INTERFACE DESIGN AND STUDENT SATISFACTION WITHIN ONLINE

NURSING EDUCATION: A RANDOMIZED CONTROLLED TRIAL

A DISSERTATION

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

IN THE GRADUATE SCHOOL OF THE

TEXAS WOMAN'S UNIVERSITY

COLLEGE OF NURSING

BY

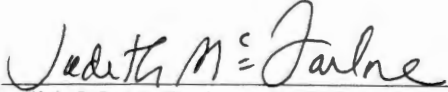KAREN K. PANCHERI, M.S.

DENTON, TEXAS

AUGUST 2009

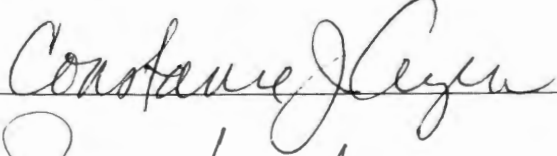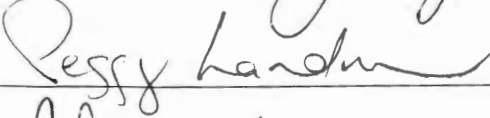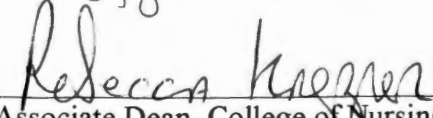TEXAS WOMAN'S UNIVERSITY
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To the Dean of the Graduate School:
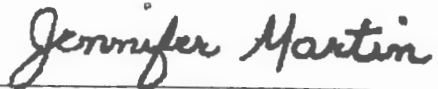
I am submitting herewith a dissertation written by Karen Pancheri entitled "Interface
Design and Student Satisfaction within Online Nursing Education: A Randomized
Controlled Trial." I have examined this dissertation for form and content and recommend
that it be accepted in partial fulfillment of the requirements for the degree of Doctor of
Philosophy with a major in Nursing.

_____
Judith M. McFarlane, DrPH, Major Professor

We have read this dissertation and recommend its acceptance:

_____

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Associate Dean, College of Nursing

Accepted:

_____
Dean of the Graduate School

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ABSTRACT

KAREN PANCHERI

INTERFACE DESIGN AND STUDENT SATISFACTION WITHIN ONLINE NURSING EDUCATION: A RANDOMIZED CONTROLLED TRIAL

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The institutions of higher education, including schools and colleges of nursing, are investing time, money, and resources in online education, a new paradigm of learning via cyberspace, with little evidence-based research. This two-group, post test only randomized control trial was conducted to determine if an interface designed to generate an affective response would result in higher student satisfaction than one designed in a conventional interface. A total of 332 nursing students who met the study criteria were randomized to the learning module in one of two interface designs, affective or conventional. A total of 293 indicated informed consent and participated in the survey. The Questionnaire for User Satisfaction (QUIS) was used to assess student satisfaction with the interfaces. Means scores were calculated for the responses to the QUIS and analyzed using Independent Samples t-tests. The results of the study found no significant difference in the student satisfaction total scores for affective interface design ($M = 7.81$, SD = 1.15) and conventional interface design ($M = 7.77$, SD = 1.08); $t(291) = .363, p = 0.358$ (one-tailed).

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CHAPTER I

INTRODUCTION

In 2007, more than 3.9 million students participated in at least one online course offered by an institution of higher education in the United States (Allen & Seaman, 2008). Over 80% of these students were at the undergraduate level and many educators indicated that online learning outcomes were the same as those face-to-face (Allen & Seaman, 2008). However, other experts asserted that online education would reduce the quality of education (Klass, 2000). In addition, Allen and Seaman (2008) reported that greater faculty time and effort was required to teach online and that online education costs more while Bishop (2006) stated that online education was cost effective relative to in-class education. Thus, institutions of higher education are investing time, money, and faculty resources in this new learning paradigm with conflicting opinions and little evidence-based research regarding the elements of online education associated with student satisfaction.

The interface of online education programs facilitates communication, connectivity, and interaction between faculty and student. Affective computing interfaces either influence or help to manage the emotional states of the users (Tractinsky, 2003). Affective computing deliberately influences the emotion of the user (Picard, 2000). It is important for web design to facilitate a positive, emotional connection between the user and the provider. Thus, within human computer interaction (HCI), research into the

affective aspects of computer design has progressed beyond the need for "working links" to ways to engage the user in emotional, persuasive design. The interface design can reflect affective actions such as protection, confidentiality, helping, sharing, interpersonal valuing, and respect in order to facilitate such affective feelings as trust, respect, and presence in the user, and may result in greater learning satisfaction.

Clearly, a major component of online education is the mode of presentation of the information, usually referred to as the interface design. Designs range from a very basic conventional interface of basic black on white and text-based to an affective interface with an aesthetic focus of specific colors, typography, imagery, and multimedia. These interfaces are associated with differences in time and costs. Measures of learner satisfaction associated with the range of designs (and associated time and costs) have not been established. The purpose of this research is to advance educational research and provide student satisfaction data following the use of an affective interface design compared to a conventional interface design.

Problem of the Study

Higher education is investing time, money, and faculty resources in online education courses with little evidence-based research regarding the elements of online education design associated with higher student satisfaction. One essential element of online education is the interface design. This randomized controlled trial will examine the impact of interface design in online education by measuring and comparing the satisfaction of baccalaureate student nurses interacting with a learning module presented within two different interface designs.

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Theoretical Framework

The theoretical framework for the study is based on the theory of usability, a design theory (Norman, 1988, 2004) and andragogy, an adult learning theory (Knowles, 1990). Norman's theory of usability in design puts the people who will use the product in the center of the design. Likewise, Knowles's theory of andragogy puts the learner in the center of the educational process (Huang, 2002).

