demographic: number of online courses taught in the past 5 years	Technology Acceptance Survey (Gibson et al., 2008)
7	Technical competence	Technology Acceptance Survey (Gibson et al., 2008)
8 - 9	Faculty perceptions of online courses	Online Faculty Satisfaction Survey (Wasilik & Bolliger, 2009)
10 - 14	Faculty perceptions of online courses	Technology Acceptance Survey (Gibson et al., 2008)
15	Faculty satisfaction	Online Faculty Satisfaction Survey (Wasilik & Bolliger, 2009) Technology Acceptance Survey (Gibson et al., 2008)
16	Faculty satisfaction	Online Faculty Satisfaction Survey (Wasilik & Bolliger, 2009)
17	Faculty satisfaction	Online Faculty Satisfaction Survey (Wasilik & Bolliger, 2009) Technology Acceptance Survey (Gibson et al., 2008)

Table 1. (continued)

18 - 24	Faculty satisfaction	Technology Acceptance Survey (Gibson et al., 2008)
25	Faculty satisfaction	Online Faculty Satisfaction Survey (Wasilik & Bolliger, 2009) Technology Acceptance Survey (Gibson et al., 2008)
26 - 32	Faculty satisfaction	Online Faculty Satisfaction Survey (Wasilik & Bolliger, 2009)
33 - 38	Faculty satisfaction	Technology Acceptance Survey (Gibson et al., 2008)
39	Faculty satisfaction	Online Faculty Satisfaction Survey (Wasilik & Bolliger, 2009)
40	Faculty satisfaction	Technology Acceptance Survey (Gibson et al., 2008)
41 - 44	Perceived ease of use	Technology Acceptance Survey (Gibson et al., 2008)
45	Perceived ease of use	Technology Acceptance Survey (Gibson et al., 2008) Online Faculty Satisfaction Survey (Wasilik & Bolliger, 2009)
46 - 50	Perceived usefulness of technology	Technology Acceptance Survey (Gibson et al., 2008)
51 - 55	Technological self-efficacy	Factors Affecting Faculty Use of Technology Survey (Buchanan et al., 2013)
56 - 57	Technological self-efficacy	New Items
58 - 60	Technological self-efficacy	Factors Affecting Faculty Use of Technology Survey (Buchanan et al., 2013)
61 - 62	Technological self-efficacy	Technology Acceptance Survey (Gibson et al., 2008)

Table 1. (continued)

63 - 75	Use of technology-enhanced learning methods	Factors Affecting Faculty Use of Technology Survey (Buchanan et al., 2013)
76	Use of technology-enhanced learning methods	Factors Affecting Faculty Use of Technology Survey (Buchanan et al., 2013) Technology Acceptance Survey (Gibson et al., 2008)

A small number of participants who were similar to those in the sample completed a pilot study. The pilot test determined if the directions for the *Radiography Faculty Perceptions of Online Education Survey* were clear, to ascertain the length of the instrument, and to receive feedback about the clarity and appropriateness of questions (McMillan & Schumacher, 2010).

Reliability measures the consistency of traits within the survey and was reported using a reliability coefficient. The scale for the coefficient ranges from .00 to .99, and the acceptable range is .70 to .80. The specific type of reliability test used for the purpose of this research study was Cronbach's Alpha (McMillan & Schumacher, 2010).

Sample

The population for this research study were educators who teach radiography courses in programs accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT). The Council for Higher Education Accreditation (CHEA) and the United States Department of Education (USDE) recognize the JRCERT for accreditation of traditional and distance delivery educational programs in radiography, radiation therapy, magnetic resonance, and medical dosimetry. The JRCERT accredits 616 radiography programs throughout the U.S.,

and the programs are sponsored by hospitals, community colleges, private colleges, and universities (Joint Review Committee on Education in Radiologic Technology (JRCERT), 2015).

The JRCERT staff was contacted to request permission to receive e-mail addresses for all radiography faculty listed in their database. The staff authorized that the names and e-mail addresses of radiography program directors and clinical coordinators be e-mailed to the researcher (see Appendix D for the request to receive list of potential participants).

The sampling frame had faculty who teach in JRCERT accredited radiography programs. The sampling criteria included radiography faculty who were teaching or had taught at least one asynchronous online course. The population (*N*) was the number of faculty who received the online instrument, and the sample (*n*) was the number of respondents. A self-selection process determined the sample size for this study.

Institutional Review Board

The researcher requested permission from the Institutional Review Board (IRB) at East Tennessee State University to conduct the research project. The ETSU Campus IRB Chair determined that this study involved minimal risk to the participants and granted exempt approval (see Appendix E for IRB Approval Letters).

Data Collection

In January 2015 radiography educators from Joint Review Committee on Education in Radiologic Technology (JRCERT) accredited radiography programs received an e-mail invitation sent through SurveyMonkey, an online survey software program (see Appendix F for

the e-mail invitation to the survey). Educators received a reminder e-mail invitation from SurveyMonkey 10 days later. The educators received a second reminder 8 days later.

The e-mail invitation had a description of the study and a link to the electronic study. After clicking on the link to the electronic survey, the faculty members viewed an introduction that had an informed consent (see Appendix G for the introduction to electronic survey). The introduction prompted only individuals who had online teaching experience to proceed to the *Radiography Faculty Perceptions of Online Education Survey* (see Appendix H for the instrument). The individuals completing the survey met the criteria for inclusion; however, they could discontinue participation at any time by exiting the survey.

The researcher ensured both confidentiality and privacy of respondents during the data collection. Secure Sockets Layer (SSL) encryption secured the survey and responses between SurveyMonkey and the respondent. Survey results were not matched to respondent names or e-mail addresses. Furthermore, participants' privacy was enhanced through the option to complete the electronic survey at a location and time of their choice.

Data Analysis

Data were exported from SurveyMonkey to a Statistical Package for the Social Sciences (SPSS) 22.0 data file. Negatively-keyed Likert scale items were reverse-scored in SPSS. Therefore, the ordinal scale ranged from strongly disagree (1) to strongly agree (5) for positively-keyed items and ranged from strongly agree (1) to strongly disagree (5) for reverse-keyed items. Statistical analysis was conducted using SPSS, and data were analyzed at the .05 level of significance.

One-way analysis of variance (ANOVAs) was conducted to test the two null hypotheses for Research Question 1. The first one-way ANOVA was conducted to evaluate the relationship between faculty position and radiography faculty perceptions of the effectiveness of online courses. The factor variable, faculty position, included three options: program director, clinical coordinator, or other position. The dependent variable was perceptions of the effectiveness of online courses. The second one-way ANOVA was conducted to evaluate the relationship between the type of institution and radiography faculty perceptions of the effectiveness of online courses. The factor variable, type of institution, included six options: 4-year college-university, community college, technical college-institute, hospital, proprietary, and other. The dependent variable was radiography faculty perceptions of the effectiveness of online courses.

Pearson correlations were conducted to test five null hypotheses for Research Question 2. The correlations were used to evaluate whether there was a relationship between radiography faculty perceptions of the effectiveness of online courses and age, years of teaching experience, years teaching online courses, number of online courses taught in the past 5 years, and perceived competence with use of technology.

Pearson correlations were conducted to test three null hypotheses for Research Question 3. These correlations were used to examine whether there was a relationship between the number of years teaching online courses and selected aspects of faculty satisfaction with online courses. The selected aspects of faculty satisfaction were: satisfaction with teaching online courses, satisfaction with interaction, and satisfaction with institutional support.

Pearson correlations were conducted to test null hypotheses for Research Questions 4, 5, and 6. For Research Question 4 a correlation was used to examine whether there was a relationship between perceived ease of use of technology and online technology acceptance. For

Research Question 5 a correlation was used to assess whether there was a relationship between perceived usefulness of technology and online technology acceptance. The final correlation was used to examine whether there was a relationship between technological self-efficacy and use of technology-enhanced learning methods for Research Question 6.

Single-sample *t*-tests were used to analyze the null hypotheses for Research Questions 7, 8, 9, and 10. For Research Question 7 a single-sample *t*-test was used to examine whether radiography faculty are satisfied to a significant degree with teaching online courses. For Research Question 8 a single-sample *t*-test was used to examine whether radiography faculty are satisfied to a significant degree with interaction in online courses. For Research Question 9 a single-sample *t*-test was used to examine whether radiography faculty are satisfied to a significant degree with institutional support. For Research Question 10 a single-sample *t*-test was used to examine whether radiography faculty perceive to a significant degree that online courses are effective. Descriptive statistics were used to calculate means and standard deviations for survey items related to faculty satisfaction with teaching online courses, faculty satisfaction with interaction in online courses, faculty satisfaction with institutional support while teaching online courses, and perceptions of the effectiveness of online courses.

Chapter Summary

Chapter 3 provided the methodology for conducting the study and included a brief introduction, description of the research design, research questions and null hypotheses, instrumentation, sample, data collection, and data analysis procedures. Statistical procedures and results are detailed in Chapter 4.

CHAPTER 4

FINDINGS

The variables identified to facilitate learning in the virtual learning environment include interaction between faculty and students, appropriate use of technological tools, and online course effectiveness (Piccoli et al., 2001). The purpose of this study was to assess radiography faculty perceptions of the effectiveness of asynchronous online courses. An original instrument was created by selecting items from three instruments used in prior research in addition to unique questions designed to elicit demographic data from faculty. The sample included a national dataset of radiography faculty members employed within JRCERT accredited programs in the United States.

This chapter includes demographic information of the participants and data, analysis and results of the 10 research questions and 17 corresponding null hypotheses. The instrument had questions related to: demographics, technical competence, the effectiveness of online courses, faculty satisfaction, ease of use and usefulness of technology, technological self-efficacy, and use of technology-enhanced learning methods. Data were collected via the web-based survey distribution site, SurveyMonkey.

The population included 1,225 faculty members who teach in JRCERT accredited radiography programs. Of the 1,225 e-mails sent, 23 did not reach the intended recipients. Therefore, there were 1,202 (1,225 – 23) respondents in the population. SurveyMonkey reported that 5 individuals chose not to complete the survey. An additional 59 individuals explained by e-mail that they did not meet the criteria set forth in the introduction (see Appendix G for the introduction to electronic survey). SurveyMonkey was used to collect 355 responses; however, only 216 were used in the data analysis because there were 55 ineligible and 84 incomplete

responses. Of the 84 incomplete responses, 20 contacted the researcher by e-mail to explain that they were ineligible. Overall, there were 1,202 radiography faculty members in the population and a sample size of 216. Therefore, the response rate was 18%.

Demographics

The demographic characteristics of the participants involved the faculty position, type of institution, age, years of teaching experience, years teaching online courses, and the number of online courses taught in the past 5 years. The demographic characteristics of the 216 participants were 44.9% program directors, 50.0% clinical coordinators, and 5.1% other. Written responses for the other category encompassed education coordinator-assistant professor, clinical coordinator-assistant professor, clinical coordinator-didactic faculty, education coordinator, and didactic faculty. Respondents were employed at various types of institutions: 4-year college-university (32.4%), community college (47.7%), technical college-institute (10.6%), hospital (7.9%), proprietary (0.9%), and other (0.5%). The written response for the other category was a state college. Table 2 provides respondent demographic information by faculty position and type of institution.

Table 2

Respondent Demographic Information by Faculty Position and Type of Institution

Faculty Position	4-Year College-University	Community College	Technical College-Institute	Hospital	Proprietary	Other
Program Director	26	43	16	9	2	1
Clinical Coordinator	40	54	6	8	0	0
Other	4	6	1	0	0	0
Total	70 (32.4%)	103(47.7%)	23(10.6%)	17(7.9%)	2 (0.9%)	1 (0.5%)

Age of participants ranged from 26 to 69 (M = 48.25). Participants self-reported years of teaching experience, and the number of years ranged from 1 to 42 (M = 15.36) years of teaching experience. Additionally, participants self-reported years teaching online courses, and the number of years ranged from 0.5 to 17 (M = 5.12). Finally, participants reported the number of online courses taught within the past 5 years. The number of courses ranged from 0 to 120 (M = 9.55). Table 3 provides respondent demographic information by faculty position and other variables.

Table 3

Respondent Demographic Information by Faculty Position and Other Variables

Faculty Position	Mean Age	Mean Years of Teaching Experience	Mean Years Teaching Online Courses	Mean Number of Online Courses Taught in the Past 5 Years
Program Director	51	18.1	5.9	10
Clinical Coordinator	46	13.0	4.5	8
Other	45	13.8	4.5	26
Total		44.9	14.9	44

Reliability

Consistency of the instrument is associated with the internal agreement of responses to common variables on an instrument. The values of Cronbach's Alpha can range from 0 to 1.0, and a value of 1.0 is considered to have a perfect reliability. A Cronbach's Alpha measurement of .80 is considered reliable; however, a value of .90 is considered to be excellent (McMillan & Schumacher, 2010).

Reliability measures of internal validity for this study involved radiography faculty perceptions of the effectiveness of online courses ($\alpha = .88$), selected aspects of faculty satisfaction with online courses ($\alpha = .86$), perceived ease of use of online technology ($\alpha = .78$), perceived usefulness of online technology ($\alpha = .83$), technological self-efficacy ($\alpha = .93$), and technology-enhanced learning methods ($\alpha = .80$). Table 4 provides the reliability scores. In terms of reliability, the variables ranged from acceptable to excellent.

Table 4

Reliability Scores

Variable	Cronbach's Alpha
Radiography Faculty Perceptions of the Effectiveness of Online Courses	.88
Selected Aspects of Faculty Satisfaction with Online Courses	.86
Perceived Ease of Use of Online Technology	.78
Perceived Usefulness of Online Technology	.83
Technological Self-efficacy	.93
Technology-Enhanced Learning Methods	.80

Analysis of Research Questions

Ten research questions were used to guide this study, and statistical tests were conducted to evaluate 17 null hypotheses. The data analyses are presented in this section (refer to Appendix I for a list of research questions, associated survey items, and corresponding statistical procedures).

