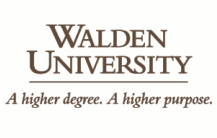

2018

Effect of Augmented Reality on Anxiety in Prelicensure Nursing Students

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This is to certify that the doctoral dissertation by

Sarah Ball

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
2018

Abstract

Effect of Augmented Reality on Anxiety in Prelicensure Nursing Students

by

Sarah Ball

MSN, Walden University, 2013

BSN, Clarkson College, 1995

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Nursing Education

Walden University

August 2018

Abstract

Prelicensure nursing students experience high anxiety as they enter the clinical setting, which can have a negative impact on learning care performance and critical thinking. Nursing faculty are faced with the challenges of limited time for clinical experiences, meeting the needs of learners who are technologically astute, and engaging students in the clinical environment to meet learning outcomes. The purpose of this pretest posttest quasi-experimental study, guided by the discovery learning theory, was to determine the effect of augmented reality (AR) 360 photosphere on prelicensure nursing students' level of anxiety as they entered a new clinical environment as compared to prelicensure nursing students' level of anxiety who did not experience AR 360 photosphere orientation. Forty-seven students completed the Spielberger's State-Trait Anxiety Inventory with 17 completing a faculty-led orientation and 30 using the AR 360 photosphere orientation method. An independent *t*-test revealed no difference between the two methods of orientation in prelicensure nursing students' anxiety levels in the immediate first clinical experience. Though no statistical difference was evident, the technology platform of AR 360 photosphere orientation allowed for autonomous orientation without having to overcome clinical environment variances. The findings of the study contribute to positive social change by indicating that the AR 360 photosphere demonstrated value as a consistent and efficient method of clinical orientation as students' encounter new environments and new evidence-based care that requires orientation.

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Dedication

I dedicate this to my grandfather, who 30 years ago with my first job as a grocery store checker stated to me “Every doctor has to start somewhere.” How did you know that one day I would be Dr. Sarah Ball?

Acknowledgments

I would like to thank my family and friends, as they encouraged me to start this journey and have supported me with prayers and understanding while I spent many hours away. Especially my husband and children who have accepted my computer and books as part of the family as they too attended your extracurricular activities and shared my time at family and holiday events. To my children, I hope one day I can encourage and support you with your scholarly journey as you reach for your life goals. To my husband, who did not realize from the moment we met seven years ago that with my decision to go back to school for my master's would lead to my PhD. You have been there to wipe every tear, push me forward when I was ready to give up, and now celebrate in my accomplishments. Thank you, and I hope you are ready to spend some time together.

I want to take a moment to state my appreciation for the committee members who shared my goals and helped guide me on this journey. Dr. Hussey, even during difficult times, you were always there to mentor and support me. You made sure to point out even the smallest of accomplishments to keep me motivated at each step to reach the final destination. I would have never been able to accomplish my terminal degree without your personal commitment and time. Dr. Bailey, your timing of being the faculty for my fourth residency during my data collection was not coincidence. You gave me that last rejuvenation to keep me motivated on my daily writing and help me see how far I had come and how close I was to the end with a study that had ongoing future implications.

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Chapter 1: Introduction to the Study

First-time clinical settings bring apprehension and anxiety to undergraduate nursing students, compromising their ability to maximize their learning (Foley, 2016). The increased anxiety negatively impacts student learning, care performance, and critical thinking in a clinical environment (Cheung & Au, 2011; Khalaila, 2014). Nursing faculty must provide techniques to help students find psychological resiliency allowing adaptation to the setting, which will allow learners to maximize their learning experience and gain the ability to provide patient care effectively (Foley, 2016). As nursing academia seeks to find an innovative method to address the needs of students, other professions have been utilizing technological advances such as augmented reality (AR; O'Shea & Elliott, 2015). The use of AR as a clinical orientation tool may be beneficial in decreasing nursing student anxiety levels, as AR can allow the student to review the clinical settings multiple times to orient themselves to the clinical site.

Redefining the delivery of nursing education by incorporating technology into the orientation process can lead to a positive social change. This social change follows the Quality and Safety Education for Nursing Institute efforts by being committed to a culture of safety. Through the strategic incorporation of technology into the orientation process, the transition to the clinical environment will be enhanced and will demonstrate commitment to patient care (Olds & Dolansky, 2017; Porter, Haberling, & Hohman, 2016; Trossman, 2016). This technology applies to not only prelicensure nursing students but also new healthcare employees or existing staff being educated on the environment or new evidence-based clinical practices. As minimal published literature on the use of AR

in nursing education exists, evaluating the use of AR and the added value it brings by decreasing the students' anxiety level before their clinical experience could provide an innovative methodology for nursing academia.

The purpose of this study was to determine the effect that the use of AR 360 photosphere technology had on prelicensure nursing students' level of anxiety as they entered a new clinical environment compared to prelicensure nursing students' level of anxiety who did not experience AR 360 photosphere orientation. As minimal published literature on the use of AR in nursing education exists, a quasi-experimental approach was used to understand if AR has value in nursing education by reducing nursing student anxiety levels. If the innovative technological use of AR can reduce anxiety levels, nursing academia may have a new strategy and teaching approach to give nursing students the opportunity to maximize their clinical experience and achieve learning outcomes.

In this chapter, I will begin with a review of the background on undergraduate prelicensure nursing students' and their anxiety levels as they enter a new clinical setting. The research questions and hypotheses were focused on the effect that AR 360 photosphere orientation has on prelicensure nursing students' level of anxiety as they enter a clinical environment. The discovery learning theory, which was used as the framework for the quasi-experimental study, will be reviewed followed by in-depth definitions of the variables used for the study. The assumptions will be examined, along with the delimitations and limitations that may have affected the study.

Background

The literature notes the difficulty faced by nursing students from high anxiety as they enter the clinical setting. This elevated anxiety level affects the student's learning care performance and critical thinking in a clinical environment (Cheung & Au, 2011; Khalaila, 2014). The academic nursing field has found the need to adapt their teaching methodology to accommodate many circumstances including the shortage of nursing faculty, a decrease in clinical site availability that leads to reduced clinical experiences, and the new era of learners (Nardi & Gyurko, 2013; Rosseter, 2015; Skiba, 2014). Through the practical, cost-effective use of technology and application tools such as AR, educators can implement teaching strategies that capture learners in a multitude of settings (Blattner & Lomicka, 2012; Ferguson, Davidson, Scott, Jackson & Hickman, 2015; Garrett, Jackson, & Wilson, 2015). These settings include on-campus, off-campus, and clinical settings.

Studies on AR have shown how it can affect students' knowledge in clinical studies. For example, Garret et al. (2015) found that students had increased their clinical skill knowledge in the clinical lab setting with the use of AR. Both students and educators found practical uses for the AR technology as they had the ability to access resources to support self-directed learning and skills review through the AR applications (Garret et al., 2015). The results suggested that future educational AR resources would be beneficial for clinical areas such as orientation to new information and skill training (Garret et al., 2015).

Learners find value and embrace the connection to technology, allowing them to be self-directed with their learning to achieve outcomes that will prepare them for future professional experiences and will foster self-efficacy (Dede, 2014; Skiba, 2014). Given the initial success of AR in other professional areas, this approach may provide answers for the new breed of learners who are now actively learning in multiple settings (Garret et al., 2015; O'Shea & Elliott, 2015). These learners are enhanced by their mobile devices and possess the ability to learn with increasing confidence in multiple clinical settings efficiently if given the right tools and support to be successful.

A review of the literature showed studies on the effectiveness of AR in educating professionals in aviation, architecture, and engineering (O'Shea & Elliott, 2015); however, AR is being increasingly used in healthcare settings. Literature has been published on the use of AR to decrease anxiety levels in nonnursing professions and how performance improves when the anxiety level is perceived as manageable to an individual (Bissonnette, Dube, Provencher, & Moreno Sala, 2016; Riva, Banos, Botella, Mantovani, & Gaggioli, 2016). Within the last decade, healthcare and education have started using AR in focusing on the skill development of the healthcare professional (Garrett et al., 2015; Smith & Foley, 2016; Spoto, Bourhaleb, & Petrone, 2016). Though literature has been published on AR for other professions, there was minimal literature on the use of the 360 photosphere, a form of AR, to decrease prelicensure nursing students' anxiety levels before entering a new clinical environment. AR 360 photosphere is a panoramic 360 degree view of an environment that has embedded images an individual can actively interact with (Andert & Alexakis, 2015; Wong, 2016). The panoramic 360-degree view

of the AR 360 photopshere allows sensorial immersion as the individual interactively experiences the environment from a distance (Dunleavy, 2014; Giard & Guitton, 2016; Lyons, 2017; & Wong, 2016). As discussed by Giard & Guitton (2016), the new tool of AR 360 photosphere provides opportunities and theoretical questions to be explored as it is introduced into the educational setting.

Given the changes in healthcare, academia seeks opportunities in ensuring that learning outcomes are met to develop professional nurses who provide safe and quality care. Research has related how clinical environment and psychological factors have a significant effect on nursing students' learning outcomes and professional development (Jun & Lee, 2017; Liao & Liu, 2015). When a prelicensure nursing student is exposed to new and unfamiliar situations such as a clinical setting, anxiety can affect nursing students' learning and professional development (Bayoumi, Elbasuny, Mohamed mofereh, Mohamed assiri, & Al, 2012; Jun & Lee, 2017; Liao & Liu, 2015; Wedgeworth, 2016). An evaluation of nursing students' perceived anxiety levels in the clinical environment revealed that over 53% of nursing students have mild to moderate anxiety during their clinical experience (Bayoumi et al., 2012). Another study showed that nursing student anxiety levels were significantly higher than other college students and specifically highlighted how nursing students beginning clinical nursing courses experienced the highest level of anxiety during this time period of learning (Wedgeworth, 2016).

Optimizing the learning experience in the clinical setting is one way to achieve learning outcomes. By preparing the prelicensure student with self-exploratory AR 360

photosphere orientations before the experience, anxiety levels can decrease and allow students to embrace the experience. By decreasing student anxiety, the student's focus will be concentrated on clinical thinking and skills that will enhance the level of student learning (Dunleavy, 2014; Jun & Lee, 2017). The student can embrace the experience through self-reflection of the environment in conjunction with past orientation experience, allowing the student awareness of the environment and the opportunity to spontaneously act through clinical performance instead of reacting to the clinical exposure (Andert & Alexakis, 2015; Riva et al., 2016). The increased awareness of the clinical setting results in an increase in the opportunities for optimal care performance and critical thinking, producing self-efficacy in providing safe and quality patient care by the future generation of professional nurses.