The theory of usability in design classifies usability as part of the behavioral level of design (Norman, 2004). According to this theory, "good behavioral design should be human-centered, focusing on understanding and satisfying the needs of the people using the product" (Norman, 2004, p. 81). The theory of usability in design puts forth that the user is evaluating (affect) and interpreting (cognition) the product at each level of design. The behavioral level of design can influence the reflective level of design. In the reflective level of design, the user is thinking back about the product's appeal and effectiveness of use. Thus, the evaluation of usability involves the feelings people have when the product is used. When the user has been in the center of the design process, feelings of satisfaction are initiated (Norman, 1988).

Knowles's (1990) theory of andragogy describes the adult learning process. The assumptions of andragogy are based on the adult learner's need to know, self-concept, experience, readiness to learn, orientation to learning, and motivation to learn. The process elements of the theory include preparing the learners, climate, planning, diagnosis of needs, setting of objectives, designing, experiential learning activities and mutual evaluation (Knowles, Holton, & Swanson, 2005). The theory puts forth that adults

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are self-directed in their learning process. This self-direction is essential in online education (Knowles, et al., 2005). The theory reflects that the comfort of the adult learner in the learning environment is important to their learning. The theory of andragogy puts the learner in the center of the educational process (Knowles, 1990).

The proposed research tests if the independent variable of affective interface design increases user satisfaction when compared to conventional interface design. Both the independent and dependent variables are linked to theories of interface design and adult learning that focus on the student user. In online education, the interaction between educator and student is facilitated by the interface design of the online education content. Thus, an affective (emotional) triad is formed between educator, interface, and student. The interface reflects a negative or positive presentation of educational content from the educator. Wang (2003) stated that an online affective interface was "a summary affective response of varying intensity that follows asynchronous e-learning activities ..." (p.77). A level of satisfaction is one emotional response from the student to the interface design. Figure 1 illustrates this affective triad.
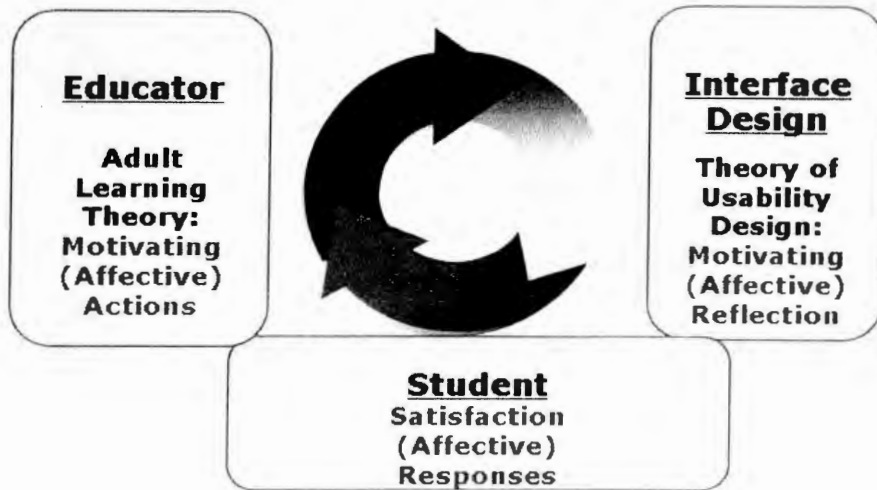
Figure 1. The affective triad.

Assumptions

The assumptions of the Affective Triad include:

1. The student is in the center of the education process (Knowles, 1990).

2. Human-computer interaction in online education puts the student in the center of focus (Norman, 1988).

3. Student-centered education and user-centered interface design motivate internal feelings, such as satisfaction in the student (Norman, 2002; Knowles, 1990).

Research Hypothesis

The following hypothesis directs the study: Students in a Bachelor of Science in Nursing program who view "NETS for Safe Stress: Nutrition, Exercise, Thought, Sleep" learning module within an affective interface via the internet will rate satisfaction significantly higher on the Questionnaire for User Interaction Satisfaction (QUIS) compared to students in the same Bachelor of Science in Nursing program who view the

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"NETS for Safe Stress: Nutrition, Exercise, Thought, Sleep" learning module within a conventional interface.

Definitions of Terms

1. A conventional interface is a means of interaction between two distinct entities designed to transmit information, not emotion. Usually, it is a black and white, text-based design.

2. An affective interface is conceptually defined as a means of interaction between two distinct entities that is designed to generate an emotional reaction as well as transmit information. Usually, it has an aesthetic focus of colors, typography, imagery, and multimedia.

3. Satisfaction is conceptually defined as "a summary affective response of varying intensity that follows asynchronous e-learning activities" (Wang, 2003, p.77). Operationally defined, satisfaction will be measured by the Questionnaire for User Interaction Satisfaction (QUIS, Version 7) (Slaughter, Harper, & Norman, 1994).

Limitations

There are limitations to this study.

1. The online learning module was experienced by baccalaureate nursing students at one university in the southwest United States. The generalizability to a broader population of baccalaureate students is unknown.

2. The mechanisms of access, such as internet connection reliability and screen size, to the online learning modules could affect the participant's satisfaction with the online learning module, regardless of interface design.

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3. The sample was limited to baccalaureate nursing students who chose to complete the online survey.

Summary

This study examined the differential satisfaction of baccalaureate nursing students with conventional and affective interface design when using an online learning module. The study was based on theoretical models from interface design and education that maintain that the student is the center of focus of the design of online education. These models also put forth that the emotional reaction of the student, expressed as satisfaction, is influenced by the affective presentation of educational content. The findings from this study will offer evidence for decision makers regarding resource allocation for the type of design for learning modules.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter presents a literature review related to online education, interface design, and student satisfaction. The sciences of education, computer science, communication science, cognitive science, psychology, and nursing intersect within this study. Thus, an interdisciplinary review of the literature was conducted.