Research Question #1a

Is there a significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by faculty position?

H_o1_a: There is no significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by faculty position.

A one-way ANOVA was conducted to evaluate the relationship between radiography faculty perceptions of the effectiveness of online courses and faculty position. The factor variable, faculty position, had three options: program director, clinical coordinator, and other. The dependent variable was radiography faculty perceptions of the effectiveness of online courses. The ANOVA was not significant, $F(2, 213) = .56$, $p = .574$. Therefore, the null hypothesis was retained. The strength of the relationship between faculty position and radiography faculty perceptions of the effectiveness of online courses assessed by η^2 was small (.005). The results revealed that radiography faculty perceptions of the effectiveness of online courses were not significantly different when compared by faculty position. Table 5 provides the means and standard deviations; Figure 1 presents a graphic representation of the data.

Table 5

Means and Standard Deviations to Evaluate the Relationship Between Radiography Faculty Perceptions and Faculty Position

Faculty Position	*N*	*M*	*SD*
Program Director	97	23.86	4.89
Clinical Coordinator	108	24.04	5.04
Other	11	25.55	6.11

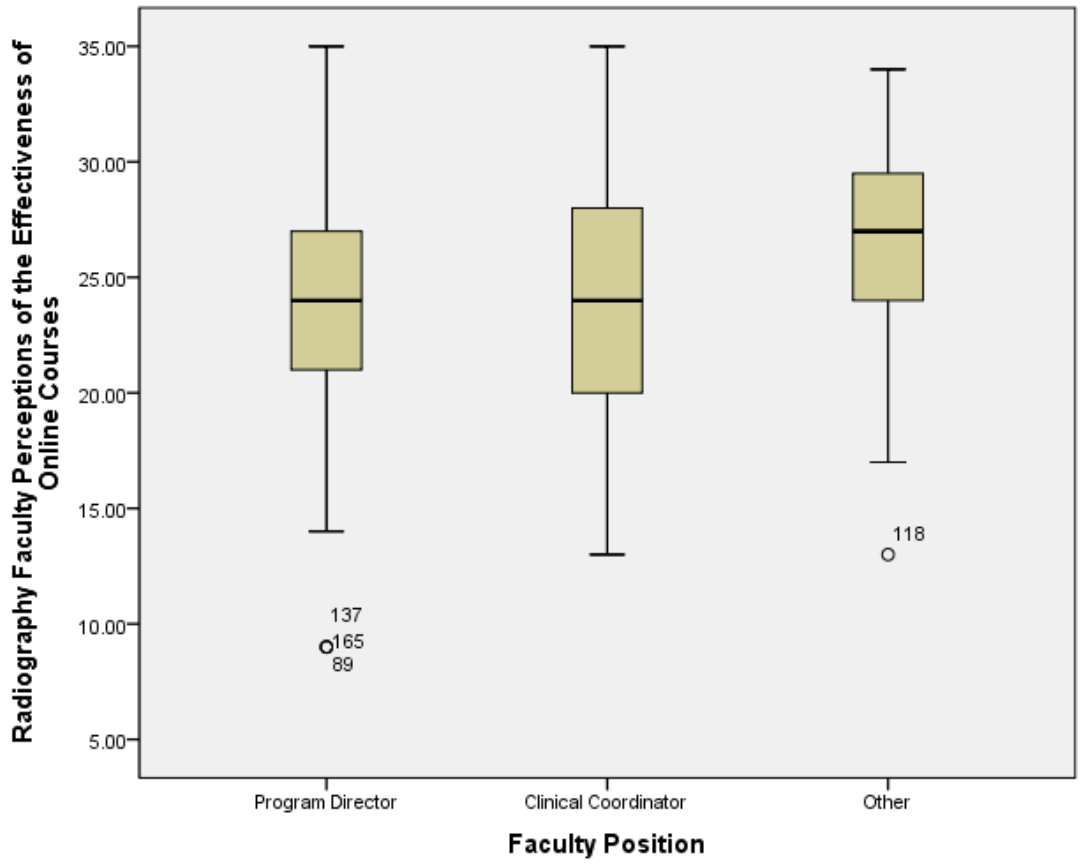

Figure 1. Means and Standard Deviations to Evaluate the Relationship Between Radiography Faculty Perceptions and Faculty Positions

Research Question #1b

Is there a significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by type of institution?

H_o1_b: There is no significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by type of institution.

A one-way ANOVA was conducted to evaluate the relationship between radiography faculty perceptions of the effectiveness of online courses and type of institution. The factor variable, type of institution, had six options: 4-year college-university, community college,

technical college-institute, hospital, proprietary, and other. The dependent variable was radiography faculty perceptions of the effectiveness of online courses. The ANOVA was not significant, $F(5, 210) = 1.273$, $p = .277$. Therefore, the null hypothesis was retained. The strength of the relationship between the faculty position and radiography faculty perceptions of the effectiveness of online courses, assessed by η^2 was small (.029). The results revealed that radiography faculty perceptions of the effectiveness of online courses were not significantly different when compared by type of institution. Table 6 provides the means and standard deviations; Figure 2 presents a graphic representation of the data.

Table 6

Means and Standard Deviations to Evaluate the Relationship Between Radiography Faculty Perceptions and Type of Institution

	N	*M*	*SD*
4-year college-university	70	24.10	4.89
Community college	103	24.22	4.97
Technical college-institute	23	22.17	5.52
Hospital	17	24.24	5.07
Proprietary	2	28.5	4.95
Other	1	30	

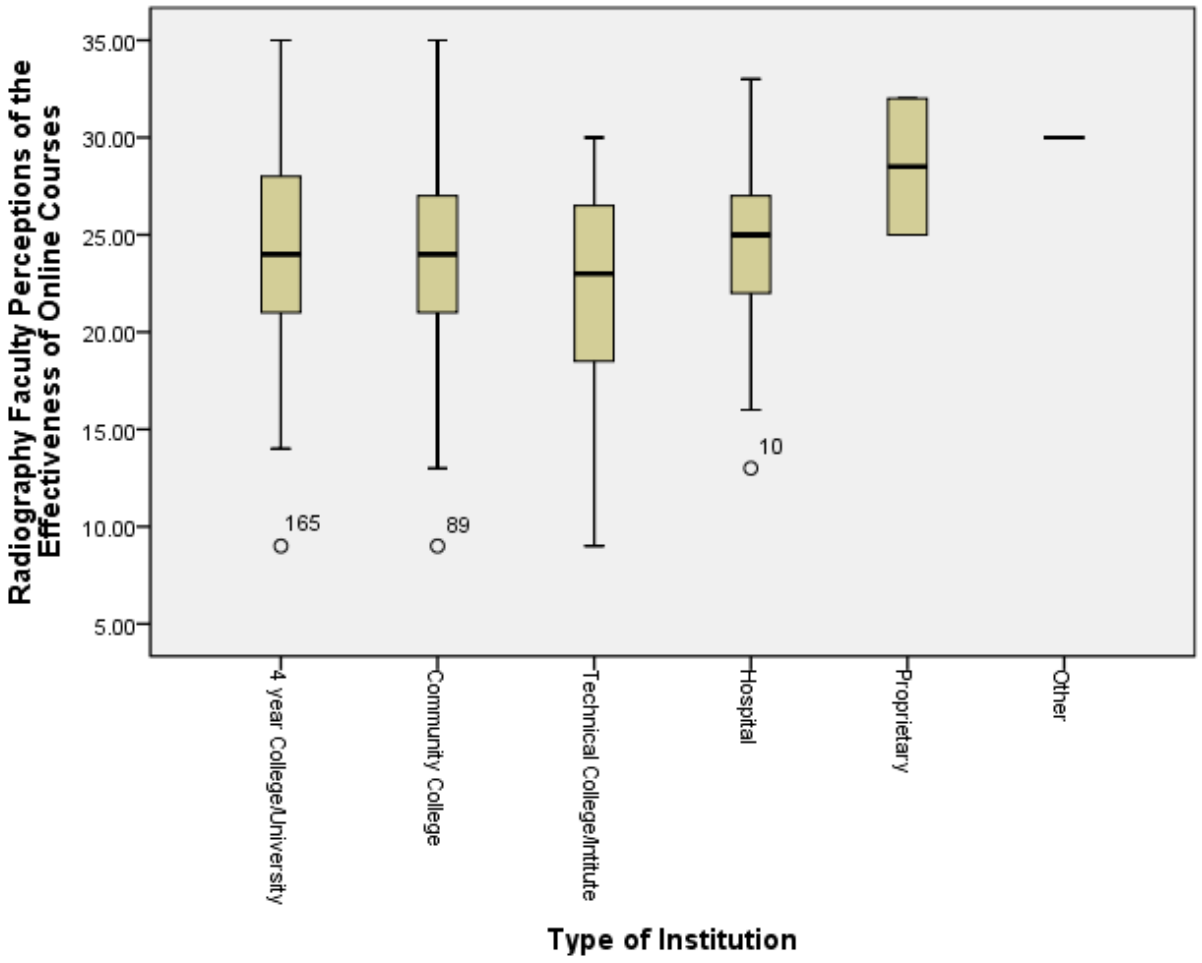

Figure 2. Means and Standard Deviations to Evaluate the Relationship Between Radiography Faculty Perceptions and Type of Institution

Research Question #2a

Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and age?

H_o2_a: There is no significant relationship between radiography faculty perceptions of the effectiveness of online courses and age.

A Pearson correlation was conducted to evaluate whether there was a relationship between radiography faculty perceptions of the effectiveness of online courses and age. The

results of the analysis revealed a weak negative relationship between radiography faculty perceptions of the effectiveness of online courses (M = 24.03, SD = 5.02) and age (M = 48.25, SD = 9.88). The Pearson correlation was not significant [$r(213) = -.013$, $p = .854$]. As a result of the analysis, the null hypothesis was retained. In general, the results revealed that radiography faculty perceptions of the effectiveness of online courses were not significantly related to age. Table 7 provides the test results.

Table 7

Pearson Correlations Between Radiography Faculty Perceptions and Variables

Variables	Faculty Perceptions	
	r	*p*
Age	-.013	.854
Years of Teaching Experience	-.069	.317
Years Teaching Online Courses	.209	.002
Number of Online Courses Taught in the Past 5 Years	.282	< .001
Perceived Competence with Use of Technology	.169	.013

Research Question #2b

Is there a significant relationship between radiography faculty perceptions of the

effectiveness of online courses and years of teaching experience?

H_o2_b: There is no significant relationship between radiography faculty perceptions of the effectiveness of online courses and years of teaching experience.

A Pearson correlation was conducted to evaluate whether there was a relationship between radiography faculty perceptions of the effectiveness of online courses and years of teaching experience. The results of the analysis revealed a weak negative relationship between radiography faculty perceptions of the effectiveness of online courses (M = 24.03, SD = 5.02) and years of teaching experience (M = 15.36, SD = 9.54). The Pearson correlation was not significant [$r(213) = -.069$, $p = .317$]. As a result of the analysis, the null hypothesis was retained. In general, the results revealed that radiography faculty perceptions of the effectiveness of online courses were not significantly related to years of teaching experience. Table 7 (above) provides the test results.

Research Question #2c

Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and years teaching online courses?

H_o2_c: There is no significant relationship between radiography faculty perceptions of the effectiveness of online courses and years teaching online courses.

A Pearson correlation was conducted to evaluate whether there was a relationship between radiography faculty perceptions of the effectiveness of online courses and years teaching online courses. The results of the analysis revealed a significant positive relationship between radiography faculty perceptions of the effectiveness of online courses (M = 24.03, SD = 5.02) and years teaching online courses (M = 5.12, SD = 3.55) and a statistically significant

correlation [$r(214) = .209$, $p = .002$]. As a result of the analysis, the null hypothesis was rejected. The results suggested that radiography faculty perceptions of the effectiveness of online courses increased as the years teaching online courses increased. Table 7 (above) provides the test results.

Research Question #2d

Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and number of online courses taught in the past 5 years?

H_o2_d: There is no significant relationship between radiography faculty perceptions of the effectiveness of online courses and number of online courses taught in the past 5 years.

A Pearson correlation was conducted to evaluate whether there was a relationship between radiography faculty perceptions of the effectiveness of online courses and number of online courses taught in the past 5 years. The results of the analysis revealed a positive relationship between radiography faculty perceptions of the effectiveness of online courses ($M = 24.03$, $SD = 5.02$) and number of online courses taught in the past 5 years ($M = 9.55$, $SD = 12.45$) and a statistically significant correlation [$r(213) = .282$, $p < .001$]. As a result of the analysis, the null hypothesis was rejected. The results suggested that radiography faculty perceptions of the effectiveness of online courses increased as the number of online courses taught in the past 5 years increased. Table 7 (above) provides the test results.

Research Question #2e

Is there a significant relationship between radiography faculty perceptions of the

effectiveness of online courses and perceived competence with use of technology?

H_o2_e: There is no significant relationship between radiography faculty perceptions of the effectiveness of online courses and perceived competence with use of technology.

A Pearson correlation was conducted to evaluate whether there was a relationship between radiography faculty perceptions of the effectiveness of online courses and perceived competence with use of technology. The results of the analysis revealed a positive relationship between radiography faculty perceptions of the effectiveness of online courses (M = 24.03, SD = 5.02) and perceived competence with use of technology (M = 3.97, SD = .657) and a statistically significant correlation [$r(214) = .169$, $p = .013$]. As a result of the analysis, the null hypothesis was rejected. The results suggested that radiography faculty perceptions of the effectiveness of online courses increased as perceived competence with use of technology increased. Table 7 (above) provides the test results.