Problem Statement

First-time clinical settings bring apprehension and anxiety to undergraduate nursing students, compromising their ability to maximize their learning performance (Foley, 2016). This increased anxiety negatively impacts student learning, care performance, and critical thinking in a clinical environment (Cheung & Au, 2011; Khalaila, 2014). Nursing faculty must provide techniques to help students find psychological resiliency that allows for adaptation to the setting and allows learners to maximize their learning experience and have the ability to provide patient care effectively (Foley, 2016).

The academic nursing field has also found the need to adapt teaching approaches to accommodate logistical circumstances including the shortage of nursing faculty, a

decrease in clinical sites available, and the new era of learners who are technology savvy and seek immediate feedback (Nardi & Gyurko, 2013; Rosseter, 2015). During these circumstances, nursing students continue to report an elevation in their anxiety level before entering their first clinical setting (Khalaila, 2014). As nursing academia seeks to find an innovative method to meet the needs of students, other professions have been utilizing technological advances such as AR to educate pilots, architecture students, and engineers for the last decade (O'Shea & Elliott, 2015).

AR is defined as the technological ability for individuals to connect to experiences in real time as they view 3D virtual objects that are placed in a 3D real-world environment (Azuma, 1997; Dede, 2104). The education and healthcare fields have not adopted AR in the same manner as other industries because of various issues such as resistance to change from traditional learning methods, the cost of development and maintenance of the AR system, and the resistance to technology (Dede, 2014; Lee, 2012). Garrett et al. (2015) completed a study on the use of AR in healthcare education and found AR to be a cost-effective strategy for increasing students' confidence and competence. The study suggests that future educational AR resources could be valuable in clinical areas such as orientation to share new information and skill training (Garrett et al., 2015). The use of AR as a clinical orientation tool may be beneficial in decreasing student anxiety levels, as AR will allow the student to actively review the clinical settings multiple times to orient themselves to the clinical site. As there is minimal published literature on the use of AR in nursing education, evaluation of AR and the added value in

decreasing the students' anxiety level before their clinical experience may provide an innovative methodology for nursing academia.

Purpose

The purpose of this study was to determine the effect of AR 360 photosphere on prelicensure nursing students' level of anxiety as they entered a new clinical environment compared to prelicensure nursing students' level of anxiety who did not experience AR 360 photosphere orientation. The purpose was driven by the recommendation of the Institute of Medicine (IOM). The IOM focused on how nurse educators need to develop and evaluate new approaches to teaching clinical education that allow prelicensure nurses to gain knowledge of real-world context (IOM, 2011). Because there is minimal literature on the use of AR in nursing education, a quasi-experimental approach was used to understand if AR can help reduce nursing student anxiety levels. If the innovative technological use of AR can help decrease anxiety, nursing academia may have a new strategy that provides a teaching approach that will give nursing students the opportunity to maximize their clinical experience and achieve learning outcomes.

Research Questions and Hypotheses

The research question that drove the study was: What is the effect of augmented reality 360 photosphere on prelicensure nursing students' level of anxiety as they enter a clinical environment as compared to prelicensure nursing students' level of anxiety that do not experience augmented reality 360 photosphere?

$H_0$1: There will be no difference in the prelicensure nursing students' level of anxiety that experience augmented reality 360 photosphere as they enter a clinical

environment as compared to prelicensure nursing students' level of anxiety who do not experience augmented reality 360 photosphere.

H_a1: There will be a decrease in the prelicensure nursing students' level of anxiety that experience augmented reality 360 photosphere as they enter a clinical environment as compared to prelicensure nursing students' level of anxiety who do not experience augmented reality 360 photosphere.

The second research question was: When controlling for chronic trait anxiety, what is the effect of the augmented reality 360 photosphere on prelicensure nursing students' level of acute anxiety as they enter a clinical environment as compared to prelicensure nursing students' level of acute anxiety who do not experience the augmented reality 360 photosphere?

$H_0 2$: When controlling for chronic trait anxiety, there will be no difference in the acute anxiety level in prelicensure nursing students' who experience augmented reality 360 photosphere as they enter a clinical environment as compared to prelicensure nursing students' level of acute anxiety who do not experience the augmented reality 360 photosphere.

$H_a 2$: When controlling for chronic trait anxiety, there will be a decrease in the acute anxiety level in the prelicensure nursing students' who experience augmented reality 360 photosphere as they enter a clinical environment as compared to prelicensure nursing students' level of acute anxiety who do not experience the augmented reality 360 photosphere.

Theoretical Foundation

The discovery learning theory was the foundational theory that guided the study. Developed by Jerome Bruner, the discovery learning theory is focused on how learners are autonomous, active, and experimental as they obtain knowledge and reach learning outcomes (Bruner, 1966, 1996). Other professional and nursing professional studies have also included Bruner's discovery learning theory as a guide to effective and meaningful teaching methods. These examples will be reviewed in Chapter 2 and compared to the methods of application with the study.

The discovery learning theory fits well with this studies' focus on the active use of AR as a method of orientation to decrease student anxiety. The constructivist framework of the theory is focused on how active self-discovery learning is more conducive to long-term retention of the obtained new information (Bruner, 1996). In past AR projects with engineering and architecture students, where learning time and space is a challenge, the deductive theory was used to acquire information in different learning scenarios (Behzadan & Kamat, 2012). As suggested by previous research, AR resources could be valuable in clinical areas such as orientation to acquire new information through self-discovery (Garrett et al., 2015).

Bruner's discovery learning theory includes three modes for how a learner interprets, constructs, and maintains the knowledge: enactive, iconic, and symbolic (Bruner, 1996). The learner can draw from existing knowledge to discover facts, relationships, and organize this data to problem solve and obtain new knowledge (Aliakbari, Parvin, Heidari, & Haghani, 2015; Bruner, 1996). With the knowledge that

the nursing students have acquired in the skills and simulation lab, they can relate to the environment and equipment found in the real clinical setting when viewing the AR 360 orientation photosphere of the clinical setting. The enactive mode represents the kinesthetic learning experience that occurs through the navigation of the AR 360 photosphere. The iconic mode is the visual view of the clinical setting in the AR 360 photosphere that allows the learner to visually understand the layout of the floor and where items are placed at the location that will need to be used to perform their clinical skills. Once the student has mastered the enactive and ionic modes, he or she can construct the final mode by having symbolic representation. The student illustrating the success of symbolic representation would be the example of remembering that the blood pressure cuff is in the third cupboard above the sink in a patient's room or that the dirty utility room is in the second hall, middle door.

After searching the nursing literature on current clinical orientation methods and the symbolic representation of the clinical site to enhance student performance, no information was found. However, literature was found addressing the importance of comprehensive orientation with an interspersed delivery method versus a bolus delivery method to prepare prelicensure nursing students (Rebueno, Tiongco, & Macindo, 2017; Kissel & Filipek, 2017). These methods of orientation were found to not only enhance skills and clinical competence in prelicensure nursing students but also to decrease their feeling of apprehension and being lost in the experience (Rebueno et al., 2017) Thus, the use of AR as a clinical orientation tool may be beneficial in decreasing student anxiety levels. AR will allow the student to autonomously and actively review the clinical

settings multiple times to orient themselves to the clinical site compare to the prelicensure nursing students who do not receive the AR 360 photosphere orientation but the one-time faculty lead orientation.

Nature of the Study

Quantitative

The current study involved a quasi-experimental research method with the sample being a convenient selection of prelicensure junior level nursing students entering their first maternal–child rotation. The independent variable in this study was the exposure to AR 360 photosphere. The control group received the traditional method of the one-time faculty-led orientation at the clinical environment. The experimental group of prelicensure nursing students received the autonomous active orientation of AR 360 photosphere where the faculty role was only to refer the prelicensure nursing students to the online access information. The dependent variable of anxiety was examined and analyzed between the two groups of prelicensure nursing students pre and post-orientation using the Spielberger's State-Trait Anxiety Inventory (STAI) instrument. Understanding that each individual's anxiety level begins at a different level, a baseline anxiety score was a covariate to the study. To understand the effects of the independent variable on anxiety, the pretest STAI score was used to control for the variation. The STAI was placed on Survey Monkey, a secured online survey platform, where students were de-identified. Data were analyzed with the use of SPSS 25.

Definitions

Operational definitions for terms used in this study include:

Prelicensure nursing student: In this study, the prelicensure nursing student was defined as an individual who had not obtained any form of a nursing licensure by the State Board of Nursing and was currently enrolled in an instructional accredited nursing program at the time of data collection. The definition of the population of prelicensure nursing students followed the requirements of the National League for Nursing Commission for Nursing Education Accreditation (NLN-CNEA).

NLN-CNE accreditation: For a nursing school to attain and maintain accreditation, the NLN-CNEA states the individual learner must be enrolled in a practical, vocational, or registered nurse prelicensure and undergraduate curriculum that incorporates a foundation of nursing arts and sciences core values (NLN-CNEA, 2016). The core values of a culture of caring, diversity, integrity, and excellence are required by the National League of Nursing to support the individual's development as a professionally identified nurse (NLN-CNEA, 2016). Participants were selected based on the definition and the study's purpose also supports the core values mentioned by fostering quality improvement in preparing caring and competent nurses.

Augmented reality (AR): The technological ability to combine reality with virtual experiences allowing individuals to connect to experiences in a real-time panoramic atmosphere that is registered in 3D (Azuma, 1997; Dunleavy, 2014). As the individual views the virtual computer-generated superimposed objects, they can interact in the 3D real world environment (Azuma, 1997; Chandler & Munday, 2011; Lyons 2017; Riva et al., 2016).Three hundred and sixty degree photosphere is a type of AR application that is produced with 360 degree camera's and allows embedded images into the 3D

environment (Andert & Alexakis, 2015; Wong, 2016). The photosphere can be viewed with technology from handheld mobile devices, context-aware devices, or visual eye viewing headsets that completely immerses one sensorially (Dunleavy, 2014; Giard & Guitton, 2016; Lyons, 2017). The unique AR 360-degree photosphere allows the visual view of the distant environment's general information at the person's current location allowing a fully immersed and interactive experience (Giard & Guitton, 2016; Wong, 2016). In this study, the experimental group used AR 360-degree photosphere of a maternal–child labor and postpartum floor as their autonomous and active means of orientation.