Ambiguity exists in the terms meant to represent education via the World Wide Web. Education presented via the internet has been referred to as online education (Allen & Seaman, 2006, 2008), online learning (Vonderwell & Zachariah, 2005), web-based learning (Janicki & Liegle, 2001; Nam & Smith-Jackson, 2007), web-based education (MacFadden, 2007), internet-based learning (Cook et al., 2008), and e-learning (Cygman, 2008; Danchak, 2002; Gunasekaran, McNeil & Shaul, 2002; Williams & Nicholas, 2005). The Sloan Foundation (Allen & Seaman, 2008) designated that "online course" meant that over 80% of the course content was delivered online, not face to face. On the other hand, the U.S. Department of Education (Parsad & Lewis, 2008) presented their "online" statistics with the caveat that some institutions labeled courses as "online" with only 50% of actual online instruction.

However, even with such discrepancies in terminology, the statistics indisputably illustrate the importance of online education within undergraduate education. In the fall of 2007, over 20% of post secondary students in the United States participated in at least

one online course (Allen & Seaman, 2008) while over 86% of the 2,550 undergraduate institutions surveyed reported offering online courses (Parsad & Lewis, 2008). The number of students enrolled in online courses doubled from 2002 to 2007 (Allen & Seaman).

Online Education

In the 1970s, distance education evolved into online education, provided across the World Wide Web (Moore, 2003). Online education provided a new method of communication of educational materials with unique challenges and opportunities. Numerous studies have looked at possible differences in student learning, motivation, or satisfaction in online learning compared to traditional courses (face to face) in higher education. The majority of studies showed a lack of statistically significant difference in learning, motivation, or satisfaction, between the two methods (Bristol, 2005; Bucy, 2003; Cook et al., 2008; Simard, 2004). However, Norman (1993, p. 250) made the point that "technology was not neutral"; everything was influenced by it. Cook (2009) stated that research is needed to compare various online interventions in online education.

Research by Picard (2000), Fogg (2003), and Norman (2004) supported factors in interface design that motivated, persuaded, engaged, and encouraged the interface user that can be applied to online education. Picard (2000) introduced the concept of affective computers that recognized and displayed emotions while interacting with a person. Fogg (2003) examined human computer interaction in terms of computers as persuasive technologies. He named the intersection of computing technology and persuasion "captology." As a part of the development of captology, Fogg investigated the persuasive

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impact of similarity between humans and computers. He found that "people are more readily persuaded by computing technology products that are similar to themselves in some way" (p. 99). On the other hand, Norman (1988) specifically identified good design as having optimal visibility, mapping, conceptual modeling, and feedback. However, research into the design of the presentation of educational content via the interface in online education has been largely ignored (Cook, Billings, Hersch, Back, & Hendrickson, 2007; Bucy, 2003).

In nursing, the use of the term "online education" suffers from the same ambiguity as within distance learning. The American Nurses Association (ANA) (2009) supported the term online with a posting entitled "Online learning/tutorials". Using the search engine of articles within the ANA website, the term "online education" was found in 369 articles, "e-learning" in 207 articles, and "web-based" in 57 articles. There were duplicate articles within each category. The National League for Nursing (NLN) (2007) website referred to "online courses," "web-based teaching," "web-based courses," and "web education" within its website. However, the terms of e-learning, elearning, or electronic learning were not found on the NLN website.

Cook et al. (2008) found, in health profession studies published from 1990 through 2007, that nursing students participated in eight studies out of 201 eligible studies investigating internet-based education with no other intervention and in 15 out of 201 eligible studies comparing internet-based education with non-internet education.

Most studies reported no significant difference between student outcomes such as satisfaction in online courses compared to traditional courses although there have been a

few exceptions. One such study, a quasi-experimental study by Salyers (2007), compared the satisfaction in a traditional method to satisfaction within a web-enhanced method in a convenience sample of 35 undergraduate students. The course satisfaction questionnaire offered a Likert Scale ranging from 1 (low satisfaction) to 5 (high satisfaction). The means with standard deviations were 2.96 (SD = .84) for the web-enhanced method and 3.50 (SD = .65) for the traditional method, indicating that students were somewhat satisfied with the traditional instruction as compared to students in the enhanced course that seemed dissatisfied to neutral. An effect size of 0.11 indicated a small difference between methods in favor of the traditional, in-class course.

Cook, Billings, et al. (2007) compared a traditional print promotion program designed to improve nutrition, reduce stress, and increase physical activity to an online multimedia program with the same intent in a randomized controlled trial. The online group rated satisfaction with the program material significantly higher than the text group (F (2, 200) = 4.63, p = .005).

Interface Design

The addition of computer-mediated learning has created another type of interaction within the educational milieu, learner-interface interaction (Hillman, Willis, & Gunawardena, 1994). The learner interface, consisting of the devices, graphics, commands, and prompts, enables a computer to communicate with the student (Kleinedler & Leonesio, 2001). This interface provides the means for students to access educational content and to communicate and interact with faculty. The interaction can be synchronous, occurring at the same time or asynchronous, occurring at different times.

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A graphic user interface (GUI) uses images rather than plain text to facilitate interaction. The key components of the graphic interface are identity, page layout, typography, color and media (Rollins, 2002).