Research Question #3a

Is there a significant relationship between the number of years teaching online courses and faculty satisfaction with teaching online courses?

H_o3_a: There is no significant relationship between the number of years teaching online courses and faculty satisfaction with teaching online courses.

A Pearson correlation was used to examine whether there was a relationship between faculty satisfaction with teaching online courses and the number of years teaching online courses. The results of the analysis revealed a weak positive relationship between faculty satisfaction with teaching online courses (M = 39.01, SD = 6.67) and number of years teaching online courses (M = 5.12, SD = 3.55). The Pearson correlation was not significant [$r(214) =$

.025, $p = .714$]. As a result of the analysis, the null hypothesis was retained. In general, the results indicated that faculty satisfaction with teaching online courses was not significantly related to the number of years teaching online courses. Table 8 provides the test results.

Table 8

Pearson Correlations Between Faculty Satisfaction and Number of Years Teaching Online Courses

Variables	Years Teaching Online Courses	
	r	*p*
Faculty Satisfaction with Teaching Online Courses	-.013	.854
Faculty Satisfaction with Interaction in Online Courses	-.069	.317
Faculty Satisfaction with Institutional Support	.209	.002

Research Question #3b

Is there a significant relationship between the number of years teaching online course and faculty satisfaction with interaction?

H_o3_b: There is no significant relationship between the number of years teaching online courses and faculty satisfaction with interaction.

A Pearson correlation was used to examine whether there was a relationship between faculty satisfaction with interaction and the number of years teaching online courses. The results of the analysis revealed a positive relationship between faculty satisfaction with interaction (*M* =

24.15, *SD* = 4.73) and number of years teaching online courses (*M* = 5.12, *SD* = 3.55) and a statistically significant correlation [*r*(214) = .178, *p* = .009]. As a result of the analysis, the null hypothesis was rejected. The results suggested that faculty satisfaction with interaction increased as the years teaching online courses increased. Table 8 (above) provides the test results.

Research Question #3c

Is there a significant relationship between the number of years teaching online courses and faculty satisfaction with institutional support?

H_o3_c: There is no significant relationship between the number of years teaching online courses and faculty satisfaction with institutional support.

A Pearson correlation was used to examine whether there was a relationship between faculty satisfaction with institutional support and the number of years teaching online courses. The results of the analysis revealed a weak negative relationship between faculty satisfaction with institutional support (*M* = 19.41, *SD* = 4.07) and the number of years teaching online courses (*M* = 5.12, *SD* = 3.55). The Pearson correlation was not significant [*r*(214) = -.098, *p* = .151]. As a result of the analysis, the null hypothesis was retained. In general, the results indicated that faculty satisfaction with institutional support was not significantly related to the number of years teaching online courses. Table 8 (above) provides the test results.

Research Question #4

Is there a significant relationship between perceived ease of use of technology and online technology acceptance?

Ho4: There is no significant relationship between perceived ease of use of technology and online technology acceptance.

A Pearson correlation was used to examine whether there was a relationship between perceived ease of use of technology and online technology acceptance. The results of the analysis revealed a positive relationship between perceived ease of use of technology (M = 18.73, SD = 2.98) and online technology acceptance (M = 7.16, SD = 1.56) and a statistically significant correlation [$r(214) = .382$, $p < .001$]. As a result of the analysis, the null hypothesis was rejected. The results suggested that online technology acceptance increased as perceived ease of use of technology increased. Table 9 provides the test results.

Table 9

Pearson Correlations Between Variables and Online Technology Acceptance

Variables	Online Technology Acceptance	
	r	*p*
Perceived Ease of Use of Technology	.382	< .001
Perceived Usefulness of Technology	.645	< .001

Research Question #5

Is there a significant relationship between perceived usefulness of technology and online technology acceptance?

Ho5: There is no significant relationship between perceived usefulness of technology and online technology acceptance.

A Pearson correlation was conducted to evaluate whether there was a relationship between perceived usefulness of technology and online technology acceptance. The results of the analysis revealed a strong positive relationship between perceived usefulness of technology (M = 19.48, SD = 3.36) and online technology acceptance (M = 7.16, SD = 1.56) and a statistically significant correlation [$r(214) = .645$, $p < .001$]. As a result of the analysis, the null hypothesis was rejected. The results suggested that online technology acceptance significantly increased as perceived usefulness of technology increased. Table 9 (above) provides the test results.

Research Question #6

Is there a significant relationship between technological self-efficacy and use of technology-enhanced learning methods?

Ho6: There is no significant relationship between technological self-efficacy and use of technology-enhanced learning methods.

A Pearson correlation was conducted to evaluate whether there was a relationship between technological self-efficacy and use of technology-enhanced learning methods. The results of the analysis revealed a strong positive relationship between technological self-efficacy (M = 44.37, SD = 7.92) and use of technology-enhanced learning methods (M = 46.88, SD = 6.86) and a statistically significant correlation [$r(214) = .440$, $p < .001$]. As a result of the analysis, the null hypothesis was rejected. The results suggested that use of technology-

enhanced learning methods significantly increased as technological self-efficacy increased. Table 10 provides the test results.

Table 10

Pearson Correlation Between Self-Efficacy and Use of Technology-Enhanced Learning Methods

Variable	Use of Technology-Enhanced Learning Methods	
	r	*p*
Technological Self-Efficacy	.440	< .001

Research Question #7

Are radiography faculty satisfied to a significant degree with teaching online courses?

Ho7: Radiography faculty are not satisfied to a significant degree with teaching online courses.

A single-sample *t*-test was conducted to evaluate the degree to which faculty were satisfied with teaching online courses. The sample mean of 39.01 (SD = 6.67) was significantly different from 36, $t(215) = 6.65$, $p < .001$. The 95% confidence interval for faculty satisfaction with teaching online courses mean ranged from 2.12 to 3.91. The effect size d of .45 indicated a medium effect. As a result of the analysis, the null hypothesis was rejected. The results supported that faculty were satisfied with teaching online courses. Table 11 provides the mean and standard deviation; Figure 3 graphically presents the distribution of the scores.

Table 11

Means and Standard Deviations for Selected Aspects of Faculty Satisfaction and Perceptions with Online Courses

Item	*N*	*M*	*SD*
Faculty Satisfaction with Teaching Online Courses	216	39.01	6.67
Faculty Satisfaction with Interaction	216	24.15	4.73
Faculty Satisfaction with Institutional Support	216	19.41	4.07
Radiography Faculty Perceptions of the Effectiveness of Online Courses	216	24.03	5.02

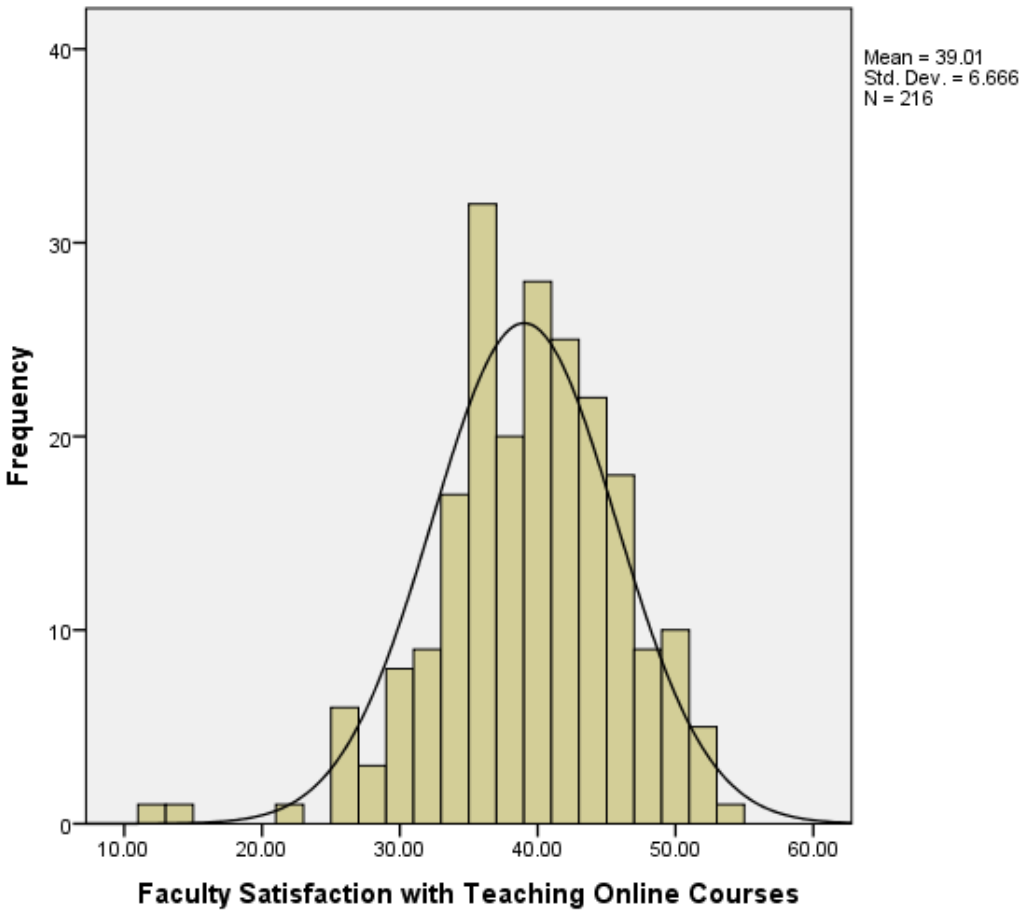

Figure 3. Distribution of Faculty Satisfaction with Teaching Online Courses

Descriptive statistics reported data for Research Question 7. The descriptive statistics included calculation of means and standard deviations for items in the instrument related to faculty satisfaction with teaching online courses. Statements 15 through 26 were scaled items, specifically a 5-point Likert scale. The ordinal scale ranged from strongly disagree (1) to strongly agree (5) for positively-keyed items and ranged from strongly agree (1) to strongly disagree (5) for reverse-keyed items. Items 15 through 26 were evaluated to assess faculty satisfaction with teaching online courses.

Table 12 provides participant responses to items 15 through 26. Faculty were most satisfied with the convenience of accessing a course at any time (M = 4.29), the flexibility

provided by teaching in the online environment (*M* = 3.87), the opportunity to try innovative teaching techniques (*M* = 3.77), and the increased autonomy offered by participating in online education (*M* = 3.42). On the other hand, faculty were most dissatisfied with the negative impact that online teaching has on student evaluation of instruction (*M* = 3.45), the perception that online education does not enhance teaching effectiveness (*M* = 3.34), the increased time it takes to grade student assignments (*M* = 2.99), and the additional time it takes to prepare for an online course (*M* = 2.93).

Table 12

Descriptive Statistics for Faculty Satisfaction with Teaching Online Courses

Item	*N*	*M*	*SD*
16. I appreciate that I can access my online course any time it is convenient for me.	216	4.29	.716
15. The flexibility provided by teaching in the online environment is important to me.	216	3.87	.867
21. Teaching online courses provides me with opportunities to try innovative teaching techniques.	216	3.77	.831
17. I believe teaching online negatively impacts student evaluations of my instruction.	216	3.45	.949
19. Participating in online education will or has already increased my autonomy.	216	3.42	.870

Table 12. (continued)

18. Online education does not enhance my teaching effectiveness.	216	3.34	1.088
20. Participating in online education enables greater achievement or success in my career.	216	3.31	.965
24. I need more time to grade student assignments when teaching an online course.	216	2.99	1.199
25. I need more time to prepare for an online course on a weekly basis than for a traditional course.	216	2.93	1.041
26. I have a higher workload when teaching an online course than a traditional course.	216	2.85	1.011
23. I need more time to administer an online course than a traditional course.	216	2.61	1.098
22. It takes me longer to develop an online course than a traditional course.	216	2.19	1.068

Research Question #8

Are radiography faculty satisfied to a significant degree with interaction in online courses?

Ho8: Radiography faculty are not satisfied to a significant degree with interaction in online courses.

A single-sample *t*-test was conducted to evaluate the degree to which faculty were satisfied with interactions in online courses. The sample mean of 24.15 (*SD* = 4.73) was significantly different from 24, $t(215) = .48$, $p = .635$. The 95% confidence interval for faculty satisfaction with interactions in online courses mean ranged from -.48 to .79. The effect size *d* of .032 indicated a very small effect. Therefore, the null hypothesis was retained. The results supported that faculty had nearly neutral responses regarding interactions in online courses. Table 11 (above) provides the mean and standard deviation; Figure 4 graphically presents the distribution of the scores related to interaction in online courses.