Anxiety: Anxiety is a subjective and normal response that an individual has to a threatening stimulus (Potter & Moller, 2016). The response to anxiety can be acute or chronic. Acute anxiety, also referred to as *state anxiety*, is a temporary, natural, and necessary autonomic nervous system response to a situation (Potter & Moller, 2016; Spielberger & Sarason, 1975). The autonomic nervous system stimulates the conscious stated feeling of anxiety that leads to the positive effect of promoting actions that protect the individual (Potter & Moller, 2016). For example; a learner may have acute anxiety to an upcoming exam, and to be successful, the student decides to study the necessary exam material. After the exam, the threatening stimulus is gone, and the experience of acute anxiety is also gone.

Chronic anxiety is also referred to as *trait anxiety*. The term *trait* refers to how each individual responds to a stimulus differently, and that the response is relatively stable with each incident (Spielberger & Sarason, 1975). Thus, trait anxiety is looked at

as an individual's characteristic and those with trait anxiety have more intense chronic anxiety (Potter & Moller, 2016). With chronic anxiety, the response can lead to a maladaptive response that is long-lasting and impedes healthy functioning (Potter & Moller, 2016; Rowney, Hermida, & Malone 2010; Sadock, Sadock, & Ruiz, 2015).

Trait anxiety plays a role in how an individual responds to an acute threat (Villada, Hidalgo, Almela, & Salvador, 2017). The higher the trait anxiety is, the more difficult it is for an individual to functionally cope with an acute threat influencing performance outcomes (Villada et al., 2017). Thus, in this convenient nonrandomized study, the variation of the participants' initial trait anxiety was obtained and analyzed to statistically control the potential difference in stated acute stress levels in participants with higher trait anxiety, who may have difficulty responding to an acutely stressful situation.

Assumptions

There were three assumptions of this study that were thought to be true. First was the assumption that prelicensure nursing students do not want to be anxious as they enter a new clinical area. It was assumed that the students wanted to feel prepared as they entered a new clinical area. To be prepared, the prelicensure nursing student was self-directed and motivated to review the orientation material provided. It was also assumed that the prelicensure nursing students were honest as they answered the self-reported pre- and post-STAI questions.

Scope and Delimitations

The scope of this study was limited to quantitative data. The participant group consisted of junior level prelicensure Bachelor of Science nursing students from two accredited nursing schools in a Midwestern community. Spielberger's STAI instrument was used to collect data on anxiety levels before and after the prelicensure nursing student's received orientation to a maternal–child clinical site. The delimitations for this study were that data collection was conducted on two of the Bachelor of Science Nursing (BSN) curriculum programs within the geographical area over the course of two semesters; translating to three different cohorts of students. The data collection was unique to the specialty area of the maternal–child clinical setting. Anxiety levels were only collected with the quantitative STAI. Without qualitative analysis of each student, there was the possibility that other stressors were occurring to the prelicensure nursing student affecting their state anxiety levels.

Limitations

This study had limitations that affected generalizability, potentially limiting the application of the results to students from similar nursing programs. One limitation of the study was the student sample. The sampling method was a convenience sample obtained from groups of participants from two BSN schools within a Midwestern Metro area. Using two BSN curriculum programs allowed reaching the sample size of 128 participants in a feasible time period of 3 to 4 months. By using just two BSN programs within the geographical area and omitting other area BSN programs, as well as the associate degree and licensed practical nursing programs that also use the same clinical

site, the generalizability was limited because the diversity of participants was restricted. The omission of the other BSN programs was related to the perceived conflict of interest of where I work and if the schools did not have a maternal–child clinical during the time period of data collection. The associate degree and licensed practical nursing programs class size varies from semester to semester, thus the feasibility of my time was uncertain.

Random assignment of participants to a group was not possible because clinical groups were set at the beginning of the semester by faculty. However, the clinical groups were randomly assigned to one of the two methods of orientation. Students with more opportunities to practice and gain experience feel more prepared and have a natural decrease of anxiety (Andert & Alexakis, 2015; Riva et al., 2016; Ross & Carney, 2016). To address the potential limitation, the two orientation methods were randomly staggered throughout the semester time frame with descriptive information collected on each participant's previous clinical experience.

Significance

This study can fill the gap in teaching methodology by familiarizing nursing students, through the use AR 360 photosphere orientation, with the clinical setting that they will be entering before physically being on site. This study can contribute to positive social change by showing the importance of incorporating technology into the process of clinical orientation. Individualized orientation assists in the transition of new individuals to the environment (Trossman, 2016). By strategically incorporating a self-guided individualized active learning method, the prelicensure nursing students can familiarize themselves with the new clinical environment. By being familiar with the clinical

environment before their initial day, the participants may potentially have a decreased anxiety level when compared to those who react to the stimuli of a new environment with no AR preclinical preparation (Ross & Carney, 2016). With the achievement of decreasing anxiety levels associated with the new environmental setting, the learner will not have to divide his or her focus with both the environment and the learning outcome which will allow singular focus on meeting the learning outcome requirements.

This study was focused on the effect that the use of AR has on prelicensure nursing students' anxiety and the potential for positive social change. The added-value that this study brings could enhance the healthcare industry by introducing an e-learning educational platform based upon AR 360 photospheres as an orientation method to reduce learners' anxiety level. Elevated anxiety levels have an adverse effect on safe patient care outcomes and the students learning success (Cheung & Au, 2011; Khalaila, 2014; Kameg Szpak, Cline, & Mcdermott , 2014; Rossignol, 2017). The educational strategy of adopting the AR 360 photosphere allows autonomous active learning that focuses on improving a student's response to anxiety-producing stimuli.

The social impact of this study was to decrease anxiety in student nurses. However, the methodology can also be extended to professional nurses and the inter-professional team to improve learning outcomes and to ensure that safe and high-quality care is being provided to the patients. AR can be utilized to orientate existing nurses and inter-professional health care team members to a new setting, a new piece of equipment, or an evidence-based practice (Garrett et al., 2015; Vera, Russo, Mohsin, & Tsuda, 2014). This is useful because those who are more familiar with the clinical setting can spend

more time focusing on patient care (Parvin, Aliakbari, Vardanjani, Dadkhah, & Jouybari, 2016).

The value-added through the use of AR can be demonstrated to the healthcare leadership team by sharing the data gathered by the study. The data gathered from the initial survey was compared with the postorientation survey data. This comparison illustrated the impact that the AR 360 photosphere has had upon the participant group, which supports the adoption of AR to decrease anxiety levels in learners. The economic feasibility of the adoption of the technology of AR can be highlighted. AR can be utilized multiple times after the initial investment, and its use can increase both student and educator productivity and satisfaction through the realized time savings and schedule flexibility achieved through the use of AR (Fonseca, Martí, Redondo, Navarro, & Sánchez, 2014; Yilmaz, & Batdi, 2016). Productivity gains can be realized as the learner may access information on demand, and the instructors can share information with their audience on a mass scale versus a one-on-one basis.

Summary

Nursing academia may have a new innovative orientation strategy through AR 360 photosphere that could provide a learning methodology that will decrease prelicensure nursing students' anxiety levels. Decreasing anxiety levels allows the nursing student the opportunity to focus on clinical experience instead of learning the clinical environment. The innovative AR 360 photosphere can decrease anxiety not only with prelicensure nursing students but may have a social impact in assisting novice and expert new healthcare employees learning new clinical situations.

Chapter 2 will be focused on an in-depth literature review of the concepts of prelicensure nursing students, anxiety, and the innovative technology of AR. The gaps identified within the literature, related to the three concepts, are what drove the study's purpose of determining the effect of AR 360 photosphere on prelicensure nursing students' level of anxiety as they enter a new clinical environment compared to prelicensure nursing students' level of anxiety who do not experience AR 360 photosphere orientation.

Chapter 2: Literature Review

Nursing programs across the United States are faced with the challenge of having an insufficient number of clinical sites and nursing preceptors to train undergraduate prelicensure nursing students in the clinical environment (Rosseter, 2015). Educators are also faced with a new era of learners who are technology savvy and seek immediate feedback (Nardi & Gyurko, 2013). Therefore, nursing programs are implementing alternative teaching methods to overcome the challenges and meet the needs of the learners. The insufficient numbers of clinical sites have led to an increase of clinical learning in the technology-driven simulation labs to compensate for the decrease of time the undergraduate prelicensure nursing student has in the actual clinical environment.

The first time entering a clinical setting brings apprehension and anxiety to undergraduate nursing students (Cowen, Hubbard, & Hancock, 2016), which can negatively affect student learning, care performance, and critical thinking in a clinical environment, compromising the ability to maximize learning (Cheung & Au, 2011; Cowen et al., 2016; Foley, 2016; Khalaila, 2014; Rossignol, 2017). With a decrease in the number of days the undergraduate prelicensure nursing student has in the clinical environment, nursing faculty must provide learning methods to help students find psychological resiliency allowing adaptation to the setting. Adaptation to the setting allows learners to maximize their learning experience and meet the outcome of having the ability to provide safe and quality patient care effectively (Foley, 2016).

As nursing academia seeks to find innovative methods to meet the needs of undergraduate prelicensure nursing students, other professions have been utilizing

technological advances such as AR (O'Shea & Elliott, 2015). Minimal published literature was found on the use of AR in nursing education, and no literature was found on research studies focused on decreasing nursing student anxiety when AR was used as a method of orientation. Evaluation of the use of AR to decrease the undergraduate prelicensure nursing students' anxiety level before their clinical experience provides an innovative methodology for nursing academia to orient prelicensure undergraduate nursing students to the clinical setting. Orientation to the clinical setting allows the student to adapt to the setting before entering the environment. Adaptation to the environment will give the nursing students the opportunity to focus on maximizing their learning experience in the clinical setting and not focus on learning the environment during their clinical time. The purpose of this study was to determine the effect of AR 360 photosphere on prelicensure nursing students' level of anxiety as they entered a new clinical environment compared to prelicensure nursing students' level of anxiety who do not experience AR 360 photosphere orientation.