As the World Wide Web integrated into society, the principles of web design became more sophisticated. Usability heuristics for web interface design are now acceptable practice. Nielsen (1994) developed ten guidelines that have been incorporated into web design. These guidelines included such items as "match between system and the real world" (para. 3), "consistency and standards" (para. 4), and "aesthetics and minimalist design" (para. 8). The United States Department of Health and Human Services (2006) built an interactive resource for evidence-based usability guidelines. Waller (2004) suggested a seven-point check list that detailed such items as a good first impression, friendly image, easy navigation, useful content, appropriateness for audience, clear contact information, and comprehensive search engines. Usability in web interface design is broadened within the discipline of human-computer interaction (HCI). HCI places the user rather than the computer as the center and the focus of interface design. In doing this, the power of the user is recognized.

Interface design influenced student participation in online courses in a case study by Vonderwell and Zachariah (2005), involving 26 in-service teachers and students. In a review of the literature about online learning and effects of interfaces, Swan (2004) found that the online education interface had significant influence on the quality and quantity of student interaction with the content. In a study of 400 student users of service-oriented web sties, the ease of web navigation was found to be the least important factor for

students in a study related web site while color and font were the most important (Nathan & Yeow, 2008). In addition, research by Staggers and Kobus (2000) investigated 98 nurses in a randomized controlled trial comparing two different user interfaces. The graphic interface design resulted in greater user overall satisfaction ($F(1,97) = 197.93$; $p < 0.0001$) compared to text-based interfaces.

Affective computing systems either influence or help manage the emotional states of the users (Tractinsky, 2003). Emotions, the conscious experiences of affect, directly influence cognition and change thoughts (Norman, 2004). Users feel stressed when interacting with poor design (MacFadden, 2005). Picard et al. (2004) supported emergent computer technology that explored inanimate and animate ways to affect personal learning. MacFadden (2005) stated, "Increasingly, emotions are being viewed as mediating all learning" (p. 81).

For the educator today, there are web page design elements that provide an affective experience for the learner. Color, typography, multimedia, and writing style generated emotional response in the interface user (Cole, O'Keefe, & Siala, 2000; Lindgaard, 2007; Murphy, Stanney, & Hancock, 2003; Nathan & Yeow, 2008). However, Grunwald and Corsbie-Massay (2006) stated that the learning interface in online education needs to stay simple, minimizing the cognitive load. Thus, the focus of interface design has moved beyond the mere presentation of information to the affective, emotional realm.

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Student Satisfaction

The student responds to the affective interface with emotion. The feeling of satisfaction is a product of that emotion (Guolla, 1999; Robinson & Hullinger, 2008). Wang (2003) stated that e-learner satisfaction "is stimulated by several focal aspects, such as content, user interface, learning community, customization, and learning performance" (p. 77). The sum of the affective experience in online interactions results in positive or negative satisfaction in the student (Lindgaard, 2007).

University students have been involved in studies examining student satisfaction with online education. Johnson, Zhang, Tang, Johnson, and Turley (2004) measured student satisfaction with the overall system plus 11 specific subsets. An independent samples t-test found no significant difference in student satisfaction scores for the two systems ($t(79) = 0.157$, $p = 0.87$). Also, Kearns, Shoaf, and Summey (2004) investigated differences in nursing student satisfaction in a comparison study between a web-based course and a web-enhanced, traditional course. The web enhancements included a home page and email accessibility. The traditional course with web enhancements ($n = 24$, $M = 37.0$) had a significantly higher satisfaction score ($p < .0005$), M) than the web-based course ($n = 23$; $M = 27.1$).

Another study examined student satisfaction in terms of four different methods of online presentation (Maag, 2004). This randomized controlled study, involving 96 undergraduate nursing students, found that students in the interactive multimedia (text, image, animation, interactivity) group were more satisfied than those in the text, text and

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image, text and image and animation groups ($F(3,89) = 0.76$, MSE $= 0.99$, $p = 0.52$); effect size $= 0.30$. However, using Tukey a, the interactive multimedia satisfaction scores were not significantly different than the combined scores of the other three groups (t = 1.43; p=0.15).

Summary

This review of the literature examined studies of online education, interface design, and student satisfaction. Ambiguity existed throughout the review, from the terms used to represent online education to the level of significance between student satisfaction with affective interface design. Such institutions as the Sloan Foundation and the United States Department of Education defined online education with different percentages of online learning within a course (Allen & Seaman, 2008; Parsad & Lewis, 2008). Most studies reported no significant differences between student outcomes in online courses compared to in-class courses (Cook, et al., 2008). On the other hand, one study found students more satisfied with traditional instruction (Salyers, 2007) while another found student satisfaction higher with an online education module than a text-based education module (Cook, Billings, et al., 2008).

Research into the effects of interface design in online education found that such things as color, font, and graphics increased student participation and interaction (Vonderwell and Zachariah, 2005; Nathan & Yeow, 2008, Staggers & Kobus, 2000). Also, affective interface design was found to influence cognition, thoughts, and emotions. Student satisfaction with interface design was studied with different results, ranging from

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no significant difference to significantly higher differences (Johnson, et al., 2004; Kearns, et al., 2004; Maag, 2004).

CHAPTER III

METHODOLOGY

This study was a randomized, posttest-only control group experimental design (Campbell & Stanley, 1963) that investigated the effect of interface design on student satisfaction in undergraduate nursing students. The control group received a learning module in a conventional interface design. The independent variable was the affective interface design of the learning module. The dependent variable was the overall satisfaction score on the Questionnaire for User Interaction Satisfaction (QUIS) scale.

Setting

The setting for this study was a large, upper division baccalaureate nursing program in the southwest United States.