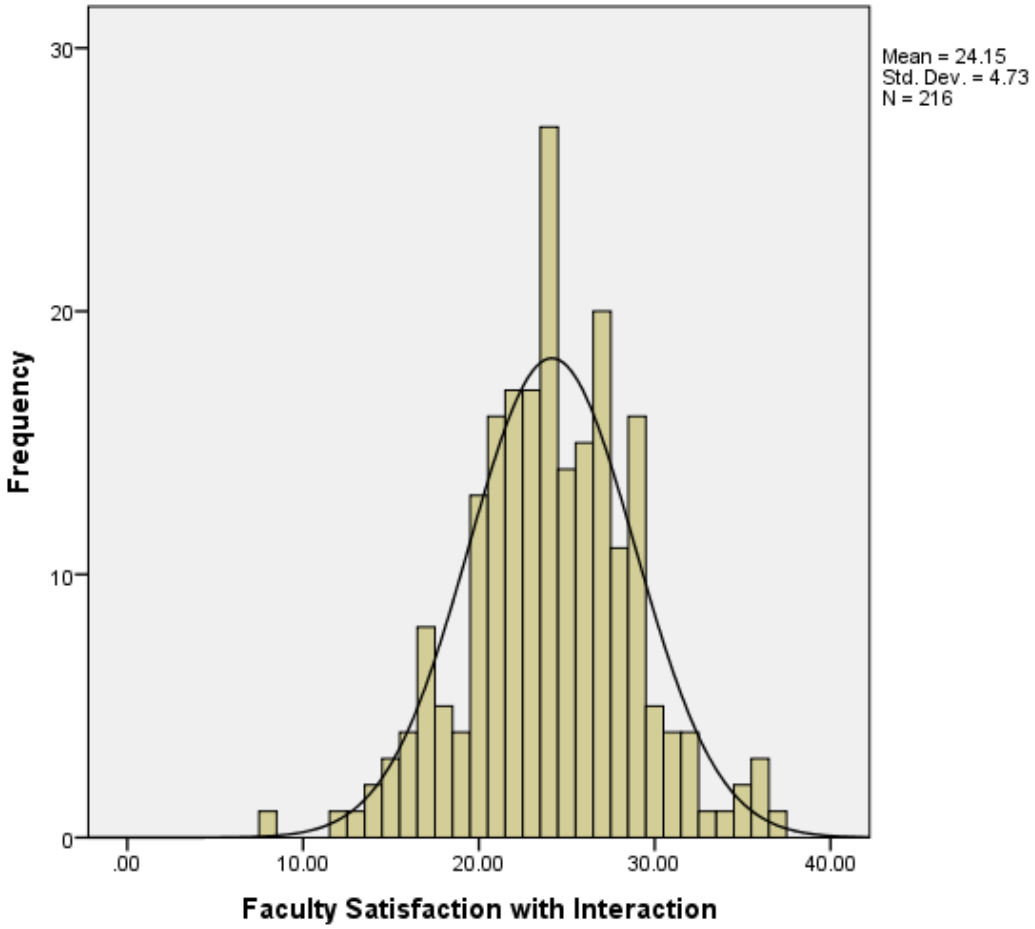

Figure 4. Distribution of Faculty Satisfaction with Interactions in Online Courses

Descriptive statistics reported data for Research Question 8. The descriptive statistics included calculation of means and standard deviations for items in the instrument related to faculty satisfaction with interactions in online courses. Statements 27 through 34 were scaled items, specifically a 5-point Likert scale. The ordinal scale ranged from strongly disagree (1) to strongly agree (5) for positively-keyed items and ranged from strongly agree (1) to strongly disagree (5) for reverse-keyed items. Items 27 through 34 were evaluated to assess faculty satisfaction with interaction.

Table 13 provides participant responses to items 27 through 34. Faculty were most satisfied that online students were active in communicating regarding course related matters (M = 3.73), that student-student interactions were meaningful (M = 3.66), and that online course were more accessible to students who would not be able to enroll in traditional courses (M = 3.56). On the other hand, faculty were most dissatisfied that online students were somewhat passive when they contact their professor about course-related items (M = 3.05) and the lack of face-to-face contact with students when teaching online courses (M = 2.24).

Table 13

Descriptive Statistics for Faculty Satisfaction with Interaction in Online Courses

Item	*N*	*M*	*SD*
30. My online students are active in communicating with me when they have questions about course related matters.	216	3.73	.881
34. Student-to-instructor interactions are meaningful in my online course.	216	3.66	.859

Table 13. (continued)

27. Online teaching is gratifying because it provides me with the opportunity to reach students who otherwise would not be able to enroll in traditional courses.	216	3.56	.953
32. My online students are somewhat passive when they contact me about course related matters.	216	3.05	1.022
31. I can provide better feedback to my online students on their performance.	216	2.94	.877
33. Teaching online courses improves my ability to build relationships with my students.	216	2.58	.880
28. The level of my interactions with students in an online course is higher than in a traditional face-to-face course.	216	2.39	.928
29. I miss face-to-face contact with students when teaching online courses.	216	2.24	.929

Research Question #9

Are radiography faculty satisfied to a significant degree with institutional support while teaching online courses?

Ho9: Radiography faculty are not satisfied to a significant degree with institutional support while teaching online courses.

A single-sample *t*-test was conducted to evaluate the degree to which faculty were satisfied with institutional support in online courses. The sample mean of 19.41 ($SD = 4.07$) was significantly different from 18, $t(215) = 5.09$, $p < .001$. The 95% confidence interval for faculty

satisfaction with institutional support in online courses mean ranged from .86 to 1.95. The effect size *d* of .35 indicated a small to medium effect. As a result of the analysis, the null hypothesis was rejected. The results supported that faculty were satisfied with institutional support in online courses. Table 11 (above) provides the mean and standard deviation; Figure 5 graphically presents the distribution of the scores.

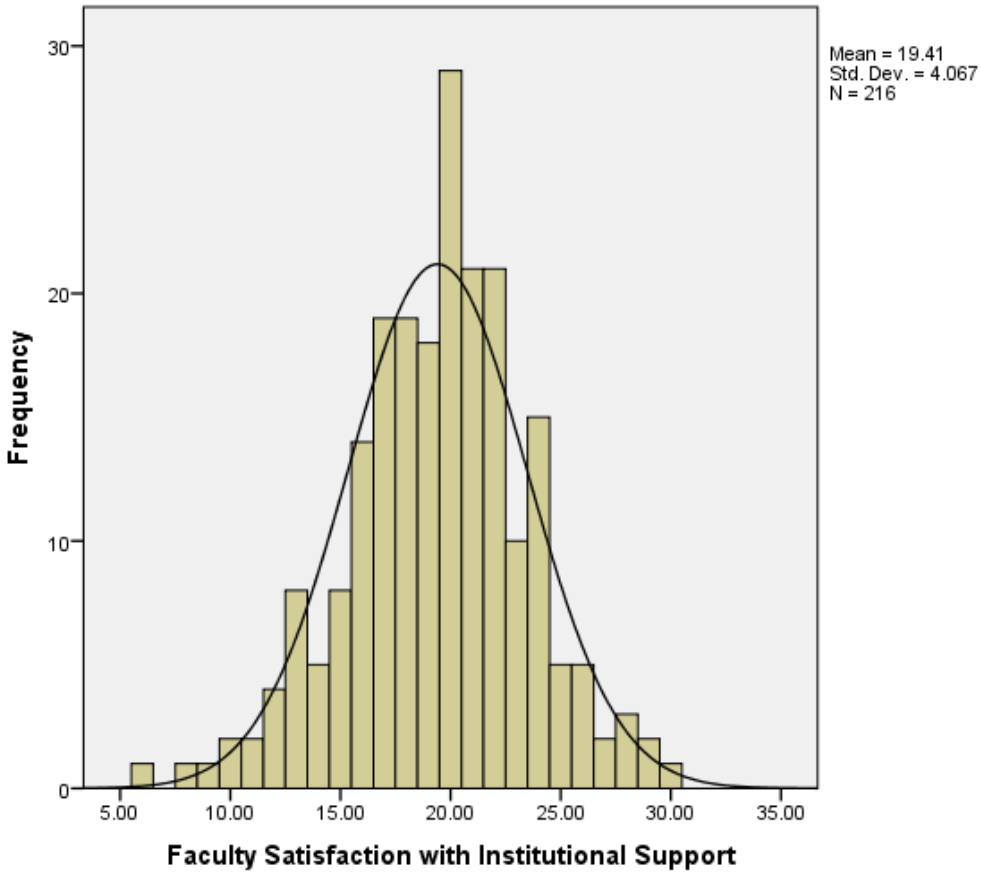

Figure 5. Distribution of Faculty Satisfaction with Institutional Support in Online Courses

Descriptive statistics reported data for Research Question 9. The descriptive statistics included calculation of means and standard deviations for items in the instrument related to faculty satisfaction with institutional support in online courses. Statements 35 through 40 were

scaled items, specifically a 5-point Likert scale. The ordinal scale ranged from strongly disagree (1) to strongly agree (5) for positively-keyed items and ranged from strongly agree (1) to strongly disagree (5) for reverse-keyed items. Items 35 through 40 were evaluated to assess faculty satisfaction with institutional support.

Table 14 provides participant responses to items 35 through 40. Faculty were most satisfied with institutional access to technology resources to teach online courses (M = 4.04) and institutional access to training resources to teach online courses (M = 3.92).

Table 14

Descriptive Statistics for Faculty Satisfaction with Institutional Support

Item	*N*	*M*	*SD*
37. I have access to technology resources from my college-university to teach online courses.	216	4.04	.859
36. I have access to training resources from my college-university to teach online courses.	216	3.92	1.003
38. I receive adequate financial resources from my college-university to teach online courses.	216	3.28	1.112
39. I receive fair financial compensation for teaching online courses.	216	3.12	1.076
40. Teaching online courses will (or has already) lead to greater recognition for me at work.	216	2.95	1.008

Table 14. (continued)

35. I receive support to teach online courses (such as clerical support or graduate assistants).	216	2.10	1.097

Research Question #10

Do radiography faculty perceive that online courses are effective?

Ho10: Radiography faculty do not perceive that online course are effective.

A single-sample *t*-test was conducted to evaluate the degree to which radiography faculty perceive that online courses were effective. The sample mean of 24.03 (SD = 5.02) was significantly different from 21, $t(215) = 8.87$, $p < .001$. The 95% confidence interval for faculty satisfaction with interactions in online courses mean ranged from 2.36 to 3.71. The effect size d of .66 indicated a medium to large effect. As a result of the analysis, the null hypothesis was rejected. The results supported that radiography faculty perceived online courses to be effective to a significant extent. Table 11 (above) provides the mean and standard deviation; Figure 6 graphically presents the distribution of the scores.

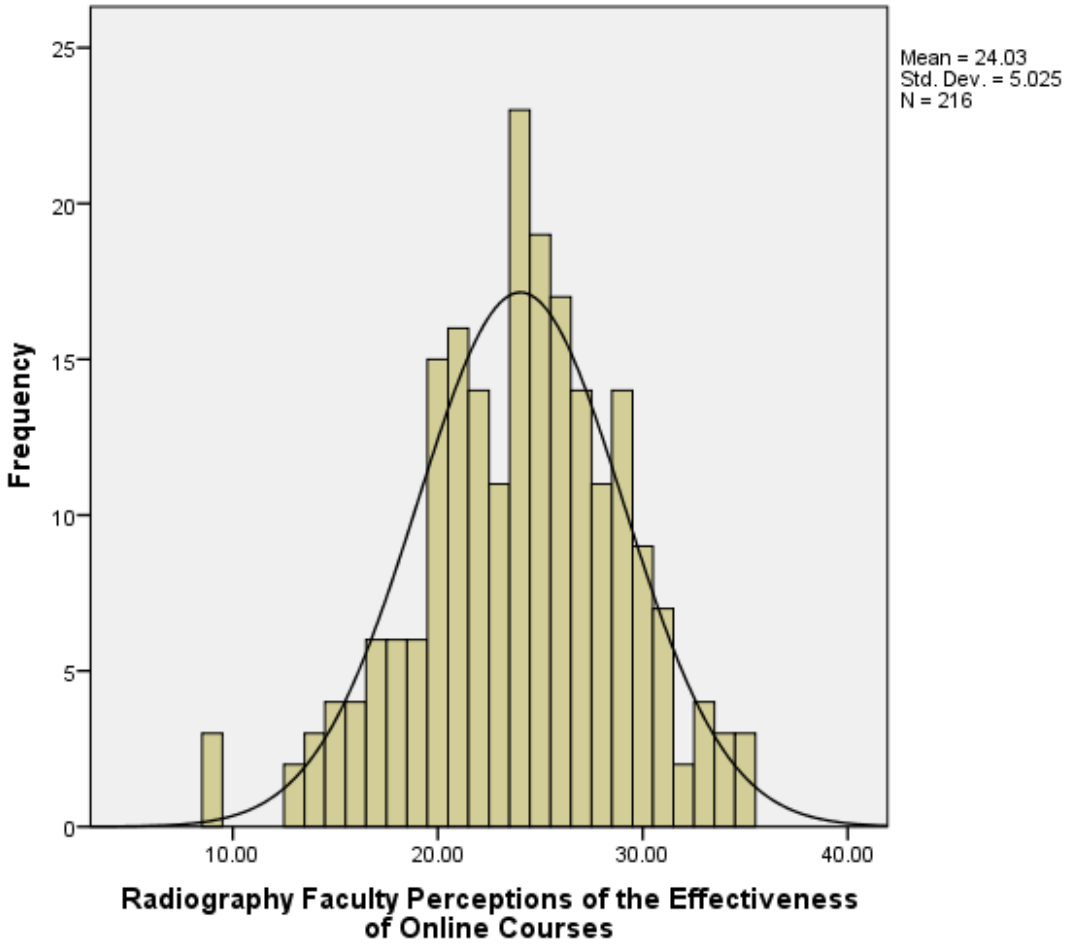

Figure 6. Distribution of Radiography Faculty Perceptions of the Effectiveness of Online Courses

Data reported for Research Question 10 involved use of descriptive statistics. The descriptive statistics included calculation of means and standard deviations for items in the instrument related to radiography faculty perceptions of the effectiveness of online courses. Statements 8 through 15 were scaled items, specifically a 5-point Likert scale. The ordinal scale ranged from strongly disagree (1) to strongly agree (5) for positively-keyed items and ranged from strongly agree (1) to strongly disagree (5) for reverse-keyed items. Items 8 through 14 were evaluated to assess radiography faculty perceptions of the effectiveness of online courses.

Table 15 provides participant responses to items 8 through 14. Faculty reported that they embrace online learning (M = 4.12) and look forward to teaching the next online course (M = 3.94). If given a choice, some faculty reported they would avoid teaching online courses (M = 3.83).