In Chapter 2, the evidence-based literature review for this study will be presented with a focuses on the relationship of the effects of anxiety on achieving prelicensure nursing students learning outcomes and the effect that AR has on decreasing anxiety. The chapter will begin with a review of the literature search strategy. The theoretical foundation, based upon Bruner's discovery learning theory, will follow and support the validity and appropriateness of the study's framework. The review of the literature will address the concepts of prelicensure nursing students, AR, AR 360-degree photosphere, and anxiety, which validates the gap this study addressed. In the area of the review of the

variables, research studies from other professions and the nursing profession were used to examine the following topic concepts: prelicensure nursing students' and their anxiety levels as they enter a new clinical setting, the effect that anxiety has on the students achieving their learning outcomes, and the technological learning method of AR that will decrease anxiety.

Literature Search Strategy

The literature review was completed through Creighton University and Walden Universities Libraries' EBSCO host collection and Google Scholar. Databases within the search engines used to find related journal articles and books included Business Source Complete, CINAHL and Medline simultaneous searches, CINAHL Plus with Full Text, Cochrane Database of Systemic Reviews, ProQuest Central, ScienceDirect, and Wiley Online. Boolean search terms included *anxiety, anxiety and nursing, anxiety and nursing students, anxiety and clinical experience, augmented reality, augmented reality and nursing, clinical orientation and nurse, discovery learning theory, discovery learning theory and nursing,* and *State-Trait Anxiety Instrument and nursing*. Peer-reviewed articles were initially reviewed from 2014 to current date, but the search was expanded to dates prior to 2014 when minimal literature was found on the concept of AR in nursing. For seminal literature on AR, articles were reviewed for the development of other professions back to 2010. The literature on Spielberger's STAI instrument was reviewed back to 1977, the initial development date of the tool.

Theoretical Foundation

The discovery learning theory is the constructivist theoretical foundation that guided this study on the effect of the e-learning platform of AR 360 photospheres on prelicensure nursing students' level of anxiety. Jerome Bruner introduced the discovery learning theory in 1961. The major proposition of the theory is the fact that learners are active explorers that interact with the world through questioning and experimenting as they apply past experiences and knowledge to obtain new insights (Bruner, 1996). The learner draws from their existing knowledge to discover facts, relationships, and organize this data to problem solve and obtain the new insights (Aliakbari et al., 2015; Bruner, 1996). Bruner's discovery learning theory suggests that the organization of problem-solving occurs in three modes: enactive, iconic, and symbolic (Bruner, 1966). How the learner interprets, constructs, and maintains the knowledge is explained through these three modes (Bruner, 1966).

In Chapter 1, it was discussed how the learner draws from existing knowledge to discover facts and relationships to organize the data to problem solve and obtain new knowledge (Aliakbari et al., 2015; Bruner, 1996). Figure 1 is a visual adaptation of Bruner's discovery learning theory, demonstrating how problem-solving occurs through the three modes of the study. Recognizing the nursing student has acquired knowledge with previous learning experiences in the skills and simulation lab, they can relate to the environment and equipment found in the real clinical setting when viewing the AR 360 orientation photosphere of the clinical setting.

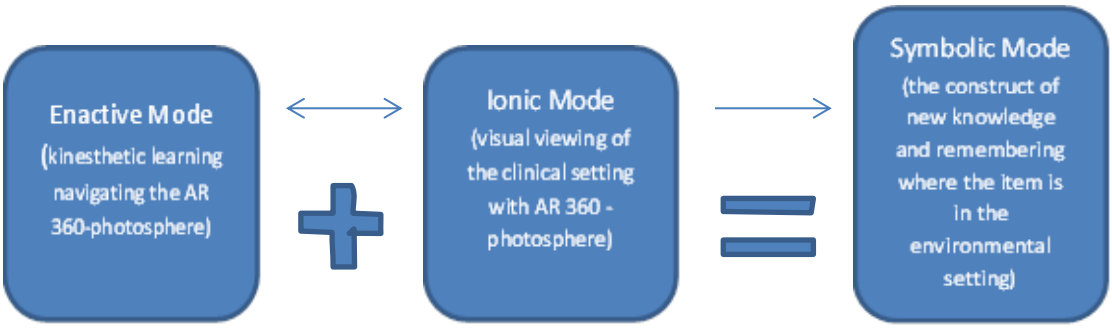

Figure 1. An adapted model of Bruner's discovery learning theory using the three modes of problem-solving for AR 360 photosphere learning. This figure illustrates how active learning involves taking existing knowledge and organizing it to problem solve and obtain new knowledge. Enactive and ionic modes are a continuous back and forth learning experience with the AR 360 photosphere as the learner visually discovers with the kinesthetic navigation of the clinical setting. The learner must have both enactive and ionic learning to achieve the symbolic mode of new knowledge.

The enactive mode represents the kinesthetic learning experience that occurs through the navigation of the AR 360 photosphere. The iconic mode is the visual view of the clinical setting in the AR 360 photosphere allowing the learner to visually understand the layout of the floor and where items are placed at the location that will need to be used to perform their clinical skills. Enactive and ionic modes are a learning experience where the learner visually discovers the clinical setting through AR 360 photosphere. Once the student has mastered the enactive and ionic modes, he or she can then construct the final mode by having symbolic representation. The student illustrating the success of symbolic representation would be the example of remembering that the blood pressure cuff is in the third cupboard above the sink in a patient's room or that the dirty utility room is in the

second hall through the middle door. Thus, AR as a clinical orientation tool may be beneficial in decreasing student anxiety levels, because students can autonomously and actively review the clinical settings multiple times to orient themselves to the clinical site.

Learning that is based on an e-learning platform requires individuals to take on the ownership to be actively engaged. The discovery learning theory is also focused on how individuals who are actively engaged are motivated and independently take on the responsibility to learn (Bruner, 1966, 1996). A replication study verified that active learning is a valid model to gain knowledge in an e-learning environment as supported by the discovery learning theory's focus. The results revealed how e-learners' ownership of material had significant contributions to their engagement in learning and gaining knowledge (Koohang, Paliszkiewicz, Goluchowski, & Nord, 2016). Another study that was guided by Bruner's discovery learning theory showed how the integration of innovative tools on an e-learning platform can improve the knowledge obtained. In the study, students were able to independently learn with opportunities to manage the time and the speed of learning; learning in an e-learning environment not only motivated the learners but also enriched the learning process (Eskandari & Soleimani, 2016).

The constructivist approach framework of the theory discusses how independent active learning is more conducive to long-term retention of the obtained new information (Bruner, 1996). To understand the effectiveness and long-term knowledge retention of the learning method, Yew and Goh (2016) conducted a meta-analysis review of the constructivist approach to problem-based learning, where active discovery learning is

required. Their conclusion supported the theory that active problem-based learning is effective for long-term knowledge retention and application (Yew & Goh, 2016).

Nursing and other professions have used Bruner's discovery learning theory to guide their studies for effective and meaningful teaching methods in a blended classroom and through the use of an e-learning platform. The discovery learning theory has been used as the foundational theoretical framework for active learning in the nursing curriculum. The theory has guided the studies of active teaching methods, unfolding clinical case scenarios along with blended and flipped classroom activities revealing the effectiveness and meaningful application of the teaching method (Costello, 2017; Swift, Efstathiou, & Lameu, 2016). In these studies, the students took the knowledge they have already learned to build their knowledge base through clinical and critical thinking.

In past AR projects with engineering and architecture students, where the faculty is similarly challenged with learning time and space, the constructivist learning by discovery framework has been used to assist learners in acquiring information through multiple learning scenarios (Behzadan & Kamat, 2013). In the case of nursing research, AR has been shown to be beneficial for prelicensure nursing students gaining knowledge of skills acquisition (Garrett et al., 2015). For example, Garrett et al. (2015) suggested the value of AR and introduced future implications for AR research to be used to orientate students to clinical areas allowing the prelicensure nurse to acquire new information through self-discovery.

Bruner's discovery learning theory correlates to the assumption of the study that learners desire to be prepared for their clinical learning experience by having knowledge

of the clinical environment. The use of an e-learning environment using the AR 360 photosphere as a clinical orientation tool allows the student to autonomously and actively discover the clinical setting. The students can view the AR 360 photosphere multiple times until the individual feels prepared with the new knowledge of information. The use of AR as a clinical orientation tool may be beneficial in decreasing student anxiety levels as AR will allow the student to review the clinical settings to orient themselves to the clinical site. Thus, Bruner's discovery learning theory was used as the framework to drive the study to answer the research question: What is the effect of AR 360 photosphere on prelicensure nursing students' level of anxiety as they enter a clinical environment compared to prelicensure nursing students' level of anxiety who do not experience AR 360 photosphere?

Literature Review

With the shift in the current healthcare and educational organization of decreased numbers of clinical sites, preceptors, and faculty, the clinical education model of training in the clinical environment is no longer the primary placement of achieving clinical outcomes (Quail, Brundage, Spitalnick, Allen & Beilby, 2016; Rosseter, 2015). Thus, healthcare educators are looking for innovative methods to effectively and efficiently capture learners and meet learning outcomes. In nursing, simulation and standardized patients are used in a lab built clinical environment to assist in teaching clinical skills (Kameg et al., 2014; Ross & Carney, 2017).

Simulation has been found to be an effective teaching method to bridge the gap, but it is not clear if simulation produces the realism of the clinical experience that is

necessary for learners to accept and embrace the experience of the concept (Vaughn, Lister, & Shaw, 2016). The innovative technology of AR has been noted to have realism because individuals can interact with the real object and be sensorial immersed in the real-world experience virtually (Riva et al., 2016; Vaughn et al., 2016). With AR becoming more available and affordable in the last decade, healthcare and education are experimenting with the potential benefits of using AR as an instructional method (Garrett et al., 2015; Khor et al., 2016; Smith & Foley, 2016; Spoto, Bourhaleb, & Petrone, 2016). This leads to this study's constructs of key variables: the value of AR applications, the discovery of knowledge AR brings to prelicensure nursing students, and the potential ability to decrease anxiety levels.

Key Variables

Key variables of the study include prelicensure nursing students, AR, and anxiety. A literature review of these key variables was completed to support the use in this study along with identified limitations. The limitations identified acknowledge the gap in the literature of the use of AR 360 photosphere as a form of orientation to decrease prelicensure nursing student's anxiety. This gap supports the need for this study to foster new knowledge in nursing academia and other professions.