Population and Sample

Three hundred thirty-four baccalaureate nursing students enrolled in four undergraduate nursing classes participated in this randomized controlled trial. The specific courses and semesters were Nursing Assessment across the Life Span (Spring), Women's Health and Family Role Competencies (Spring), and Mental Health Competencies (Fall, Spring). The study was integrated into each course as a specific course assignment. Students were randomized, using SPSS v.12 (2003) software, to receive the online learning module in either the conventional or the affective interface.

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A review of the literature was conducted to determine the effect size for comparative studies of satisfaction and interface design in baccalaureate nursing education. One study met this criteria; Maag (2004) reported an effect size of 0.30, a moderate effect (Cohen, 1988). Thus, based on this review, a moderate effect size of was determined for this research. According to Cohen's (1988) estimation, a sample size of 280 students was required. Cohen's calculation is based on an effect size of 0.30, power of 0.80, and alpha of .05 (one-tailed) .

Pilot Study

A pilot study was completed in November, 2008 with 76 baccalaureate nursing students to determine such things as the rate of student participation in the module and questionnaire. The results of the pilot study found that no significant difference in the student satisfaction total scores for affective interface design (M = 7.18, SD = 1.65) and conventional interface design (M = 7.61, SD = 1.27); t (61) = -1.15, p =0.26 (one-tailed). Thus, the hypothesis was not supported in the pilot study.

Little attrition had been expected, since the learning module was integrated into required course content. However, even though 73 students viewed the module, only 63 students completed the QUIS questionnaire. An examination of possible solutions to this attrition for the full study resulted in placing the student's certificate of completion after the Statement of Informed Consent in PsychData. The study participants in the pilot study represented 22% of the total participants needed in the full study.

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Protection of Human Subjects

The protection of human subjects was assured by several measures. The

Institutional Review Board at Texas Woman's University (IRB-TWU) approved the study

(Appendix A.). Also, permission was granted to conduct the study within the

baccalaureate program of Texas Woman's University, College of Nursing, Houston

Campus (Appendix B.). Each study participant was presented a statement of informed

consent, as approved by the Institutional Review Board, via PsychData. No participant

identifying information was obtained. Each student was informed of the expected

completion time needed for the module and questionnaire. Moreover, the participants

were given the researcher's contact information to use if they had any other questions

about the study.

Instrumentation

The Questionnaire for User Interaction Satisfaction (QUIS) 7.0 (Harper, Slaughter,

& Norman, 1997) was used to measure student satisfaction with the interface design of an

online module in this study. The QUIS measures the user's perception of the interface

through assessment of the user's subjective satisfaction. It has proven reliability and

validity, developed through extensive and rigorous testing of seven versions at the

University of Maryland. The complete QUIS includes a demographic questionnaire, six

scales that measure overall system satisfaction, four measures of specific interface factors

plus optional sections to evaluate components of the interface such as multimedia. Each

section of the QUIS has established reliability. The item on each scale is rated in a

hierarchal measure from 1 to 9 plus "not applicable". Also, a space for participant

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comments is provided. The QUIS was first tested in 1988 (Chin, Diehl, & Norman, 1988) with a resulting reliability of 0.939, using Cronbach's alpha. The QUIS version 5.5 and above established the reliability of each section of the QUIS enabling users to use only those sections applicable to their unique study (Harper & Norman, 1993). The seventh version of QUIS had a reliability of 0.95, using Cronbach's alpha (Harper, Slaughter, & Norman, 1997).

The Questionnaire for User Interaction Satisfaction (QUIS) versions 1 through 4 were tested on academic interfaces within a university student population. Version 5.0 expanded the sample beyond academia to commercial/industrial users, international education and research, and domestic education and research users. This expansion generalized the reliability to a more diverse population. The QUIS has recently been used by the Statistical Research Division of the United States Census Bureau to evaluate the interface of their data tables (Ashenfelter, Beck, & Murphy, 2009). The quantity of research using the QUIS with resulting publication in peer-reviewed journals plus the descriptions within these research reports pertaining to the use of the QUIS to measure satisfaction with interface provided evidence of construct validity. This study used the QUIS sections pertaining to overall user reactions, screen design, and online tutorials. A total of 17 scaled questions were presented. In order to provide clarity for this research, the term "module" was substituted for "tutorial".

Intervention

This study compared student satisfaction with an online learning module presented in a conventional interface design to an online learning module presented in an

affective interface design. Educational content and presentation design are the key components of any learning module. In this study, the modules were developed by the primary investigator, pulling together information from various sources. A heuristic evaluation was performed to assure that established standards of usability were met. The content of the modules was selected because it was information that would be of interest to the generic nursing student. The conventional and affective modules had the same content; however, the presentation of the content was different. The conventional module presented the content in a text-based, hierarchal style, similar to a textbook. The content presented in the conventional interface was reinforced with text-related differences: font size, underlining, bolding, and italics. It was written in a third person, factual style.

In contrast, the affective module presented and reinforced the content with special, typography, first person writing style, video, colors, and pictures. The short videos contained interviews with baccalaureate students similar to the participants of this study. The students in the videos were discussing the stressor they experienced in school and what actions they took to decrease stress. In the online module design, the colors were specifically selected to reinforce the topic under discussion. For instance, the color green was connected to information about sleep because it is associated with restfulness (Madden, Hewett, & Roth, 2000). Charts and tables were colorfully illustrated with figures related to a student's point of view.

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Data Collection

Following Institutional Review Board (IRB) approval, the faculty of four baccalaureate nursing courses included the online educational module in their syllabus as a required course assignment. The enrolled students were randomized to receive the online education module in either the affective interface design or conventional interface design. The faculty was blinded as to which interface design presentation of the online education module the student received. Via university email, each student was provided the specific web-link for the module, information about the expected time needed to complete the module plus questionnaire, and a name and number to contact if any questions or problems occurred with the assignment. Students were given 10 days to complete the online module and questionnaire. Reminder emails were sent to the students on the 7th and 9th days.