Table 15

Descriptive Statistics for Radiography Faculty Perceptions of the Effectiveness of Online Courses

Item	*N*	*M*	*SD*
11. I embrace online learning technology in my workplace.	216	4.12	.709
8. I look forward to teaching my next online course.	216	3.94	.844
12. Given the choice, I avoid teaching online courses.	216	3.83	1.013
13. Teaching online courses is rewarding.	216	3.56	.833
10. Assuming I have the opportunity, I teach online courses as much as possible.	216	3.05	1.077
9. I am more satisfied teaching online compared to other delivery methods.	216	2.85	.928
14. Teaching online courses is less rewarding than teaching face to face.	216	2.70	1.073

Chapter Summary

Chapter 4 provided demographic information and statistical analyses for 10 research questions and 17 null hypotheses. One-way ANOVAs, Pearson correlations, and *t*-tests were conducted to analyze the data. Ten of the 17 null hypotheses were rejected.

Research findings indicated that radiography faculty perceptions of the effectiveness of online courses and faculty position were not significantly affected by faculty position or type of institution. Additionally, radiography faculty perceptions of the effectiveness of online courses were not significantly related to age or years of teaching experience. The findings suggested that radiography faculty perceptions of the effectiveness of online courses increased as the years teaching online courses, number of online courses taught in the past 5 years and perceived competence with use of technology increased.

Participant responses suggested that faculty satisfaction with interaction in online courses increased as the years teaching online courses increased. On the other hand, the number of years teaching online courses was not related to faculty satisfaction with teaching online courses or faculty satisfaction with institutional support. Online technology acceptance had a positive relationship with perceived ease of use and a strong positive relationship with perceived usefulness of online technology. Additionally, use of technology-enhanced learning methods had a strong positive relationship with technological self-efficacy.

The participants were satisfied with teaching online courses and institutional support but had nearly neutral responses regarding interactions in online courses. Overall, radiography faculty members perceived that online courses were effective. The findings, recommendations, conclusions, recommendations for practice, and recommendations for future research are detailed in Chapter 5.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The faculty perspective, technology, and online learning effectiveness in the virtual learning environment were assessed in this study. Specifically, online learning effectiveness within radiography programs was examined. The purpose of this study was to assess radiography faculty perceptions of the effectiveness of asynchronous online courses. This chapter contains a summary, discussion, and summary of findings regarding faculty perceptions regarding online course effectiveness. The study ends with recommendations for policy, practice and future research.

Summary

The population for this study included 1,202 radiography faculty members employed at Joint Review Committee on Education in Radiologic Technology (JRCERT) accredited radiography programs. The 1,202 individuals were offered the opportunity and 216 participated. The majority of the 216 participants were program directors (44.9%) and clinical coordinators (50.0%) from radiography programs sponsored by 4-year colleges-universities (32.4%) and community colleges (47.8%). Participants, on average, were 48 years old, had 15.4 years of teaching experience, had 5 years of experience teaching online courses, and taught an average of 9.6 online courses.

Participants completed the *Radiography Faculty Perceptions of Online Education Survey*. The 76-item electronic survey was based on the literature and included components of the VLE conceptual framework. The instrument was modified and compiled from three established

surveys: the *Online Faculty Satisfaction Survey* (Wasilik & Bolliger, 2009), the *Technology Acceptance Survey* (Gibson et al., 2008), and the *Factors Affecting Faculty Use of Technology Survey* (Buchanan et al., 2013).

Ten research questions were used to guide this study, and statistical tests were conducted to evaluate 17 null hypotheses. The research questions and null hypotheses were introduced in Chapter 1, described in Chapter 3, and analyzed in Chapter 4. Statistical analysis was conducted using SPSS, and data were analyzed at the .05 level of significance. Research Question 1 was analyzed using two analyses of variances (ANOVAs); Research Questions 2 through 6 were analyzed using Pearson correlation tests; and Research Questions 7 through 10 were analyzed using single-sample *t*-tests.

Discussion and Summary of Findings

The purpose of this study was to assess radiography faculty perceptions of the effectiveness of asynchronous online courses. This project was used to assess the perceptions of 216 faculty members employed in radiography programs throughout the U.S. This section includes the summary of findings from the data analyses.

The results of statistical analyses for Research Question 1 indicated that radiography faculty perceptions of the effectiveness of online courses were not significantly affected by faculty position or type of institution. The mean scores for radiography faculty perceptions of the effectiveness of online courses were similar among radiography faculty who were in different positions and employed at various types of institutions.

The findings for Research Question 1 were consistent with a research study conducted by Shea (2007) in that the type of institution at which faculty members were employed influenced

their motivation in teaching online courses; however, the rationale varied. Motivation to teach online among faculty members employed at universities stemmed from the flexibility of teaching at any location or time. Motivation to teach online courses among community college faculty members stemmed from being able to volunteer. Therefore, faculty at the two types of institutions were equally motivated to teach online courses but for different reasons (Shea, 2007).

Additionally, the faculty members represented in this study taught in the same discipline accredited by the same organization. Programmatic accreditation by the JRCERT mandated that all radiography programs adhere to the same curriculum (JRCERT, 2015). Furthermore, radiography educators accessed similar resources from the American Society of Radiologic Technologists to provide insight in online delivery methods used in the virtual learning environment (Martino & Odle, 2008).

Research Question 2 had five null hypotheses, and Pearson correlations were conducted to analyze the data. The Pearson correlation for Research Question 2a was conducted to evaluate whether there was a relationship between radiography faculty perceptions of the effectiveness of online courses and age. The Pearson correlation for Research Question 2b was conducted to evaluate whether there was a relationship between radiography faculty perceptions of the effectiveness of online courses and years of teaching experience. The results of the analyses revealed a weak negative relationship between radiography faculty perceptions of the effectiveness of online courses and age as well as with years of teaching experience. Furthermore, the Pearson correlations were not significant.

In general, the results for Research Questions 2a and 2b indicated that radiography faculty perceptions of the effectiveness of online courses were not significantly related to age or years of teaching experience. Additional statistical analysis verified that age and years of

teaching experience of the radiography faculty were positively correlated. Because the majority of more mature faculty taught for a longer period of time, the two variables can be considered analogous for purposes of data interpretation. These results were consistent with studies in the literature. Shea (2009) discovered that professors under the age of 45 were more motivated to teach online courses for reasons related to tenure or promotion while professors who were 45 or older were motivated to teach online courses due to the opportunity to experiment with different pedagogy and a new delivery method. Therefore, faculty of all ages were motivated to teach online courses but for different reasons.

The Pearson correlation for Research Question 2c was used to assess whether there was a relationship between radiography faculty perceptions of the effectiveness of online courses and years teaching online courses. The results of the analysis revealed a positive relationship between the two variables and a statistically significant correlation. The Pearson correlation for Research Question 2d was conducted to evaluate whether there was a relationship between radiography faculty perceptions of the effectiveness of online courses and number of online courses taught in the past 5 years. The results of the analysis revealed a positive relationship between the two variables and a statistically significant correlation.

The findings for research questions 2c and 2d suggested that radiography faculty perceptions of the effectiveness of online courses increased as the years teaching online courses and the number of online courses taught in the past 5 years increased. Additional statistical analysis verified that years teaching online courses and the number of online courses taught in the past 5 years were positively correlated. Because the years teaching online courses and the number of online courses taught in the past 5 years were highly related and positively correlated, the two variables were considered analogous for purposes of data interpretation. These results

were consistent with studies in the literature. Britt (2006) conducted a research study with faculty and students from radiography and nursing programs and reported that experienced online faculty achieved greater student learning outcomes. In another study research findings revealed that the institution motivated computer savvy faculty to serve as mentors (Shea, 2007).

The Pearson correlation for Research Question 2e was used to assess whether there was a relationship between radiography faculty perceptions of the effectiveness of online courses and perceived competence with use of technology. The results of the analysis revealed a positive relationship between the two variables and a statistically significant correlation.

Data analysis for Research Question 2e suggested that radiography faculty perceptions of the effectiveness of online courses increased as perceived competence with use of technology increased. The self-reported mean score for perceived competence with technology was 3.97; however, the mean scaled score for survey items related to radiography faculty perceptions of the effectiveness of online courses was 3.43. Therefore, the participants reported a higher technical competence score than for effectiveness of online courses. The findings were congruent with the literature. Effective use of technologies and media served to support and enhance learning, increased student satisfaction, decreased attrition, and lead to a student-centered learning environment (Revere & Kovach, 2011). Additionally, it increased student engagement (Donathan & Hanks, 2010; Khan, 2009; Revere & Kovach, 2011), improved interaction among students and faculty (Khan, 2009), and enhanced experiences and collaboration among students (Boulos et al., 2006). Accordingly, radiography faculty perceptions with effectiveness of online education increased when faculty perceived that they have greater competence with technology.

There were three null hypotheses for Research Question 3, and Pearson correlations were used to analyze the data. The Pearson correlation for Research Question 3a was used to examine

whether there was a relationship between faculty satisfaction with teaching online courses and the number of years teaching online courses. The results of the analysis revealed a weak positive relationship, and the Pearson correlation was not significant.

The Pearson correlation for Research Question 3b was used to examine whether there was a relationship between faculty satisfaction with interaction (including faculty-student and student-student interactions) and the number of years teaching online courses. The results of the analysis revealed a positive relationship and a statistically significant correlation.

The Pearson correlation for Research Question 3c was used to examine whether there was a relationship between faculty satisfaction with institutional support and the number of years teaching online courses. The results of the analysis revealed a weak negative relationship, and the Pearson correlation was not significant.

Findings for Research Question 3 indicated that the number of years teaching online courses was not significantly related to faculty satisfaction with teaching online courses or faculty satisfaction with institutional support. Additionally, an increase in the years teaching online courses improved faculty satisfaction with interaction (including faculty-student interactions and student-student interactions).

The results were congruent with the literature. Wasilik and Bolliger (2009) conducted a study that investigated faculty satisfaction with online education. Variables associated with teaching online courses and institutional support were not significantly related to faculty satisfaction; however, elements associated with interaction with students were significantly related to faculty satisfaction (Wasilik & Bolliger, 2009).

Pearson correlations were used to examine whether there was a relationship between perceived ease of use of technology and online technology acceptance for Research Questions 4

and 5. The results of the analysis revealed a positive relationship and a statistically significant correlation. The second Pearson correlation was conducted to evaluate whether there was a relationship between perceived usefulness of technology and online technology acceptance. The results of the analysis revealed a strong positive relationship and a statistically significant correlation.

The results for Research Questions 4 and 5 suggested that online technology acceptance improved as perceived ease of use of technology increased. Moreover, online technology acceptance significantly increased as perceived usefulness of technology increased. Gibson et al. (2008) conducted a similar study, and research findings revealed that perceived usefulness predicted use of technology in online courses; however, ease of use was not a concern among the participants. Research findings between the two studies were similar for perceived usefulness; however, the results varied for the perceived ease of use. Variations in responses could be a result of the study with the radiography faculty being conducted nationally in one discipline. The study conducted by Gibson et al. (2008) was conducted with faculty in the College of Business and College of Education at one university.

A Pearson correlation was conducted to evaluate whether there was a relationship between technological self-efficacy and use of technology-enhanced learning methods for Research Question 6. The results of the analysis revealed a strong positive relationship between technological self-efficacy and use of technology-enhanced learning methods and a statistically significant correlation.

The findings revealed that use of technology-enhanced learning methods significantly increased as technological self-efficacy improved. This is consistent with the literature. There was a similar study conducted in which internet self-efficacy was positively related to faculty use

of technology (Buchanan et al., 2013). Therefore, use of technology in online courses increased as a result of faculty having more confidence in using tools. Buchanan et al. (2013) concluded that greater self-efficacy could be a direct result of greater use of technological tools and from institutional support in the form of training.

A single-sample *t*-test was used to examine if radiography faculty were satisfied to a significant degree with teaching online courses for Research Question 7. The results supported that faculty were satisfied with teaching online courses. Faculty were most satisfied with the convenience of accessing a course at any time, the flexibility provided by teaching in the online environment, the opportunity to try innovative teaching techniques, and the increased autonomy offered by participating in online education. Faculty were most dissatisfied with the negative impact that online teaching has on student evaluations of instruction, the perception that online education does not enhance teaching effectiveness, and the increased workload associated with grading assignment and preparing for an online course.

The result were congruent with the research findings from the study conducted by Wasilik and Bolliger in 2009 in which faculty were moderately satisfied with teaching online. Additionally, faculty members were most satisfied with flexibility and accessibility in teaching online courses and least satisfied with the increased workload (Wasilik & Bolliger, 2009). In other studies, faculty expressed satisfaction with flexible schedules (Hodges et al., 2013; Shea, 2007) and learning new technology (Shea, 2007). Nevertheless, the faculty expressed dissatisfaction with the decreased interaction with students enrolled in their online courses (Hodges et al., 2013). Increased workload in teaching online courses was generally the greatest area of concern for faculty (Barbera & Linder-VanBerschot, 2011; Bejerano, 2008; Bender et al., 2004; Britt, 2006; Hodges et al., 2013; Shea, 2007; Taft et al., 2011; Wasilik & Bolliger, 2009).

A single-sample *t*-test was used to examine if radiography faculty were satisfied to a significant degree with interaction in online courses for Research Question 8. The results supported that faculty had nearly neutral responses regarding interactions in online courses. Faculty were most satisfied that online students were active in communicating regarding course related matters, student-student interactions were meaningful, and online course were more accessible to students who would not be able to enroll in traditional courses. Faculty were most dissatisfied that online students were somewhat passive when contacting them about course-related items and the lack of face-to-face contact with students when teaching online courses.