Prelicensure Nursing Students

To be identified as a prelicensure nursing student, the NLN-CNEA states that the individual student must be enrolled in a practical, vocational, or registered nurse prelicensure and undergraduate curriculum that incorporates a foundation of nursing arts and sciences core values (NLN-CNEA, 2016). Accreditation of the nursing school's

program is required for a prelicensure nurse who graduates from the program to be eligible to take the NCLEX exam that is required before being able to practice professionally as a nurse (National Council of State Boards of Nursing [NCSBN], n.d.). The nursing school's program approval for accreditation represents that the minimum standards are met in preparing the future generations of nurses to assist in ensuring that safe and quality patient care is received (NCSBN, n.d.). Within the standards is the requirement of having deliberate practice within the authentic clinical environment (NCSBN, n.d.).

A detailed exanimation of the prelicensure students from the NLN 2015-2016 biennial survey of schools of nursing revealed that 75% of students in a BSN program were under the age of 25 (NLN, 2016). The young age of the prelicensure nursing student correlates to minimal professional life experiences and behaviors that potentially affect learning outcomes (Kameg et al., 2014; Walker & Vreklan, 2016). These behaviors include apprehension, anxiety, stress, and decrease self-confidence and clinical decision ability. These behaviors have been the concepts of other studies' research questions with the focus of interventions to address the factors (Cowen et al., 2016; Foley, 2016; Kameg et al., 2014; Lee & Noh, 2016; Ross & Carney, 2016; Turner & McCarthy, 2017). The literature review completed with the key terms did not reveal any studies in the databases searched that examined prelicensure nursing students using AR 360 photosphere as an intervention to address the behaviors or in preparing the prelicensure student for a deliberate learning in the authentic clinical environment.

Augmented Reality

AR is defined as the technological ability to combine reality with virtual experiences allowing individuals to connect to experiences in a real-time panoramic atmosphere that is registered in 3D (Azuma, 1997: Dunleavy, 2014). As the individuals view the virtual computer-generated superimposed objects, they are allowed to interact in the 3D real-world environment (Azuma, 1997; Chandler & Munday, 2011; Lyons 2017; Riva et al., 2016). AR applications are effective educational tools as learners can virtually experiment within an environment (Yilmaz & Batdi, 2016). The immersive nature of the AR education delivery allows an increased realism of the experience which transforms our external experience, in turn bringing an individual awareness to the new environment (Riva, et al., 2016; Vaughn, et al., 2016). When a learner has the immersive experience, there is a sense of presence and emotional engagement in the environment offering a more authentic learning experience (Riva et al., 2016; Vaughn et al., 2016). With the experience, the learner can self-reflect which assists in the development of knowledge, decreasing apprehension and anxiety, building confidence and self-efficacy in reaching the learning outcome (Quail, et al., 2016; Riva et al., 2016; Yilmaz & Batdi, 2016).

For over a decade, AR has been used to teach professions such as engineering, architecture, and aviation (Fonesca et al. 2014; O'Shea & Elliott, 2015). Healthcare and education were slow to adopt the AR applications as a method of teaching due to integration issues into the traditional learning methods, the cost of development and maintenance of the AR system, and the resistance to the technology (Lee, 2012). Virtual and AR technology e-learning platforms are now more available, accessible, and cost-

effective (Khor et al., 2016). Smith and Foley (2016) discussed the opportunities represented by innovative technologies, such as AR platforms, as the younger generations are digital natives. Digital natives have grown up with technologies and are less likely to see the technology as an interfering element in their learning, in other words, the technology is transparent (Tapscott, 1997). These factors, in the last few years, support the opportunities of adopting AR as a learning method for educators in the healthcare setting. With the recent adoption of the methodology, dissemination of studies on the use of AR in the educational and healthcare setting are appearing more frequently (Smith & Foley, 2016; Yilmaz & Batdi, 2016).

To determine if learning that is achieved with AR applications is comparable to the traditional methods, a quasi-experimental study compared three different methods of learning with the student being either in the traditional clinical environment, simulation lab with a trained standardized patient, or in virtual reality learning. The results of the study found no difference in the learning that occurred with each strategy (Quail et al., 2016). A review of two different pilot studies that were completed with prelicensure nursing students using AR as a learning platform to learn clinical skills found that the benefits of the realism and ability to self-direct the active learning contributed to independent problem solving (Garret et al., 2016; Vaughn, 2016). These results are similar to research by Parvin et al. (2016) who found that learners who are prepared and familiar with the clinical environment and the location and usage of the required equipment, have more time to focus on providing patient care. Essentially the prelicensure nursing student does not have to divide their focus between the environment

and patient care as they are already familiar with the environment. Gonzalez and Kardong-Edgren (2107) found in their study of deliberate practice and cognitive load, that in situations where nursing students did not have an enormous amount of simultaneous learning they were able to process the learning experience more effectively cognitively. These results lead to the conclusion that using AR to process the new clinical environments will allow the prelicensure nursing student to maintain singular focus on the patient care and required learning, thereby potentially, maximizing the student's clinical performance and learning experience.

Yilmaz and Batdi (2016) completed a meta-analysis of 12 studies and concluded that AR applications are effective e-learning methods and discovered when students experiment within the realistic AR learning environment that their interest and curiosity about the content increased. This peaked interest and curiosity motivated them to have repeated viewing of the AR application which is not available with the traditional learning method that requires physical presence. Repetition of actively viewing information along with connecting with prior experiences and knowledge is correlated with the success of developing new learning and remembering (Karpicke, 2012; Ledermuller & Fallmann, 2017). AR technology e-learning platforms have also been found beneficial for distant learning in healthcare which is advantageous with the changes in the availability of clinical sites (Eskandari & Soleimani, 2016; Lyons, 2017; Riva et al., 2016).

Along with the benefits of AR applications in healthcare and education, there are also limitations. Research studies have noted that one limitation of AR is the participants'

lack of familiarity with the technological e-learning interface which poses challenges for the user (Fonesca et al., 2014; Vaughn et al. 2016; Yilmaz & Batdi, 2016). With the ongoing growth of AR technology in healthcare education, this challenge of familiarity with use will need to be continuously addressed (Vaughn et a., 2016: Yilmaz & Batdi, 2016). A second limitation identified in the literature review of previous works with AR applications in education was the lack of generalization due to small homogeneous sample sizes that lacked randomization (Fonseca et al., 2014: Quail et al., 2016; Riva et al., 2016; Vaughn et al., 2016). Statistically significant results may have been demonstrated by these studies, but can not be generalized to a larger diverse population. As AR technology continues to develop, more studies with larger diverse sample sizes are needed to test its effectiveness in the healthcare and clinical learning environment (Garrett et al., 2016; Vaughn et al., 2016; Yilmaz & Batdi, 2016)

The development of an AR application for a clinical site environment could potentially be an efficient method to orientate prelicensure nursing students to a clinical site before their first clinical experience (Garrett et al., 2016). As a method of learning, AR is as effective as being in the traditional learning environment with additional benefits (Quail et al., 2016; Yilmaz & Batdi, 2016). AR offers the benefit of consistent delivery of information to a large number of individuals independent of their location allowing flexibility of where and when the learning will occur (Andert & Alexakis, 2015; Ledermuller & Fallmann, 2017; Quail et al., 2016; Riva et al., 2016; Spotos, 2016; Yilmaz & Batdi, 2016). An experimental study supported the effectiveness of virtual static learning environments that could be viewed multiple times. A statistically higher

retention of learned information occurred when an individual had a static learning environment that they could encounter multiple times to encode memories of spatial locations as compared to a continuously changing environment (Brodt et al., 2016). The increased memory occurred in the static virtual learning environment was not only found immediately after the interaction, but there was also continuous memory activity twenty-four hours later (Brodt et al., 2016). The static virtual learning environment is a benefit to the learners when comparing to a faculty-led orientation method that occurs once at a set time and place over a specific time period. In the faculty-led orientation method information may be inadvertently not reviewed by the faculty and the learner is not able to review the information multiple times at their individual learning pace.

One type of AR application is 360 degree photosphere that is produced with a 360 degree camera and allows embedded images to be introduced into the 3D environment (Andert & Alexakis, 2015; Wong, 2016). The AR 360-degree photosphere has the benefit of allowing the user to visually view distant environments such as a clinical environment and receive specific general information about this environment without leaving the person's current location, allowing a fully immersed and interactive experience (Giard & Guitton, 2016; Wong, 2016). An experimental study compared 360 degree panoramic photosphere environments to participants who did not view panoramic 360 degree but spliced views and 180 degree views to understand the importance with facilitating the accuracy of remembering the environment. Memory accuracy was not only higher with the 360 degree photosphere viewers, but the discrete views of the environment allowed participants to have perceptual judgments with subsequent experiences within the

environment (Robertson, Hermann, Mynick, Kravitz, & Kanwisher, 2016). Clemenson and Stark (2015) discovered that individuals who explored complex 3D video games had higher memory recognition of tasks than individuals who trained in a passive and 2D game training environment.

In 2005, when the NCSBN Board was asked about the future of nursing education with the decrease in clinical sites, they responded with the need to "increase technology for teaching clinical experiences and to make the most of the clinical site" (NCSBN, 2005, p.7). This paper is still present as a resource on the NCSBN's website under the sub-heading Evidence-based Nursing Education evidence to support clinical experiences in prelicensure nursing programs. The document refers to the NCSBN board's statement and the NLN requirements of educators to support the prelicensure development of a professional nurse. It served as the catalyst for this study to determine the effect of the AR technology when applied to prelicensure nursing students' anxiety when used for clinical orientation.

Anxiety

Anxiety is a subjective and normal response that an individual has to a threatening stimulus (Potter & Moller, 2016). The stimulus that causes the anxiety response can be unknown, vague, or from a previous experience with future anticipation of the incident reoccurring (Rowney, Hermida, & Malone 2010; Potter & Moller, 2016). The response to anxiety can be acute or chronic. Acute anxiety, also referred to as 'state anxiety,' is a temporary, natural, and necessary autonomic nervous system response to a situation (Potter & Moller, 2016; Spielberger & Sarason, 1975). The autonomic nervous system

stimulates the conscious stated feeling of anxiety symptoms that lead to the positive effect of promoting actions that protect the individual (Potter & Moller, 2016). Chronic anxiety is also referred to as "trait anxiety." The term trait focuses on how each individual responds to a stimulus differently, and that the response is relatively stable with each incident (Spielberger & Sarason, 1975). Thus, trait anxiety is regarded as an individual's characteristic, and those with trait anxiety have more intense chronic anxiety symptoms (Potter & Moller, 2016).