At the end of the online learning module, the student was linked to a Statement of Informed Consent via PsychData.com, an online survey tool. When the student consented to participate in the survey, the online version of the Questionnaire for User Interaction Satisfaction (QUIS) was provided.

Treatment of Data

The student responses to the Questionnaire for User Interaction Satisfaction (QUIS) (Harper, Slaughter, & Norman, 1997) were collected online via PsychData and then downloaded into SPSS statistical software. Mean scores were obtained and an independent samples t-test performed. The profile of each design, conventional and affective, was generated by calculating the means and standard deviations for each item

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in the QUIS. In each analysis, responses that were left blank or marked "not applicable" were excluded.

CHAPTER IV

ANALYSIS OF DATA

The purpose of this research was to advance educational research and measure student satisfaction data following the use of an affective interface design compared to a standard interface design. Students enrolled in four baccalaureate nursing classes within a College of Nursing in a large university in the southwest United States formed the sampled population. Three sections of the Questionnaire for User Satisfaction (QUIS) (Harper, Slaughter, & Norman, 1997) were used to determine student satisfaction with the interface of the online module. The QUIS sections included overall reactions, screen, and online module. These sections were chosen for their applicability to the educational interfaces being tested (Harper & Norman, 1993). Descriptive statistics were used to summarize the data. An independent t-test analyzed the difference between group means.

Description of the Sample

The online module entitled "NETS for Safe Stress: Nutrition, Exercise, Thought, Sleep" was included as an assignment within the class syllabus of four baccalaureate nursing classes. The specific courses and semesters were Nursing Assessment across the Life Span (Spring), Women's Health and Family Role Competencies (Spring, and Mental Health Competencies (Fall, Spring). Each of the four classes had a clinical component and was required for graduation. A total of 332 students were enrolled in these four classes; thus, they met the inclusion requirements for the study. These students were

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randomized into an experimental group who would view the online learning module in an affective design (*n*=166) and a control group who would view the online learning module in a conventional design (*n*=166). At the end of the online module, each student was offered an explanation of the research study and asked to complete the Questionnaire for User Satisfaction (QUIS) (Harper, Slaughter, & Norman, 1997). Nineteen students in the affective interface and nine students in the conventional interface group did not offer informed consent and therefore, did not participate in the satisfaction survey. Also, participants with 10% or greater missing values, including those items marked as "not applicable" were excluded from further analysis. This excluded four participants in the affective design group and seven participants in the conventional design group. The analysis proceeded with a total of 293 participants, 143 randomly assigned to the affective interface and 150 randomly assigned to the conventional interface (see Figure 2).
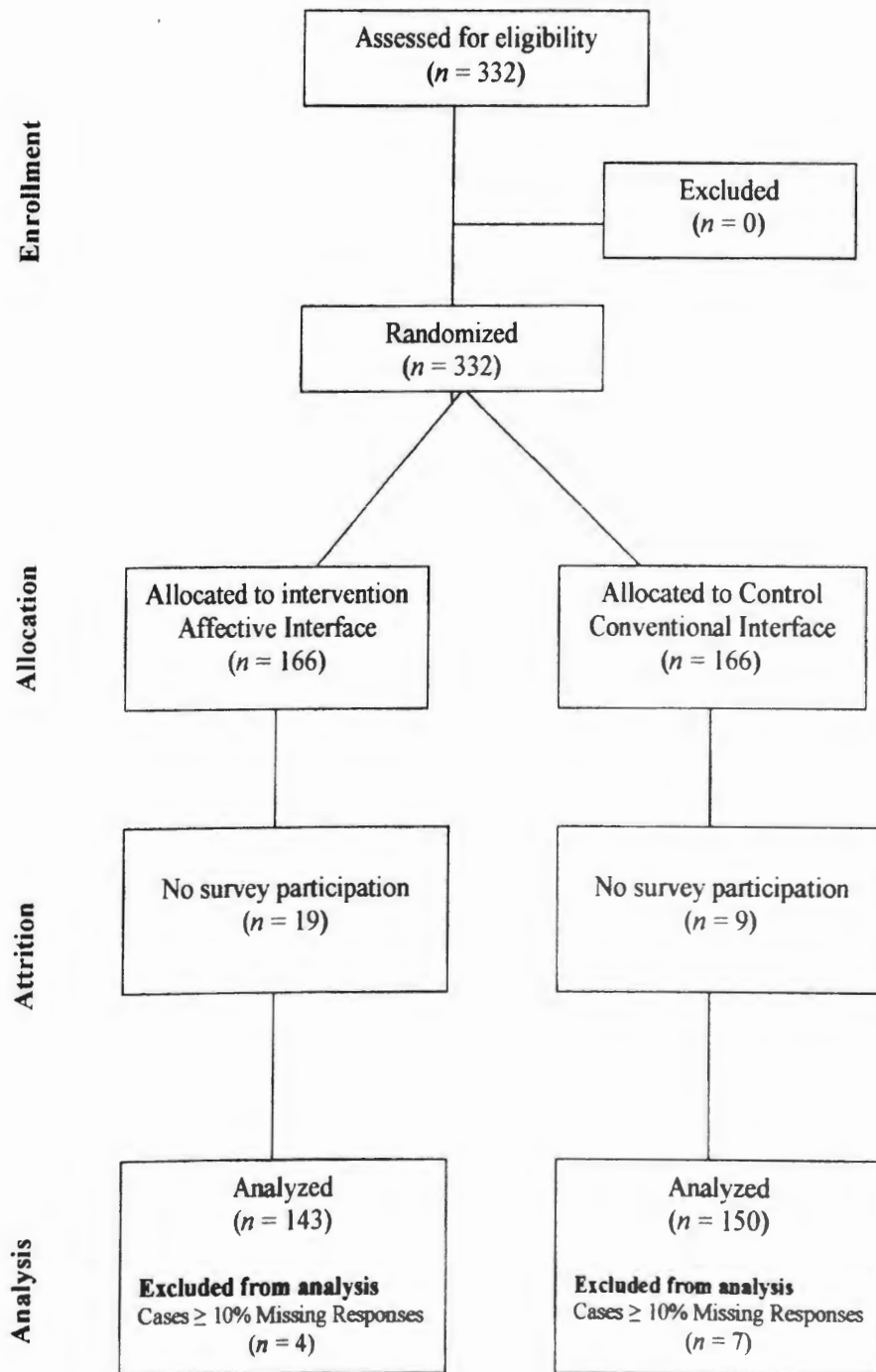
Figure 2. Participant flow through study