The results were congruent with the research findings from the study conducted by Wasilik and Bolliger in 2009. Faculty were most satisfied with student accessibility to taking online courses and students being actively involved in learning; however, faculty were most dissatisfied with the lack of student participation and that online students were somewhat passive when they contact their professor about course-related items (Wasilik & Bolliger, 2009). In other studies faculty expressed satisfaction with increased student access (Shea, 2007) and dissatisfaction with the lack of personal contact with students (Hodges et al., 2013). On the other hand, the findings varied from the study completed by Wasilik and Bolliger (2009) in that online faculty were least dissatisfied with the lack of face-to-face contact with students when teaching online courses.

A single-sample *t*-test was used to examine if radiography faculty were satisfied to a significant degree with institutional support while teaching online courses for Research Question 9. The results supported that faculty were satisfied with institutional support in online courses. Faculty were most satisfied that they had access to technology resources from their college-university to teach online courses ($M = 4.04$) and that they have access to training resources to

teach online courses (M = 3.92). These results were contradictory to a hybrid study conducted at a research university in which participants recommended that the institution should provide better technology, technical support, training resources, and library resources (Hodges et al., 2013).

Other studies reported specific information about technology and its impact on learning effectiveness. Effective use of technologies and media served to support and enhance learning, increased student satisfaction, decreased attrition, and lead to a student-centered learning environment (Revere & Kovach, 2011). Use of technology increased student engagement (Donathan & Hanks, 2010; Khan, 2009; Revere & Kovach, 2011), improved interaction between students and faculty (Khan, 2009), and enhanced experiences and collaboration among students (Boulos et al., 2006). Appropriate investments in technical infrastructure and support should be made to increase use of technology (Buchanan et al., 2013).

A single-sample *t*-test was used to examine if radiography faculty perceive to a significant degree that online courses were effective for Research Question 10. The results supported that radiography faculty perceived online courses to be effective to a significant extent. Faculty reported that they embrace online learning in their workplace (M = 4.12) and look forward to teaching their next online course (M = 3.94). On the other hand, a small number of faculty reported they would avoid teaching online courses (M = 3.83).

Recommendations for Policy

The purpose of this study was to assess radiography faculty perceptions of the effectiveness of asynchronous online courses. Below are recommendations for policy:

1. Institutional policies should address faculty workload. Increased workload in teaching online courses is the greatest area of concern for most faculty teaching online courses (Barbera & Linder-VanBerschot, 2011; Bejerano, 2008; Bender et al., 2004; Britt, 2006; Hodges et al., 2013; Shea, 2007; Taft et al., 2011; Wasilik & Bolliger, 2009).
2. Institutional policies should address faculty training. Institutions of higher education are encouraged to have online faculty take a course to learn how to select and appropriately integrate the appropriate technological tools in the virtual learning environment.

Recommendations for Practice

The purpose of this study was to assess radiography faculty perceptions of the effectiveness of asynchronous online courses. Below are recommendations for practice:

1. Because faculty benefit from the convenience and flexibility of teaching online courses, institutions should provide professional development training and workshops to introduce the concept of teaching in an online environment.
2. Institutions should support faculty with educational resources for interacting and connecting with students in online courses. These strategies will serve to improve faculty satisfaction with online courses, student satisfaction with online courses, and enhance online learning effectiveness.
3. Because many online educators miss face-to-face contact with students, institutional administrators should provide professional development training, workshops, and orientations including the use of synchronous online tools to enhance faculty-student and student-student interactions in online courses.

4. Institutions need to improve technological infrastructure to support online technology and acquire technology and media needed to support faculty and students in the virtual learning environment. Use of technology and tools may improve faculty-student and student-student interactions.
5. Administrators, staff, and faculty should collaborate to enhance technical and library support for the online course environment within the institution.

Recommendations for Future Research

Below are recommendations for future research:

1. A method to increase the sample size would better represent views of online radiography educators and would increase the statistical power of a future study.
2. The method of collecting e-mail addresses of members of the population should be modified to ensure it only includes radiography faculty members who teach online courses.
3. A qualitative study could be conducted to acquire additional information from participants with the use of focus groups or interviews. The qualitative study could permit further investigation into variables that serve to improve online course effectiveness.
4. A similar study should be completed to evaluate online course effectiveness from the student perspective.
5. Because the population included radiography educators, the results may not be generalized to the other disciplinary areas within higher education. Therefore, the study should be repeated to capture responses of online faculty from other disciplines.

Conclusion

The purpose of this study was to assess radiography faculty perceptions of the effectiveness of asynchronous online courses. Faculty were satisfied with teaching online courses and institutional support in online courses. Instructors had nearly neutral responses regarding interactions in online courses. Radiography faculty, in general, perceived online courses to be effective.

Additional findings from this study revealed that faculty perceptions of the effectiveness of online courses were not significantly affected by faculty position, type of institution, age, or years of teaching experience; however, faculty perceptions increased as the years teaching online courses, the number of online courses taught in the past 5 years increased, and perceived competence with use of technology increased.

The number of years teaching online courses was not significantly related to faculty satisfaction with teaching online courses or faculty satisfaction with institutional support. An increase in the years teaching online courses improved faculty satisfaction with interactions. Online technology acceptance improved as perceived ease of use of technology increased. Moreover, online technology acceptance significantly increased as perceived usefulness of technology increased. Finally, use of technology-enhanced learning methods significantly increased as technological self-efficacy improved.

Recommendations for policy changes include online faculty workload and faculty taking a course to learn how to effectively integrate technology tools in the virtual learning environment. Recommendations for changes in practice include professional development training and workshops, and educational resources about online teaching, connecting with students, and faculty-student and student-student interactions in online courses. Institutions need

to improve technological infrastructure and technical and library support for the online environment.

Recommendations for future research include increasing the sample size of online radiography educators and modifying the method of collecting e-mail addresses of members of the population. A qualitative study should be conducted to acquire additional information from participants with the use of focus groups or interviews. Also, a similar study should be completed to evaluate online course effectiveness from the student perspective. Finally, the study should be repeated to capture responses of online faculty from other disciplines.

REFERENCES

Aleksic-Maslac, K., Magzan, M. & Juric, V. (2009). Social phenomenon of community on online learning: Digital interaction and collaborative learning experience. *WSEAS Transactions on Information Science and Applications, 8*(6), 1423-1432.

Allen, I. E., & Seaman, J. (2013). Changing course: Ten years of tracking online education in the in the United States. *Babson Survey Research Group*. Needham, MA: Babson Survey Research Group and Quahog Research Group, LLC. Retrieved on July 2, 2014 from http://www.onlinelearningsurvey.com/reported/changingcourse.pdf

Allen, I. E., & Seaman, J. (2014). Grade change: Tracking online education in the United States. *Babson Survey Research Group*. Needham, MA: Babson Survey Research Group and Quahog Research Group, LLC. Retrieved on November 30, 2014 from http://www.onlinelearningsurvey.com/reports/gradechange.pdf

Altmyer, D., & Yang, S. (2010). The comparative effectiveness of web-based and classroom instruction vs. learning outcomes. *Studies in Learning, Evaluation Innovation and Development, 7*(3), 109-119. Retrieved on June 2, 2014 from http://sleid.cqu.edu.au

AAUP. (2013, March). College and university governance: The University of Virginia governing board's attempt to remove the president. *AAUP Bulletin*, 1-21. Retrieved on July 2, 2014 from http://www.aaup.org/report/college-and-university-governance-university-virginia-governing-board

Artino, A. R. (2007). Motivational beliefs and perceptions of instructional quality: Predicting satisfaction with online training. *Journal of Computer Assisted Learning, 24*, 260-270. doi:10.1111/j.1365-2729.2007.00258.x

Barbera, E., & Linder-VanBerschot, J. A. (2011). Systemic multicultural model for online education: Tracing connections among learner inputs, instructional processes, and outcomes. *The Quarterly Review of Distance Education, 12*(3), 167-180.

Bejerano, A. R. (2008). The genesis and evolution of online degree programs: Who are they for and what have we lost along the way? *Communication Education, 57*(3), 408-414. doi:10.1080/03634520801993697

Bender, D. M., Wood, B. J., & Vredevoogd, J. D. (2004). Teaching time: Distance education versus classroom instruction. *American Journal of Distance Education, 18*(2), 103-114.

Bickle, M. C., & Carroll, J. C. (2003). Checklist for quality online instruction: Outcomes for learners, the professor and the institution. *College Student Journal, 37*(2), 208-218.

Boulos, M. N., Maramba, I., & Wheeler, S. (2006). Wikis, blogs and podcasts: A new generation of web-based tools for virtual collaborative clinical practice and education. *BMC Medical Education, 6*(41), 1-8. doi:10:1186/1472-6920-6-41

Britt, R. (2006). Online education: A survey of faculty and students. *Radiologic Technology, 77*(3), 183-190.

Buchanan, T., Sainter, P., & Saunders, G. (2013). Factors affecting faculty use of learning technologies: Implications for models of technology adoption. *Journal of Computing in Higher Education, 25,* 1-11. doi:10.1007/s12528-013-9066-6

Cauble, K. C., & Chernow, H. (1996). A distance learning project in the radiologic sciences. *Radiologic Technology, 67*(4), 307-310.

Changchit, C., & Klaus, T. (2008). Classroom preferences: What factors can affect students' attitudes on different classroom settings? *International Journal of Information and Communication Technology Education, 4*(1), 33-43.

Chao, C. Y., Hwu, S. L., & Chang, C. C. (2011). Supporting interaction among participants of online learning using the knowledge sharing concept. *TOJET: The Turkish Online Journal of Educational Technology, 10*(4), 311-319.

Clark, R. E. (1994). Media will never influence learning. *Educational Technology Research and Development, 42*(2), 21-29.

DeMaria, R., & Bongiovanni, T. (2012, March/April). Dispelling myths about online education. *BizEd,* 36-40.

Dixson, M. D. (2010). Creating effective student engagement in online courses: What do students find engaging? *Journal of the Scholarship of Teaching and Learning, 10*(2), 1-13.

Donathan, L. N., & Hanks, M. (2010). Group project: A new online tool. *Radiologic Technology, 82*(2), 183-184.

Dunlap, J. C., & Lowenthal, P. R. (2009). Tweeting the night away: Using twitter to enhance social presence. *Journal of Information Systems Education, 20*(2), 129-135.

Evans, K. D., Gallatin, A., Taylor, C. A., & Brodnik, M. S. (2008). Self-directed characteristics of participants in online CE programs. *Radiologic Technology, 80*, 11-19.

Ferguson, J. M., & DeFelice, A. E. (2010). Length of online course and student satisfaction, perceived learning, and academic performance. *International Review of Research in Open and Distance Learning, 11*(2), 73-84.

Gibson, S. G., Harris, M. L., & Colaric, S. M. (2008). Technology acceptance in an academic context: Faculty acceptance of online education. *Journal of Education for Business, 83*(6), 355-359. doi:10.3200/JOEB.83.6.355-359

Grandzol, C. J., & Grandzol, J. R. (2010). Interaction in online courses: More is not always better. *Online Journal of Distance Learning Administration, 13*(2). Retrieved on September 10, 2013 from http://www.westga.edu/~distance/ojdla/summer132/Grandzol_Grandzol132.pdf

Head, J. T., Lockee, B. B., & Oliver, K. M. (2002). Method, media, and mode: Clarifying the discussion of distance education effectiveness. *The Quarterly Review of Distance Education, 3*(3), 261-268. Retrieved on September 10, 2013 from http://eric.ed.gov/?id=EJ657870

Hodges, C., Way, R., & Shepherd, S. S. (2013). Online teaching: Perceptions of faculty at a research university. In A. Sigal (Ed.), *Advancing Library Education: Technological Innovation and Instructional Design* (chapter 2). doi:10.4018/978-1-4666-3688-0.ch002

Hu, H., & Gramling, J. (2009). Learning strategies for success in a web-based course: A descriptive exploration. *Quarterly Review of Distance Education, 10*(2), 123-134.

Jaggars, S. S., & Bailey, T. (2010). Effectiveness of fully online courses for college students: Response to a department of education meta-analysis. *Community College Research Center*. New York, NY: Teachers College, Columbia University.

Johnston, J. (2008). Effectiveness of online instruction in the radiologic sciences. *Radiologic Technology, 79*(6), 497-506.

JRCERT. (2015). Monthly statistics: January 2015. Retrieved on January 10, 2015 from http://www.jrcert.org/sites/jrcert/uploads/documents/Monthly_Statistics/January_2015.pdf

Jones, A. N. (2006). From the sage on the stage to the guide on the side: The challenge for educators today. *ABAC Journal, 26*, 1-18.

Khan, M. (2009). Effects of information technology usage on student learning: An empirical study in the United States. *International Journal of Management, 26*(3), 354-364.

Kirtman, L. (2009). Online versus in-class courses: An examination of differences in learning outcomes. *Issues in Teacher Education, 18*(2), 103-116.

Kowalczyk, N., & Copley, S. (2013). Online course delivery modes and design methods in the radiologic sciences. *Radiologic Technology, 85*, 27-36.

Lockee, B., Burton, J., Potter, K. (2010). Organizational perspectives on quality in distance learning. In D. Gibson and B. Dodge (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2010* (pp. 659-664). Retrieved on September 10, 2013 from http://www.editlib.org/p/33419/

Lockee, B., Moore, M., & Burton, J. (2002). Measuring success: Evaluation strategies for distance education. *Educause Quarterly, 1,* 20-26. Retrieved on September 10, 2013 from https://net.educause.edu/ir/library/pdf/eqm0213.pdf

Mandernach, B. J. (2009). Effect of instructor-personalized multimedia in the online classroom. *International Review of Research in Open and Distance Learning, 10*(3), 1-19.

Martino, S., & Odle, T. G. (2008). New instructional technology. *Radiologic Technology, 80,* 67-74.