The symptoms of both acute and chronic anxiety can range from mild and unnoticed by many to unhealthy panic attacks. Hildegard Peplau classified symptoms of anxiety into four levels of; mild, moderate, severe, and panic (Potter & Moller, 2016). Mild anxiety symptoms include restlessness, irritability, and increased motivation. Moderate anxiety produces physiological responses such as tachycardia, tachypnea, muscular tension, increased perspiration, and rate of speech (Potter & Moller, 2016). The individual experiencing both mild and moderate anxiety symptoms can be directed to have a positive learning experience (Gonzalo, 2011). Both levels are beneficial as they achieve an alarm response of protection or promote motivation to act and relieve the anxiety (Potter & Moller, 2016; Teixeira et al., 2014).

With severe anxiety, the individual reacts to try to relieve the anxiety but has physiological symptoms such as urinary frequency, diarrhea and nausea, headaches, dizziness, and the inability to sleep (Potter & Moller, 2016). Individuals in this condition of anxiety still desire to relieve the anxiety, but thoughts are unclear, and they are focused on themselves and not the surrounding environment (Gonzalo, 2011; Potter & Moller,

2016). The panic level of anxiety leads to extreme symptoms including uncontrolled trembling, insomnia, palpitations, withdrawal, muscular incoordination, immobility, and irrational thoughts (Gonzalo, 2011; Potter & Moller, 2016). Both severe and panic anxiety can lead to negative effects and a lack of safety for both the individual displaying the symptoms and those within the environment if the anxiety is not controlled (Kameg et al., 2014). The symptoms of anxiety cause clinically significant distress and impairment in physical, psychological, and social functioning responses (Rowney et al., 2010). How an individual responds to anxiety-causing stimuli is not only based on the severity of symptoms but also based on one's chronic trait anxiety level. The higher one's chronic trait anxiety is, the more difficult it is for one to functionally cope with an acute threat influencing performance outcomes (Villada et al., 2017).

New clinical environments can be viewed as threatening stimuli to a nursing student. Chernomas and Shapiro (2013) acknowledged, in their cross-sectional descriptive exploratory study of 437 undergraduate nursing students, that the lack of knowledge of the physical environment was one stressor that was associated with the anxiety felt by the nursing student entering the clinical setting. The stimuli of entering a new environment can induce and increase the physiological and psychological anxiety response symptoms during the new learning experience in a clinical environment. Increased anxiety compromises the undergraduate nursing student's thinking, perception, and attention to clinical performance (Foley, 2016; Potter & Moller, 2016; Rossignol, 2017; Sadock, Sadock, & Ruiz, 2015). The anxiety can have a direct negative impact on student learning, critical thinking, and the performance of patient care (Cheung & Au,

2011; Khalaila, 2014, Rossignol, 2017). The symptoms of anxiety can also have the negative sociological influence of establishing a therapeutic relationship between the nursing student, the faculty, precepting nurse, and the patient (Kameg et al., 2014). The lack of a relationship can lead to increased anxiety resulting from the fear that the nursing student is not meeting the expectations because they do not receive the feedback of validation and affirmation that occurs within positive relationships (Sadock et al., 2015). Faced with a lack of support, an individual becomes uncomfortable in the environment and with those in the environment which leads to loneliness and self-seclusion (Potter & Moller, 2016). Thus, as the student focuses on the anxiety stimuli and how to cope or relieve the symptoms of anxiety, the elevated anxiety levels have a negative effect on safe patient care outcomes and the students learning success (Cheung & Au, 2011; Khalaila, 2014; Kameg et al., 2014; Rossignol, 2017).

Anxiety can be decreased when one is prepared to confront a new stimulus. This theory was supported by a quasi-experimental study on the effect of preparing 95 sophomore level Bachelor of Science prelicensure nursing students before their first clinical experience through the intervention of simulation scenarios (Ross & Carney, 2016). There was a statistically significant decrease in anxiety and increased the feeling of preparedness which resulted from more access and opportunity for prelicensure students to practice and gain experience with skills and clinical decision-making, (Ross & Carney, 2016).

In the literature, Spielberger's self-reported STAI instrument has been proven as a valid and reliable tool to measure both the acute state and chronic trait anxiety levels in

individuals (Horsley & Wamabach, 2014). The STAI form Y-2 is used to collect data on an individual's chronic trait anxiety while Form Y-1's questions focus on the individual's acute stated anxiety. The use of each form or the combination of both forms is based upon the research purpose and question being analyzed. If a study focuses on one singular form of anxiety, only one STAI form is needed to collect data. Conversely, a study that focuses on a combination of both types of anxiety would require both forms to be utilized when gathering data.

A meta-analysis contained 122 world-wide articles from the last 40 years that utilized the STAI Form Y-2 which were analyzed to assess individual trait anxiety levels (Booth, Sharma & Leader, 2015). In this study, the Y-1 forms were not used, as the purpose of the study was to look at the mental health or trait anxiety of individuals. The study discussed how the state anxiety level was not analyzed as state anxiety is a natural and adaptive, which fluctuates and would add error variance (Booth et al., 2015). Ross and Carney, (2017) used Spielberger's STAI to measure nursing students' anxiety related to initial clinical practicum before and after the intervention of simulation. Only the Y-1 form was used as the author compared the pre-and post-state anxiety scores. One identified limitation of the study was a lack of a control group to examine if the significant statistical difference, $p<0.001$, of anxiety levels, was due to the intervention and not a confounding variable. Future studies addressing the limitation were recommended (Ross & Carney, 2017). In a quasi-experimental study determining the effect of the instructors' presence in the simulation lab on students' level of anxiety, both forms of the STAI were used (Horsley & Wambach, 2015). Form Y-2 was used to

control the students' trait anxiety to decrease the potential error of statistical analysis while measuring state anxiety. When controlling for trait anxiety, there was a significant difference in the acute stated anxiety amongst the two groups (Horsley & Wambach, 2015).

In my study, I sought out to determine if AR 360 photosphere orientation had an effect on prelicensure nursing students stated acute anxiety. Understanding trait anxiety may affect how an individual copes with an acute anxiety-driven stimulus influencing the outcome of the analysis. Chronic trait anxiety is being used as a confounding variable in this study (Villada et al., 2017). Having trait anxiety as a confounding variable during statistical analysis will decrease the potential for a type II error to occur. A type II error would reveal there is no statistical difference causing the null hypothesis to be retained when there is a statistical difference in the acute state anxiety levels. By controlling the confounding variable of chronic trait anxiety, I could determine whether the intervention of AR 360 photosphere orientation had an effect on the acute stated anxiety response that occurs when confronted with the stimuli of a new clinical environment compared to prelicensure nursing students who do not receive the intervention of AR 360 photosphere orientation.

Synthesis of Studies Related to the Research Questions

Minimal literature exists that discusses AR, and the effects of the intervention on anxiety as evidenced by the search using the Boolean terms. A meta-analysis of 13 studies, using the keywords of AR and anxiety, concluded that AR was a useful tool in assisting with individuals with anxiety and phobias. The analysis of these studies

revealed that when individuals interacted in the AR environment, their concentration and motivation improved (Riva et al., 2016). The improvement in concentration and motivation improved the individual's ability to develop knowledge and skills on how to improve or overcome the response of anxiety to stimuli in the real-world environment (Riva et al., 2016).

Limitations of the studies focusing on interventions that were effective in decreasing anxiety in students included small sample size, no control group to compare results, and generalization of the group of students (Riva et al., 2016; Ross & Carney, 2016; Turner & McCArthy, 2017). Understanding the challenges in healthcare and education, along with prelicensure student's apprehensions and behaviors of anxiety as they are to enter a new clinical environment, in conjunction with the documented learning benefits that other professions have had in achieving learning outcomes with AR was the driver of this study.

Summary and Conclusion

AR has been successfully used for decades as a method of education in other disciplines. Healthcare, specifically nursing, is in the beginning stages of studying the benefits of using AR as a method of teaching. With minimal literature on the use of AR in the health care profession as a method to reduce learners' anxiety level, no literature was found using AR through the means of orientation, to decrease prelicensure nursing student's anxiety. By exposing the prelicensure nursing student to the stimuli of the unknown clinical environment, anxiety levels can be reduced. This exposure can be obtained through the human perceptive adventure AR allows by interacting with the

environment, thereby, improving one's awareness of the environment. Guided by Bruner’s Discovery Learning Theory, the present study will fill the gap of knowledge by determining if the use of AR 360 photosphere as a method of orientation to a new clinical environment from a distance will decrease anxiety levels in prelicensure nursing students as they enter a new clinical setting. The intervention of AR 360 photosphere anxiety levels was analyzed pre-and post and was also be compared to students who did not receive the intervention of AR 360 photosphere. The methodology of the study follows in Chapter 3.

Chapter 3: Research Method

The purpose of this study was to determine the effect of AR 360 photosphere on prelicensure nursing students' level of anxiety as they enter a new clinical environment compared to prelicensure nursing students' level of anxiety who do not experience AR 360 photosphere orientation. The purpose was driven by the recommendation of the IOM, which focuses on how nurse educators need to develop and evaluate new approaches to teaching clinical education that help prelicensure nurses to gain knowledge of real-world context (IOM, 2011). I used a quasi-experimental approach to understand if AR has value in nursing education by reducing nursing student anxiety levels. The use of AR can provide nursing academia with a new teaching approach that will give nursing students the opportunity to maximize their clinical experience and achieve learning outcomes.

In Chapter 3, the methodology and research design for the study is presented. Details will be discussed on Spielberger's STAI along with the rationale for why the instrument was chosen to measure the prelicensure nursing student's anxiety's and how the data were analyzed. The chapter will continue with descriptions of potential threats to external and internal validity and how they were addressed. The chapter will end with the ethical procedures that were followed to ensure higher standards of protecting the participants was maintained before, during, and after the study.