Findings of the Study

The hypothesis tested was: Students in a Bachelor of Science in Nursing program who view "NETS for Safe Stress: Nutrition, Exercise, Thought, Sleep" online learning module within an affective interface via the internet will rate satisfaction significantly higher on the Questionnaire for User Interaction Satisfaction (QUIS) compared to students in the same Bachelor of Science in Nursing program who view the "NETS for Safe Stress: Nutrition, Exercise, Thought, Sleep" online learning module within a conventional interface. The QUIS was offered at the end of the online module via PsychData.com. The individual sections of the Questionnaire for User Satisfaction, overall user reaction, online tutorial (module), and screen layout, demonstrated no significant difference in student satisfaction within the affective or conventional interface design. These results are presented in Table 1.

Table 1

Means, Standard Deviation (SD), Independent Samples t-Test of QUIS

Ratings for Overall Reaction, Screen, and Online Module

	Interface	N	Mean	SD	t	Sig (1-tailed)
Overall Reactions	Affective	143	7.53	1.31		
	Conventional	150	7.33	1.42		
					1.2	.10
Screen	Affective	143	7.96	1.23		
	Conventional	150	8.00	1.11		
					-.32	.38
Online Module	Affective	143	7.96	1.22		
	Conventional	150	7.97	1.22		
					-.09	.47

Note. Range: 1 = most negative, 9 = most positive

The Total Satisfaction scores for the affective interface group and the conventional interface group were calculated based on the total of the section means. An independent-samples t-test (one-tailed) was conducted to compare the total mean scores of student satisfaction generated by the affective or conventional interface. There was no significant difference in the total mean scores for student satisfaction with the affective interface design. These results are presented in Table 2.

Table 2.

Means, Standard Deviation (SD), Independent Samples t-Test of QUIS Ratings

for Total Satisfaction

	Interface	N	Mean	SD	t	Sig (1-tailed)
Total Satisfaction	Affective	143	7.81	1.15		
	Conventional	150	7.78	1.08		
					.363	.358

Note. Range: 1 = most negative, 9 = most positive

After the t-tests were performed, a Cohen's d was calculated for each group to determine the effect size of each. The Overall Reactions to the modules had a small effect while the satisfaction with screen and online module had negligible effects. The Total Satisfaction (the combination of the three section scores) also had a negligible effect. These results are presented in Table 3.

Table 3.

Cohen's d effect size for Total Satisfaction, Overall Reaction, Screen, OnlineModule

	Cohen's *d*	Effect
Overall Reaction	0.15	Small
Screen	0.03	Negligible
Module	0.01	Negligible
Total Satisfaction	0.04	Negligible

Summary of the Findings

A sample of baccalaureate nursing students participated in this randomized, posttest-only control group experimental study designed to determine if an affective interface within online education would generate higher student satisfaction than a conventional interface. The Questionnaire for User Satisfaction (Harper, Slaughter, & Norman, 1997) was the tool used to measure student satisfaction with the interface. Descriptive statistics and an independent samples t-test (one-tailed) were used to determine the difference between groups and test the hypothesis. The statistical analysis revealed no significant difference in student satisfaction with an online module presented within an affective interface and a conventional interface . There were also no significant differences in the sub-sections of the QUIS. The affective interface did not achieve higher satisfaction scores than the conventional interface.

CHAPTER V

SUMMARY OF THE STUDY

There is a crucial need for evidence-based research within nursing education. The complex world of online education requires extensive expenditure of staff, resources, and money. Faculty shortages and a tight economic climate have increased pressure on institutions of higher education to decrease the cost of education while increasing user satisfaction. However, few studies have examined the facets of online education in relation to user satisfaction. The student is one such user of online education.

Online education creates a theoretical intersection between education theory and human computer interaction (HCI) theory. The conceptual underpinning for this research rests on the theory of adult learning of Knowles (1990) and the theory of usability in design by Norman (1988, 1993). Within the educational environment, both of these theories put the student in the center of the process and contend that student satisfaction is an important outcome. Student satisfaction can influence student problem solving, perceptions, motivation, and reasoning (Picard et al., 2004). An interface facilitates communication, connectivity, and interaction between two distinct entities; therefore, a critical part of online education is the interface design in which the content is presented in. This study examined the effect of interface design within an online module on student satisfaction

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Summary

A randomized post-test only control group experimental design was used to examine the level of baccalaureate nursing student satisfaction with interface design in online education. An online education module was designed in an affective interface and a conventional interface. The online module was a part of the syllabus for four baccalaureate nursing courses comprised of 332 unique students. Following approval by the Institutional Review Board and the university, the students were randomized into two groups, receiving the online module in either the affective or the conventional interface. At the end of the module the students were directed to the online survey tool of PsychData.com. After indicating informed consent, a total of 293 students completed 90% or more of the Questionnaire for User Interaction Satisfaction (Harper, Slaughter, & Norman, 1997). This tool was used to measure student satisfaction with the interface design. The students had a 10 day period to complete the module and, if they chose, the QUIS. The student's ratings of satisfaction were analyzed using SPSS (SPSS, 2003).