Mashhadi, V. Z., & Kargozari, M. R. (2011). Influences of digital classrooms on education. *ScienceDirect, 3,* 1178-1183. doi:10.1016/j.procs.2010.12.190

Mayes, R., Ku, H., Akarasriworn, C., Luebeck, J., & Korkmaz, O. (2011). Themes and strategies for transformative online instruction: A review of literature and practice. *Quarterly Review of Distance Education, 12*(3), 151-166.

McLawhon, R. & Cutright, M. (2011). Instructor learning styles as indicators of online faculty satisfaction. *Educational Technology & Society, 15*(2), 341-353.

McMillan, J. H., & Schumacher, S. (2010). *Research in education: Evidence-based inquiry* (7th ed.). Boston, MA: Pearson Education.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies, *U.S. Department of Education, Office of Planning, Evaluation, and Policy Development.* Washington, DC: U.S. Government Printing Office.

Moore, J. C. (2011). A synthesis of sloan-c effective practices. *Journal of Asynchronous Learning Ne2rks, 16,* 91-115.

Morgan, K., Cameron, B. A., & Williams, K. C. (2009). Student perceptions of social task development in online group project work. *Quarterly Review of Distance Education, 10*(3), 285-320.

Olesova, L. A., Weasenforth, D., Richardson, J. C., & Meloni, C. (2011). Using asynchronous instructional audio feedback in online environments: A mixed methods study. *MERLOT Journal of Online Learning and Teaching, 7,* 30-42.

Parietti, I. S. C., & Turi, D. M. (2011). Assessment of the online instructor. *Academy of Educational Leadership Journal, 15,* 63-78.

Pate, A., Smaldino, S., Mayall, H. J., & Leutkehans, L. (2009). Questioning the necessity of nonacademic social discussion forums within online courses. *The Quarterly Review of Distance Education, 10,* 1-8.

Piccoli, G., Ahmad, R., & Ives, B. (2001). Web-based learning environments: A research framework and a preliminary assessment of effectiveness in basic IT skills training. *MIS Quarterly, 25*(4), 401-426.

Revere, L., & Kovach, J. V. (2011). Online technologies for engaged learning: A meaningful synthesis for educators. *The Quarterly Review of Distance Education, 12*(2), 113-124.

Salyers, V., Carter, L., Barrett, P., & Williams, L. (2010) Evaluating student and faculty satisfaction with a pedagogical framework. *International Journal of E-Learning and Distance Education, 24*(3). Retrieved on September 10, 2013 from http://www.ijede.ca/index.php/jde/article/view/695/1169

Schulte, M. (2011). The foundations of technology distance education: A review of the literature to 2001. *The Journal of Continuing Higher Education, 59,* 34-44. doi:10.1080/07377363.2011.544981

Shea, P. (2007). Bridges and barriers to teaching online college courses: A study of experienced online faculty in thirty-six colleges. *Journal of Asynchronous Learning Network, 11*(2), 73-128.

Sheridan, K., & Kelly, M. A. (2010). The indicators of instructor presence that are important to students in online courses. *MERLOT Journal of Online Learning and Teaching, 6*(4), 767-779.

Simon, M. K., & Goes J. (2013). Dissertation & scholarly research: A practical guide to start & complete your dissertation, thesis, or formal research project. North Charleston, SC: CreateSpace Publishing.

Sussman, S., & Dutter, L. (2010). Comparing student learning outcomes in face-to-face and online course delivery. *Online Journal of Distance Learning Administration, 8*(4), 19-30.

Taft, S. H., Perkowski, T., & Martin, L. S. (2011). A framework for evaluating class size in online education. *The Quarterly Review of Distance Education, 12*(3), 181-197.

Wasilik, O., & Bolliger, D. U. (2009). Faculty satisfaction in the online environment: An institutional study. *Internet and Higher Education, 12*, 173-178. doi:10.1016/j.iheduc.2009.05.001

Willging, P. A., & Johnson, S. D. (2009). Factors that influence students' decision to dropout of online courses. *Journal of Asynchronous Learning Networks, 13*(3), 115-127.

Zingaro, D., & Oztok, M. (2012). Interaction in an asynchronous online course: A synthesis of quantitative predictors. *Journal of Asynchronous Learning Networks, 16*(4), 71-82.

APPENDICES

Appendix A

Permission to Use and Modify the Online Faculty Satisfaction Survey

Email received on 11/22/2014 @ 5:01 PM

Dear Shirley,

My apologies for not responding to your e-mail sooner. You have my permission to use and modify our survey instrument. Good luck with your research!

Kind regards,
Doris Bolliger

Email sent on 11/16/14 @ 4:03 PM

Dr. Bolliger,

I corresponded with you in August 2013 to request permission to use the Online Faculty Satisfaction Survey (OFSS) developed by you and Oksana Wasilik for the purpose of my dissertation. I defended my oral prospectus last week, and one of my committee members asked if I had your permission to both use and modify your instrument for the purpose of my research study. I apologize for just now asking, but I wanted to inquire if I have your permission to not only use but also modify your survey before I proceed with requesting IRB approval.

Best regards,
Shirley Cherry
Doctoral Candidate

Email received on 8/22/2013 @ 3:44 PM

Dear Shirley,

Thank you for your e-mail and interest in our work. You have my permission to use the survey (OFFS) for your dissertation research. There is no cost associated with its use as we develop instruments such as the OFFS for researchers like you.

If you have any questions, please let me know. Good luck with your study!

Dr. Doris Bolliger

Email sent on 8/17/13 @ 5:40 PM

Dear Dr. Bolliger:

I am a doctoral student at East Tennessee State University in Johnson City, Tennessee, and I currently working on my doctoral dissertation entitled *Radiography Faculty Perceptions of the Effectiveness of Asynchronous Online Courses.* I am writing to request permission to use the Online Faculty Satisfaction Survey (OFSS) developed by you and Oksana Wasilik. Please let me know what additional information is needed, and the cost that may be associated with using it.

Thank you for your time and consideration.
Sincerely,

Shirley J. Cherry
Doctoral Candidate

Appendix B

Permission to Use and Modify the Technology Acceptance Survey

Email received on 11/16/2014 @ 4:23 PM

Absolutely.

Email sent on 11/16/14 @ 4:06 PM

Dr. Gibson,
I corresponded with you in January 2014 to request permission to use the survey instrument from your 2008 publication in the Journal of Education for Business titled, "Technology acceptance in an academic context: Faculty acceptance of online education" for the purpose of my dissertation. I defended my oral prospectus last week, and one of my committee members asked if I had your permission to both use and modify your instrument for the purpose of my research study. I apologize for just now asking, but I wanted to inquire if I have your permission to not only use but also modify your survey before I proceed with requesting IRB approval.

Best regards,
Shirley Cherry
Doctoral Candidate

Email received on 11/16/2014 @ 4:23 PM

Shirley,
Hope this helps,
--sg

Email sent on 12/28/13 @ 2:47 AM

Dr. Gibson,
I am a doctoral student at East Tennessee State University in Johnson City, Tennessee, and I currently working on my dissertation titled *Radiography Faculty Perceptions of the Effectiveness of Asynchronous Online Courses.* I am writing to request permission to use the survey instrument from your 2008 publication in the Journal of Education for Business titled, "Technology acceptance in an academic context: Faculty acceptance of online education."

Please let me know what additional information is needed as well as the cost that may be associated with using it. Would you also be willing to e-mail a copy of the survey or provide it in a different format? Thank you for your time and consideration.

Sincerely,
Shirley J. Cherry
Doctoral Candidate

Appendix C

Permission to Use and Modify the Factors Affecting Faculty Use of Technology Survey

Email received on 11/17/2014 @ 5:03 AM

Dear Shirley,

Please take this email as confirmation that you may both use and modify the instrument for your research. Feel free to forward this as evidence of permission if required.
Best wishes
Tom Buchanan

Email sent on 11/16/14 @ 4:05 PM

Dr. Buchanan,

I corresponded with you in January 2014 to request permission to use the survey instrument from your 2013 publication in the Journal of Computing in Higher Education titled, "Factors affecting faculty use of learning technologies: Implications for models of technology adoption for the purpose of my dissertation. I defended my oral prospectus last week, and one of my committee members asked if I had your permission to both use and modify your instrument for the purpose of my research study. I apologize for just now asking, but I wanted to inquire if I have your permission to not only use but also modify your survey before I proceed with requesting IRB approval.
Best regards,
Shirley Cherry
Doctoral Candidate

Email received on 1/6/2014 @ 1:09 PM

Shirley,
Thanks for your interest in our work. I've attached a copy of the questionnaire we used - formatting is a little mangled but you should be able to make it out I hope! The 2013 paper has a description of the sources for different sections.

Best,
Tom

Email sent on 12/28/13 @ 3:40 AM

Dr. Buchanan,

I am a doctoral student at East Tennessee State University in Johnson City, Tennessee, and I currently working on my dissertation titled *Radiography Faculty Perceptions of the Effectiveness*

of Asynchronous Online Courses. I am writing to request permission to use the survey instrument from your 2013 publication in the *Journal of Computing in Higher Education* titled, "Factors affecting faculty use of learning technologies: Implications for models of technology adoption."

Please let me know what additional information is needed as well as the cost that may be associated with using it. Would you also be willing to e-mail a copy of the survey or provide it in a different format?

Thank you for your time and consideration.

Sincerely,

Shirley J. Cherry
Doctoral Candidate

Appendix D

Request to Receive List of Potential Participants

Hi Shirley,

The attached MS Excel file contains names and e-mail addresses of radiography program directors and clinical coordinators. Good luck with your survey!

Teresa

Teresa Cruz
Finance Manager
JRCERT

-----Original Message-----
From: Cherry, Shirley J. [mailto:CHERRYS@mail.etsu.edu]
Sent: January 12, 2015 9:47 PM
To: Teresa Cruz
Subject: Re: Dissertation survey distribution

Good evening Teresa,

I completely understand the delayed response. I really did not want to bother you today, but I'm really eager to start my study. On second thought, I would appreciate receiving e-mail addresses and names so I can personalize the e-mails using HTML. Would you be able to send them to me in a MS Excel file?

Thank you and have a nice Tuesday,
Shirley

From: Teresa Cruz <tcruz@jrcert.org<mailto:tcruz@jrcert.org>>
Date: Monday, January 12, 2015 at 6:11 PM
To: "Cherry, Shirley J." <CHERRYS@mail.etsu.edu<mailto:CHERRYS@mail.etsu.edu>>
Subject: RE: Dissertation survey distribution

Hi Shirley,

I apologize for the delay in responding. The JRCERT can provide you with a list of e-mail addresses for radiography program directors and clinical coordinators (we do not collect didactic faculty e-mail addresses). There is no cost for the list.

So you only want e-mail addresses? No names or associated programs??

Teresa

Teresa Cruz
Finance Manager
JRCERT

From: Cherry, Shirley J.
Sent: Monday, January 05, 2015 6:31 PM
To: mail@jrcert.org<mailto:mail@jrcert.org>
Subject: Dissertation survey distribution

Dear JRCERT Staff:

I hope you had a wonderful holiday. I am the program director at East Tennessee State University (program #0214) and am in the process of receiving IRB approval to e-mail an electronic survey instrument as part of my doctoral dissertation to educators in JRCERT accredited radiography programs. I had hoped to e-mail all radiography program directors and request that each individual forward the electronic survey to all of their faculty. The IRB office at ETSU requires that I e-mail an electronic link to each individual educator. The ARRT only provides physical addresses for technologists, not e-mail addresses. Would it be possible to receive or purchase a complete list of all e-mail addresses for radiography program directors, clinical coordinators, and didactic instructors that are in the JRCERT database? I do not need the names - only e-mail addresses. If this is possible, what steps do I need to take to accomplish this? I would more than happy to send any documentation - including any or all parts of my dissertation completed to date.

Thank you and have a wonderful day,
Shirley Cherry

Shirley J. Cherry, M.B.A., R.T.(R)
Program Director, Imaging Sciences
ETSU Department of Allied Health Sciences

Appendix E

IRB Exempt Approval

EAST TENNESSEE STATE UNIVERSITY
Office for the Protection of Human Research Subjects • Box 70565 • Johnson City, Tennessee 37614-1707
Phone: (423) 439-6053 Fax: (423) 439-6060

IRB APPROVAL – Initial Exempt

January 7, 2015

Ms. Shirley Cherry
1709 Cherokee Road Unit 301
Johnson City, TN 37604

RE: Radiography Faculty Perceptions of the Effectiveness of Asynchronous Online Courses
IRB#: c1214.13e
ORSPA#: n/a

On **January 7, 2015**, an exempt approval was granted in accordance with 45 CFR 46. 101(b)(2). It is understood this project will be conducted in full accordance with all applicable sections of the IRB Policies. No continuing review is required. The exempt approval will be reported to the convened board on the next agenda.

- xform New Protocol Submission; Email Invite; Survey Introduction Consent (stamped approved 1/7/15); Survey; References; CV

Projects involving Mountain States Health Alliance must also be approved by MSHA following IRB approval prior to initiating the study.

Unanticipated Problems Involving Risks to Subjects or Others must be reported to the IRB (and VA R&D if applicable) within 10 working days.

Proposed changes in approved research cannot be initiated without IRB review and approval. The only exception to this rule is that a change can be made prior to IRB approval when necessary to eliminate apparent immediate hazards to the research subjects [21 CFR 56.108 (a)(4)]. In such a case, the IRB must be promptly informed of the change following its implementation (within 10 working days) on Form 109 (www.etsu.edu/irb). The IRB will review the change to determine that it is consistent with ensuring the subject's continued welfare.