Research Design and Rationale

In this quantitative study, the independent variable is the exposure to AR 360 photosphere as a method of orientation for prelicensure nursing students to a maternal–child clinical unit. The dependent variable is the prelicensure nursing students' acute state

anxiety levels after receiving the AR 360 photosphere orientation. The prelicensure nursing student's acute anxiety level was measured using the overall score from Spielberger's Likert-based STAI tool.

With a nonrandomized study, there can be an unexplained variation in the participant's day to day anxiety levels also known as an individual's chronic trait anxiety. Chronic trait anxiety may affect how an individual copes with an acute state anxiety driven stimulus, influencing the outcome of the analysis (Villada et al., 2017). Chronic trait anxiety can change the effect AR 360 photosphere orientation has on anxiety. Each individual's acute state and chronic trait anxiety level begins at a different level. Individuals with low chronic trait anxiety may respond differently to the orientation compared to those with high chronic trait anxiety. Thus, chronic trait anxiety was a moderating variable of the study to control for the influence chronic anxiety may have had in the relationship between the AR 360 photosphere orientation and the outcome of anxiety. Pretest STAI scores were collected to give a baseline state and trait anxiety scores. The pretest score of the moderating variable of chronic trait anxiety was compared to the posttest STAI scores to control for the potential influence in the anxiety response to the AR 360 photosphere orientation.

This quantitative study involved a two group, pretest, posttest, quasi-experimental research method with the sample being a convenient selection of prelicensure junior level nursing students entering their first maternal–child rotation. The quasi-experimental method was used to compare postintervention anxiety scores to score preintervention to determine if AR 360 photosphere affects anxiety levels. The analysis was also compared

to a control group of participants' mean difference of pre- and post-anxiety levels to understand if there was a difference in methods of orientation.

Within the quasi-experimental method, the timing of the pre- and post-STAI analysis needed to be consistent throughout the study for the accuracy of the data. For both the intervention and control group administration of the pre-STAI survey was to be 1 week before entering the clinical setting experience. After the administration of the pre-STAI, the two groups were divided into their method of orientation. I explained and demonstrated the instructions and how to access the link of the AR 360 photosphere, illustrating how the AR 360 photosphere orientation works to the intervention group. After the demonstration, the prelicensure nursing students had 1 week to view the active AR 360 photosphere orientation autonomously. The AR 360 photosphere is located on an online platform that documents the frequency and duration of use for each prelicensure nursing student through their individualized de-identified login code. I was able to analyze the login data to ensure each individual code or student had viewed the AR 360 photosphere orientation at least once.

The control group that participated in the traditional faculty-led orientation was scheduled for their orientation at any point during the week after completing the pre-STAI survey. Currently, the faculty-led orientation is scheduled at the convenience of the clinical faculty and the availability of the clinical site within the week time period. The control group that had the faculty-led orientation of the clinical site consisted of a singular physical visit to the clinical site and a tour of the maternal–child unit as the clinical faculty demonstrated the location and the required clinical equipment.

The post-STAI survey was required to be administered for both groups after the participants received either the AR 360 photosphere or the faculty-led orientation method, and immediately before the participants enter the clinical setting experience. The rationale for the timing of the post-STAI immediately before entering the clinical setting was to measure the effectiveness of the AR 360 photosphere and its ability to be viewed autonomously at the participant's discretion, which could allow the prelicensure nursing student to review their orientation just before their clinical experience. Again, the online platform that the AR 360 photosphere documented the frequency and duration of use for each prelicensure nursing student through their individualized de-identified login code, allowing me to see when the last viewing of the AR 360 orientation method was.

By using the quasi-experimental approach, the comparison between the intervention and control group was used to understand if AR has value in nursing education by reducing nursing student anxiety levels. If AR can decrease anxiety levels in prelicensure nursing students, nursing academia may have a new teaching approach to maximize nursing students' clinical experience and help them achieve learning outcomes.

Methodology

Population

Junior level students who were completing their coursework from an accredited school of nursing and who were scheduled to complete their maternal–child rotation were the target population. With four colleges of nursing at the clinical site, there was an estimate of 150 prelicensure nursing students entering the maternal–child clinical rotation site, where the AR 360 photosphere orientation is available, during a semester. The

sample population was drawn from two of the five colleges of nursing due to the resources that would have been required to include all five colleges.

Sampling Procedures

This study involved a two group, pretest-posttest quasi-experimental research method with the sample being a convenient selection of prelicensure junior level nursing students entering their first maternal–child clinical rotation. Because clinical groups are predetermined by the schools of nursing, neither randomization or random assignment was possible. The clinical groups of the prelicensure nursing students from each of the two schools were divided into either a control group or an intervention group. The control group for one of the schools of nursing was those who do not complete their rotation at the AR 360 photosphere orientation site but at a logistically similar maternal–child clinical site. The other school of nursing's first clinical group was assigned to receive the control method of orientation and the second clinical group received the intervention method of orientation. The control group received the standard in-person faculty-led orientation at the clinical site. The intervention group of prelicensure nursing students received the use of the autonomous active orientation of AR 360 photosphere for orientation to their clinical setting.

Due to the logistics of the class size of two of the schools of nursing, they completed their maternal–child rotations at more than one hospital site within the area. Each of the hospitals used by the school of nursing offers the same clinical experience with similar settings. The similar settings include the setup of the rooms and the equipment available to complete the care. The environment is also similar in that these

hospitals are teaching facilities where there are also medical students and residents in the learning environment. To ensure there was no sharing of the orientation methods between the groups of participants, the control group was in the clinical setting where the AR 360 photosphere orientation was not available. The intervention group was the prelicensure nursings students who were in the clinical setting where the AR 360 photosphere is available.

The other school of nursing completed all their maternal–child rotations at the site where the AR 360 photosphere orientation is used. Over the course of two semesters, data were obtained from this school due to the logistics of their maternal–child being only half of a semester. To ensure no sharing of the AR 360 photosphere among the control and intervention group, the control group of the current faculty-led orientation method was completed first. The intervention AR 360 photosphere orientation method was the following clinical group.

The inclusion criteria for this study were:

Junior level prelicensure nursing students who were scheduled for their maternal–child clinical rotation and were enrolled at one of two schools of nursing had completed the written consent to participate in the study, and who had not previously worked in or been exposed to the study clinical site environment.

The exclusion criteria for this study was:

A prelicensure nursing student who had previously worked in or been exposed to the study clinical site environment.

To ensure an adequate sample size, G*Power 3.0.10 software was used to calculate a sample size of 128. The sample size was based on the two-tail statistical independent *t*-test of means difference between two independent groups. The input parameters of the power analysis included a medium effect size of 0.5, an alpha of 0.05, and power of 0.80. The calculated sample size of 128 would mean the sample size of both the control and experimental group would each be 64 prelicensure nursing students.

Procedures for Recruitment, Participation, and Data Collection

Recruitment procedure began by contacting Curriculum and IRB Chairs from the two colleges of nursing school, who used the maternal–child clinical site where the AR 360 photosphere orientation is available and have no connection with the study, for permission to allow nursing students from their school participate in the study. To ensure that the participants were not a vulnerable population and to ensure no conflict of interest, I did not make educational contact with the prelicensure nursing students during the research study. The prelicensure nursing students received access to the STAI pre- and post-surveys on Survey Monkey, access to the online AR 360 photosphere orientation through secured Internet links, and the onsite clinical orientation through assigned clinical faculty. The rationale for this was that the prelicensure nursing student would perceive this as the norm of being orientated by their assigned clinical faculty member from their nursing school who was overseeing their clinical progress during the rotation. Thus, there was no change in routine by having an unfamiliar third-party instructor from outside the participating school's orientating the prelicensure nursing student to the clinical site, which may affect anxiety levels.

After permission was granted and IRB approval obtained, 1 week before the prelicensure nursing students started their maternal–child rotation, I met with the students and explained the study, obtained participation consent, and distributed the de-identifying code and link for the pre-STAI survey with the two schools of nursing prelicensure nursing students. The participation consent and the pre-STAI survey were placed together on a confidential third-party confidential platform of Survey Monkey. I met with those in the intervention group to instruct the students on how to log in with their de-identify code and how to actively view the AR 360 orientation method. I gave the instructions (Appendix B) to the clinical instructors for the control group on how to proceed with their current clinical on-site orientation making sure that they tour the maternal–child floor of the facility where the clinical experience occurred and include the necessary equipment required to complete the learning outcomes.

I asked for the participation of the prelicensure nursing student through a written informed consent that was placed into Survey Monkey. The informed consent was connected to a de-identified code number that was used by both groups of the prelicensure nursing student to log in and complete the pre and post-STAI and for the intervention group to log into the AR 360 photosphere orientation. A statement in the informed consent stated that the participant could withdraw from the study by not completing either the pre- or post-survey, with the understanding that both the pre- and post-survey needs to be completed for the participant to be included in the study. The students also received a copy of the informed consent. The students were asked to save a copy of the informed consent which contained the referral information to each of the

participating schools counseling centers for anyone who may have realized the study was focused on their level of anxiety and as such desired a consultation.

The STAI was placed on Survey Monkey, a secured third party online survey platform, ensuring students had no contact with the researcher and were completely de-identified during data analysis. At the beginning of the STAI survey, there was directions on how to complete the survey. Besides the instructions, demographics were included at the beginning of the survey before Spielberger's 4-point Likert scale STAI questions. Demographic information is found in Appendix A and included the gender of the student, the number of semesters completed in the prelicensure nursing program, the number of hours the individual has completed in the clinical setting, what specialty areas of clinical experience the participant has had, if the individual has previously worked or been exposed to the particular maternal–child clinical site environment, and if they have completed a maternal–child clinical experience at a different but similar site. I excluded the STAI survey's from the study that did not meet the inclusion criteria or meet the exclusion criteria for this study. Participants, including each nursing school's curriculum chair, faculty, and the participating prelicensure nursing students, were debriefed on the findings at the conclusion of the study.