Three sections of the Questionnaire for User Interaction Satisfaction (QUIS) (Harper, Slaughter, & Norman, 1997) were used to evaluate student overall satisfaction, screen design satisfaction, and tutorial (module) satisfaction. The questionnaire also provided an opportunity for student comment. A total of 304 questionnaires were submitted. The responses were inputted into SPSS 12.0 (SPSS, 2003) for analysis. A preliminary analysis found 11 participants that had less than 10% responses. These participants were eliminated from further analysis. The remaining 293 randomized participants were examined in terms of the research hypothesis: Students in a Bachelor of

Science in Nursing program who view "NETS for Safe Stress: Nutrition, Exercise, Thought, Sleep" learning module within an affective interface via the internet will rate satisfaction significantly higher on the Questionnaire for User Interaction Satisfaction (QUIS) compared to students in the same Bachelor of Science in Nursing program who view the "NETS for Safe Stress: Nutrition, Exercise, Thought, Sleep" learning module within a conventional interface.

Discussion of the Findings

Few randomized controlled trials have studied the effects of interface design on university students. After statistical analysis of the responses of 293 baccalaureate students in a Bachelor of Science in Nursing (BS) program, the results of this study found no significant difference in the student satisfaction total scores for affective interface design ($M = 7.81$, SD $= 1.15$) and conventional interface design ($M = 7.77$, SD $= 1.08$); t (291) $= .363$, $p = 0.358$ (one-tailed). There were no significant differences in the total satisfaction score or in the subsets of overall satisfaction, screen design satisfaction, or module satisfaction.

Also, few studies have examined the effects of interface design in online learning in relation to student satisfaction. The online learning modules presented within conventional and affective interface design for this research were very similar to those produced within various course management systems (CMS) in higher education. The conventional interface consisted of black and white text with bolding, underlining, and italics. The affective interface consisted of short video clips, colored graphics, colored coding to generate affective response and language suggested in emotional design. Both

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interfaces followed the rules of usability. The affective and conventional interfaces were designed to reinforce the learning content; however, the elements of the affective interface were hypothesized to increase student satisfaction. Through the Questionnaire for User Interaction Satisfaction (Harper, Slaughter, & Norman, 1997), the students expressed the no significant difference between satisfaction with the affective interface design and satisfaction with the conventional interface design.

Conclusions and Implications

The results of this study about student satisfaction with an online module presented in two different interface designs led to the following conclusion: baccalaureate nursing students did not reflect higher satisfaction when viewing an online module within an affective interface design than when viewing the online module within a conventional interface design.

The results of this study demonstrated the vital need for evidence-based research within this discipline. All of the existing theories pointed to an overwhelming support of the affective interface design as a means to initiate higher student satisfaction in the online interface. However, the research in this study resulted in no significant difference in student satisfaction between the conventional interface design and the affective interface design.

The following implications for nursing education can be extrapolated:
1. The complexity of the interface design in online education may not increase student satisfaction.

2. Theory supporting interface design needs to be confirmed by evidence-based research within the educational milieu.

Recommendations for Further Study

The results of this study confirmed the need for further research into this critical area. Recommendations for future studies include:

1. Learning outcomes of students interacting with online content within the conventional interface and affective interface should be examined and compared with student satisfaction.

2. Evidence-based research on differences in satisfaction and learning between asynchronous online education and other online venues such as education in virtual reality should be performed.

3. Institutional course design requirements and online teaching support should be examined and compared with faculty satisfaction in online teaching.

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APPENDIX A

IRB Approval

TWU

EXAS WOMAN'S UNIVERSITY

DENTON DALLAS HOUSTON

Office of Research
6700 Fannin Street
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713-794-2480   Fax 713-794-2488

April 8, 2009

Ms. Karen Pancheri
College of Nursing-J. McFarlane Faculty Adv
6700 Fannin Street
Houston, TX 77030

Dear Ms. Pancheri:

Re: *"Interface design and student satisfaction within online nursing education: A randomized
controlled trial"*

The above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and was
determined to be exempt from further review.

Any changes in the study must receive review and approval prior to implementation unless the change
is necessary for the safety of subjects. In addition, you must inform the IRB of adverse events
encountered during the study or of any new and significant information that may impact a research
participant's safety or willingness to continue in your study.

Sincerely,

John D. Radcliffe

Dr. John Radcliffe, Chair
Institutional Review Board - Houston

APPENDIX B

Agency Approval

TWU
TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

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Pioneering Nursing's Future:
An Adventure in Excellence

April 7, 2009

Dr. Ruth Johnson
Associate Dean of the Graduate School
Texas Woman's University
P.O. Box 425649
Denton, TX 76204-5649

RE: Doctoral Candidate and PI: Karen G. Pancheri (0002136)
         Dissertation Chair: Dr. Judith McFarlane

Dear Dr. Johnson:

This letter is to convey that I have reviewed the proposed research study, being conducted by Karen Pancheri, intended to conduct evidence-based research into baccalaureate student satisfaction with online education. I am aware that she will conduct this research by administering an online survey to students enrolled in our baccalaureate nursing program at Texas Woman's University, School of Nursing, Houston Campus. I find the study acceptable.

I give permission for Karen Pancheri to conduct research at this site. If you have any questions regarding this permission letter, please contact the undersigned at cayers@twu.edu.

Sincerely,

Dr. Constance Ayers

Program Coordinator
Baccalaureate Nursing Program