Sincerely,
Stacey Williams, Chair
ETSU Campus IRB

EAST TENNESSEE STATE UNIVERSITY

Office for the Protection of Human Research Subjects • Box 70565 • Johnson City, Tennessee 37614-1707
Phone: (423) 439-6053 Fax: (423) 439-6060

IRB APPROVAL – Minor Modification

January 22, 2015

Ms. Shirley Cherry
1709 Cherokee Road Unit 301
Johnson City, TN 37604

RE: Radiography Faculty Perceptions of the Effectiveness of Asynchronous Online Courses
IRB #: c1214.13e

On January 22, 2015, a final approval was granted for the minor modification listed below. The minor modification will be reported to the convened board on the next agenda.

- xform Modification Request: 1) Revise Survey questions. 2) Use list of email addresses provided by JCERT. Documents: Revised Survey (stamped approved 1/22/15)

Unanticipated Problems Involving Risks to Subjects or Others must be reported to the IRB (and VA R&D if applicable) within 10 working days.

Proposed changes in approved research cannot be initiated without IRB review and approval. The only exception to this rule is that a change can be made prior to IRB approval when necessary to eliminate apparent immediate hazards to the research subjects [21 CFR 56.108 (a)(4)]. In such a case, the IRB must be promptly informed of the change following its implementation (within 10 working days) on Form 109 (www.etsu.edu/irb). The IRB will review the change to determine that it is consistent with ensuring the subject's continued welfare.

Sincerely,
Stacey Williams, Chair
ETSU Campus IRB

Full AAHRPP Accreditation

Accredited Since December 2005

Appendix F

E-mail Invitation to Survey

Dear Radiography Faculty Member,

I am working on my doctoral dissertation entitled Radiography Faculty Perceptions of the Effectiveness of Asynchronous Online Courses and in the process of collecting data. I would greatly appreciate your assistance in completing an electronic survey that will take approximately 15 to 20 minutes to complete.

Your participation is completely voluntary, and your submission will remain anonymous. The ETSU Institutional Review Board reviewed and approved this research project. You may also contact the ETSU IRB at 423.439.6054 for information regarding your rights as a research participant.

I greatly appreciate your assistance with my research study. Please click the link below to begin the survey:

{URL Address here}

Thank you in advance for your participation.

Sincerely,

Shirley J. Cherry
Doctoral Candidate
East Tennessee State University

P.S. This survey invitation was sent through SurveyMonkey. If you click the following link, you can opt out of future surveys: {URL Address here}

Appendix G

Introduction to Electronic Survey

Dear Radiography Faculty Member:

I am working on my doctoral dissertation and would like to invite you to complete the Faculty Perceptions of Online Education Survey. The purpose of the study is to assess radiography faculty perceptions of the effectiveness of asynchronous online courses.

The ETSU Institutional Review Board reviewed and approved this research project. You may contact the ETSU IRB with questions regarding this survey or regarding your rights as a research participant. If you have any questions or concerns about the research and want to talk to someone independent of the research team, you may call an ETSU IRB Coordinator at (423) 439-6002.

If you agree to participate, please begin by answering six demographic questions. Next, respond to one question describing your level of competence with technology. Finally, indicate the level to which you agree or disagree with 44 statements regarding your role as a radiography faculty member who has taught at least one asynchronous online course, 12 statements concerning your technological self-efficacy, and 14 statements concerning the use or potential use of technology-enhanced learning. The survey will take approximately 15 minutes to complete.

If you agree to the four items below please continue reading the information on the remainder of this page and click the Next Page icon located at the bottom of the screen to begin the survey. If you do not agree with one or more of the items below or do not wish to participate, please click the Exit this survey icon at the top of the page.

- I am at least 18 years of age.
- I am a radiography program faculty member.
- I am teaching or have taught at least 1 asynchronous online course.
- I voluntarily agree to participate in the research study.

Participation is completely voluntary, and your submission will remain anonymous. The data will be reported in aggregate form with no identification of individuals, programs or institutions. There will be no penalty to individuals who choose not to participate, and you may discontinue participation at anytime by exiting the survey.

Your participation will provide valuable information for my study. Thank you in advance.

Sincerely,
Shirley J. Cherry
Doctoral Candidate
East Tennessee State University
1000 Jason Witten Way
cherrys@etsu.edu

Appendix H

Radiography Faculty Perceptions of Online Education Survey

1. Which of the following categories best describes your position?
   A. Program Director
   B. Clinical Coordinator
   C. Other, please specify: _____

2. At what type of institution are you currently employed?
   A. 4-year College-University
   B. Community College
   C. Technical College-Institute
   D. Hospital
   E. Proprietary
   F. Other, please specify: _____

3. What is your age (today)?

4. How many years have you been teaching?
   (If applicable, include years teaching in areas other than radiography)

5. How many years have you been teaching online courses?

6. How many online courses have you taught in the past 5 years?
   (Include courses you are currently teaching. If you have taught the same course three times, count it as 3.)

7. How would you describe your level of competence with technology?
   A. Excellent
   B. Above Average
   C. Average
   D. Poor
   E. None

Indicate to what level you agree or disagree with the following statements regarding your role as a faculty member who has taught at least one asynchronous online course:						
		SA	A	N	D	SD
8	I look forward to teaching my next online course.					
9	I am more satisfied teaching online as compared to other delivery methods.					
10	Assuming I have the opportunity, I teach online courses as much as possible.					
11	I embrace online learning technology in my workplace.					
12	Given the choice, I avoid teaching online courses. (R)					
13	Teaching online courses is rewarding.					
14	Teaching online courses is less rewarding than teaching face to face. (R)					
15	The flexibility provided by teaching in the online environment is important to me.					
16	I appreciate that I can access my online course any time it is convenient for me.					
17	I believe teaching online negatively impacts student evaluations of my instruction. (R)					
18	Online education does not enhance my teaching effectiveness. (R)					
19	Participating in online education will or has already increased my autonomy.					
20	Participating in online education enables greater achievement or success in my career.					
21	Teaching online courses provides me with opportunities to try innovative teaching techniques.					
22	It takes me longer to develop an online course than a traditional course. (R)					
23	I need more time to administer an online course than a traditional course. (R)					
24	I need more time to grade student assignments when teaching an online course. (R)					
25	I need more time to prepare for an online course on a weekly basis than for a traditional course. (R)					
26	I have a higher workload when teaching an online course than a traditional course. (R)					
27	Online teaching is gratifying because it provides me with the opportunity to reach students who otherwise would not be able to enroll in traditional courses.					

Indicate to what level you agree or disagree with the following statements regarding your role as a faculty member who has taught at least one asynchronous online course:						
		SA	A	N	D	SD
28	The level of my interactions with students in an online course is higher than in a traditional face-to-face course.					
29	I miss face-to face contact with students when teaching online courses. (R)					
30	My online students are active in communicating with me when they have questions about course related matters.					
31	I can provide better feedback to my online students on their performance.					
32	My online students are somewhat passive when they contact me about course related matters. (R)					
33	Teaching online courses improves my ability to build relationships with my students.					
34	Student-to-instructor interactions are meaningful in my online course.					
35	I receive support to teach online courses (clerical support, graduate assistants, other).					
36	I have access to training resources from my college-university to teach online courses.					
37	I have access to technology resources from my college-university to teach online courses.					
38	I receive adequate financial resources from my college-university to teach online courses.					
39	I receive fair financial compensation for teaching online courses.					
40	Teaching online courses will (or has already) lead to greater recognition for me at work.					

Indicate to what level you agree or disagree with the following statements regarding your role as a faculty member who has taught at least one asynchronous online course:						
		SA	A	N	D	SD
41	I find that online resources (course management software, etc.) at my institution are easy to use.					
42	I find it difficult to enhance my technology skills in to teach online courses. (R)					
43	I find it easy to teach using the course management software (Blackboard, D2L, or other) at my institution.					
44	I find that online learning technology is not flexible. (R)					

45	I am satisfied with the use of communication tools in the online environment (e.g., chat rooms, threaded discussions, etc.).					
46	Online courses are not useful in education. (R)					
47	Teaching online courses will decrease my effectiveness as a faculty member in the future. (R)					
48	Online education is not compatible with how I prefer to teach. (R)					
49	I believe that online education is an effective learning methodology for students.					
50	Faculty should use online learning technology.					

Indicate to what level you agree or disagree with the following statements regarding your self-efficacy related to technology use at home or work. The more confident you feel about each of these things, the higher your rating should be.

		SA	A	N	D	SD
51	I feel confident understanding terms/words related to Internet hardware.					
52	I feel confident understanding terms/words related to Internet software.					
53	I feel confident describing functions of Internet hardware.					
54	I feel confident troubleshooting Internet problems.					
55	I feel confident explaining why a task will not run on the Internet.					
56	I feel confident troubleshooting problems with technological tools.					
57	I feel confident troubleshooting problems with the course management system at my institution.					
58	I feel confident using the Internet to gather data.					
59	I feel confident learning advanced skills within a specific Internet program.					
60	I feel confident turning to an online discussion group when help is needed.					
61	I possess the knowledge to teach online courses.					
62	As an instructor, I am prepared to teach online courses.					

The following statements relate to the use or potential use of technology-enhanced learning in your asynchronous online course:						
		SA	A	N	D	SD
63	I have limited time available for teaching development. (R)					
64	Using new technological tools is risky. (R)					
65	I am not aware of available methods and products. (R)					
66	I am satisfied with my current online teaching methods.					
67	There are limited institutional resources to permit use of technology-enhanced learning methods in radiography courses. (R)					
68	There are limited program/department resources to permit use of technology-enhanced learning methods. (R)					
69	Technology-enhanced learning methods are not suited for use in radiography courses. (R)					
70	Students do not react well to technology-enhanced learning methods in asynchronous online courses. (R)					
71	Teaching innovation is a relatively low priority in my institution. (R)					
72	There is limited support available (e.g. technical and/or administrative) for new learning methods. (R)					
73	Use of technology-enhanced learning methods increases my workload. (R)					
74	I lose ownership of my course materials when I use technology-enhanced learning methods. (R)					
75	In the future, student numbers will decline in face-to-face lectures. (R)					
76	I do not possess the skills necessary to use technology-enhanced learning methods. (R)					

The items in Radiography Faculty Perceptions of Online Education Survey were compiled from three surveys: the *Online Faculty Satisfaction Survey* (Wasilik & Bolliger, 2009), the *Technology Acceptance Survey* (Gibson et al., 2008), and the *Factors Affecting Faculty Use of Technology Survey* (Buchanan et al., 2013).

Appendix I

Research Questions and Corresponding Statistical Procedures

Research Question	Survey Question	Statistical Test/Procedure
1. Is there a significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by faculty position and type of institution?		
a. Is there a significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by faculty position?	8-14 1	One-Way ANOVA
b. Is there a significant difference between radiography faculty perceptions of the effectiveness of online courses as compared by type of institution?	8-14 2	One-Way ANOVA
2. Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and age, years of teaching experience, years teaching online courses, number of online courses taught in the past 5 years, and perceived competence with use of technology?		
a. Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and age?	8-14 3	Pearson correlation
b. Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and years of teaching experience?	8-14 4	Pearson correlation
c. Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and years teaching online courses?	8-14 5	Pearson correlation
d. Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and number of online courses taught in the past 5 years?	8-14 6	Pearson correlation
e. Is there a significant relationship between radiography faculty perceptions of the effectiveness of online courses and perceived competence with use of technology?	8-14 7	Pearson correlation
3. Is there a significant relationship between the number of years teaching online courses and selected aspects of faculty satisfaction with online courses.		
a. Is there a significant relationship between the number of years teaching online courses and faculty satisfaction with teaching online courses?	5 15-26	Pearson correlation
b. Is there a significant relationship between the number of years teaching online courses and faculty satisfaction with interaction?	5 27-34	Pearson correlation
c. Is there a significant relationship between the number of years teaching online courses and faculty satisfaction with institutional support?	5 35-40	Pearson correlation

4. Is there a significant relationship between perceived ease of use of technology and online technology acceptance?	41-45 10-11	Pearson correlation
5. Is there a significant relationship between perceived usefulness of technology and online technology acceptance?	46-50 10-11	Pearson correlation
6. Is there a significant relationship between technological self-efficacy and use of technology-enhanced learning methods?	51-62 63-76	Pearson correlation
7. Are radiography faculty satisfied with teaching online courses?	15-26	Single-sample *t*-test
8. Are radiography faculty satisfied with interactions in their online courses?	27-34	Single-sample *t*-test
9. Are radiography faculty satisfied with institutional support while teaching online courses?	35-40	Single-sample *t*-test
10. Do radiography faculty perceive that online courses are effective?	8-14	Single-sample *t*-test

VITA

SHIRLEY JEAN CHERRY

Education:	Public Schools, Vienna, Ohio
	Certificate, Radiography, Sharon Regional Health System, Sharon, Pennsylvania, 1989
	B.S. Radiology, minor in Business, Salem-Teikyo University, Salem, West Virginia, 1990
	M.B.A. Business Administration, Kent State University, Kent, Ohio, 1995
	Ed.D. Educational Leadership, East Tennessee State University, Johnson City, Tennessee, 2015
Professional Experience:	Diagnostic Radiologic Technologist, Sharon Regional Health System, Sharon, Pennsylvania, 1990
	Assistant Clinical Instructor and Afternoon Supervisor, Sharon Regional Health System, Sharon, Pennsylvania, 1990 – 1994
	Radiography Program Director, Sharon Regional Health System, Sharon, Pennsylvania, 1994 – 1997
	Faculty Member and Radiography Program Director, Riverland Community College, Austin, Minnesota, 1997 - 2001
	Assistant Professor, East Tennessee State University, Johnson City, Tennessee, 2001 – 2006
	Assistant Director, Joint Review Committee on Education in Radiologic Sciences, Chicago, Illinois, 2007
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