Information on Conducting the Intervention

The AR 360 photosphere of the maternal–child clinical area was available on a secured platform that required the student to use their individual specific de-identified passcode for access to the website link. Faculty and students from two Midwestern College of Nursing agreed to participate in the usage of the AR 360 photosphere

orientation method. The intervention began with the administration of Spielberger's STAI that was available through the secured third-party online database platform of Survey Monkey. The clinical faculty from the participating organization, who had no connections with the researcher, assisted in executing the study. The login information was distributed to the prelicensure nursing student participants in the form of a de-identifying code that the students entered as they completed the pre- and post- STAI survey. The pre-survey was administered in an online format that was distributed to the students by an email link that both groups completed before receiving their method of orientation. Distribution by the third-party platform assured that the researcher had no identification information such as email addresses that would link the students to any data results.

The method of orientation depended on the group to which the students were assigned. The control group received the routine faculty-led orientation and no intervention with the AR 360 photosphere (see Appendix B). The intervention group received the AR 360 photosphere orientation. To access the AR 360 photosphere orientation, each participant received a de-identified code. The post-survey STAI was administered in an online format to both groups, through a link sent by the third party platform, after the participants had completed orientation and immediately before the student entered the clinical environment for their first clinical experience.

Instrumentation and Operationalization of Constructs

The dependent variable of anxiety was measured with Spielberger's STAI instrument. The STAI instrument was developed in 1970 by Spielberger, Gorsuch, and

Lushene and has been utilized in multiple diverse studies establishing the validity and reliability of the results. The STAI has been widely researched and used to measure anxiety as the instrument measures the specific phenomena of anxiety through the stated conscious awareness of the anxiety level that may occur during an initial situation along with the personal propensity to the trait of anxiety (Julian, 2011; Spielberger, Gorsuch & Lushene, 1970). The STAI instruments measurement of anxiety was important in this study as this was the first time that the prelicensure nursing students were in the maternal–child clinical setting. The STAI will be used pre- and post-orientation method, to measure the effect of the independent variable of AR 360 photosphere orientation on the dependent variable of anxiety.

The self-reported STAI consists of a total of 40 questions. Form Y-1 contains 20 questions that focus on state anxiety levels which are answered on a 4-point ordinal Likert scale with answers ranging from 1 ‘not at all’ to 4 ‘very much so.’ Form Y-2 has 20 questions that focus on trait anxiety levels which are answered on a scale of 1 ‘almost never’ to 4 ‘almost always.’ the higher the score, the higher the anxiety levels (American Psychological Association, 2017; Julian, 2011; MindGarden, 2017).

The Spielberger’s STAI has a copyright and is available from MindGarden.com (see Appendix D). The online survey license of permission, both Y-1 & Y -2 form, and answer key is $2.50 per survey. The permission gave me the allowance to retype and format the STAI for any online administrative platform. The limiting factor was that the number of purchased instruments must be used within one year of purchase. With the

Spielberger's STAI, there is the stipulation that permission must also be obtained to insert up to five sample questions in a manuscript and not the entire instrument

The reported test-retest coefficient for the Y-1state anxiety form was reported 0.16 to 0.33 and Y-2 trait anxiety form 0.76-0.84. Internal consistency reliability ranged from 0.83 to 0.92 (Spielberger et al., 1970). A meta-analysis of 816 articles, medical and nonmedical, were reviewed to test the reliability of Spielberger's STAI instrument. The median score for the internal consistency of Y-1 state anxiety form was 0.92 with test-retest of 0.68, and for Y-2 trait anxiety form internal consistency was 0.90 and the test-retest of 0.88 (Barnes, Harp & Jung, 2002). The internal consistency reliability of the STAI is acceptable for studies involving various populations studying state and trait anxiety levels (Barnes et al., 2002). One suggestion in the meta-analysis to enhance the internal consistency reliability of studies is to make sure that they use the correct age appropriate STAI instrument is used as there are adult and child versions (Barnes et al., 2002). In the proposed study, the adult version was the appropriate version to use with the prelicensure nursing students (MindGarden, 2017).

The STAI has been validated for general and psychiatric populations (Julian, 2011). The validation was derived by testing multiple populations in high stimulating stress environments (Julian, 2011). Though the STAI can detect anxiety levels, there is the limitation of the instrument in differentiating between behaviors of anxiety and depression levels (Julian, 2011). In the proposed study, the focus is the effect that AR 360 photosphere orientation has on the level of detected anxiety, and it is not necessary to differentiate if the level is due to the behavior of anxiety or depression.

Intervention

An AR 360 photosphere of the maternal–child clinical area was built through a collaborative effort between the clinical site's organizational research committee, the hospital's nursing executives, a Midwestern University's college of nursing, and research and development technical team in 2016. AR 360 photosphere was developed by taking 360 degree panoramic photos of the clinical site and having the research and development technical team piece the 360 degree photos together with the use of Unity Game Engine, PHP, and Linux scripting. The AR 360 photosphere of the maternal–child clinical area is placed on a secured platform that requires an individual specific passcode for access to the website link. Two Midwestern Colleges of Nursing who were not involved with the building of the AR 360 photosphere agreed to allow their faculty and students to participate in the usage of the AR 360 photosphere orientation method. IRB was obtained from each of these colleges.

Operationalization Definitions

AR is defined as the technological ability to combine reality with virtual experiences allowing individuals to connect to experiences in a real-time panoramic atmosphere that is registered in three dimensions (3D) (Azuma, 1997: Dunleavy, 2014). As the individual views the virtual computer-generated superimposed objects, they are allowed to interact in the 3D real-world environment (Azuma, 1997; Chandler & Munday, 2011; Lyons 2017; Riva et al., 2016). A 360-degree photosphere is a type of AR application that is produced through the use of 360-degree cameras and allows embedded images to be added into the 3D environment (Andert & Alexakis, 2015; Wong, 2016).

Anxiety is a subjective and normal response that an individual has to a threatening stimulus (Potter & Moller, 2016). The response to anxiety can be acute or chronic. Acute anxiety, also referred to as ‘state anxiety,' is a temporary, natural, and necessary autonomic nervous system response to a situation (Potter & Moller, 2016; Spielberger & Sarason, 1975). Chronic anxiety is also referred to as “trait anxiety.” The term trait focuses on how each individual responds to a stimulus differently and that the response is relatively stable with each incident (Spielberger & Sarason, 1975). Trait anxiety plays a role in how one responds to an acute threat (Villada et al., 2017). The higher one's trait anxiety is, the more difficult it is for one to functionally cope with an acute threat influencing their stated acute anxiety.

The dependent variable of anxiety was measured with the self-reported STAI instrument for both the control group and the intervention group, who received the independent variable of AR 360-photosphere orientation.

Data Analysis Plan

The coded data obtained was directly exported from Survey Monkey to an Excel spreadsheet for accurate coding according to Spielberger’s STAI manual, and then imported to the SPSS 25 program for analysis. Any data that did not match the inclusion or meets the exclusion criteria was removed from the analysis. Both Survey Monkey and SPSS 25 are secured sites. Survey Monkey retains, and stores data as long as needed by the survey account owner.

The statistical analysis of the data was completed to answer the following research question: What is the effect of augmented reality 360 photosphere on

prelicensure nursing students' level of anxiety as they enter a clinical environment as compared to prelicensure nursing students' level of anxiety that do not experience augmented reality 360 photosphere?

$H_0$1: There will be no difference in the prelicensure nursing students' level of anxiety that experience augmented reality 360 photosphere as they enter a clinical environment as compared to prelicensure nursing students' level of anxiety who do not experience augmented reality 360 photosphere.

H_a1: There will be a decrease in the prelicensure nursing students' level of anxiety that experience augmented reality 360 photosphere as they enter a clinical environment as compared to prelicensure nursing students' level of anxiety who do not experience augmented reality 360 photosphere.

The second research question was: When controlling for chronic trait anxiety, what is the effect of the augmented reality 360 photosphere on prelicensure nursing students' level of acute anxiety as they enter a clinical environment as compared to prelicensure nursing students' level of acute anxiety who do not experience the augmented reality 360 photosphere?

$H_0$2: When controlling for chronic trait anxiety, there will be no difference in the acute anxiety level in prelicensure nursing students' who experience augmented reality 360 photosphere as they enter a clinical environment as compared to prelicensure nursing students' level of acute anxiety who do not experience the augmented reality 360 photosphere.

H_a2: When controlling for chronic trait anxiety, there will be a decrease in the acute anxiety level in the prelicensure nursing students' who experience augmented reality 360 photosphere as they enter a clinical environment as compared to prelicensure nursing students' level of acute anxiety who do not experience the augmented reality 360 photosphere.

Data were statistically analyzed in three steps; data preparation, descriptive statistics, and inferential statistics (Trochim, 2006). Data preparation was assured by the researcher accurately coding the data according to the STAI answer key and entering the numbers into SPSS 25, a statistical database. Descriptive statistics of the means, standard deviations, and ranges were completed with independent variables. Graphic display of this information allows a visual interpretation of what the data reported (Trochim, 2006). Spielberger's STAI instrument is a 4- point Likert scale and should be analyzed as ordinal level data. With the ordinal level of the dependent variable of anxiety, and examining the differences in the dependent variable amongst two independent groups with an independent sample research design, the independent *t*-test be utilized for analysis to test the first research question's hypothesis.

The second research question was driven by understanding that each individual's anxiety traits are different. To test the hypothesis, statistical analysis was completed by separating out the STAI questions of the stated conscious awareness of the anxiety level that may occur during an initial situation and the personal propensity to the trait of anxiety. By separating the two different concepts of acute state and chronic trait anxiety, I was able to complete an ANCOVA. With the ANCOVA analysis of the moderator

variable of chronic trait anxiety was controlled. Analysis of the moderator variable allows one to see the influencing effect chronic trait anxiety has on the dependent outcome variable of anxiety. The analysis that controls for the moderator variable was then compared between each orientation method groups to understand the mean effects of each orientation method on acute state anxiety levels.

Threats to Validity

Internal Validity

The validity of the STAI instrument was discussed previously as the long-standing instrument has been used in multiple studies for general and psychiatric populations (Julian, 2011). In the proposed study, internal validity was of concern with the convenience non-randomized sample of the study as external variables may be found in each group that cannot be controlled for such as history and testing. The individual participant's history at the time of the study was difficult to control in the convenience non-randomized sample as unaware of other stimuli that may affect the participant's level of anxiety. This could include personal and academic stressors that would increase the individual's level of anxiety to even actions the student may be doing to control of decrease anxiety such as relaxation techniques. The history of the participant's anxiety can be partially controlled in this study for participants who have a tendency of chronic anxiety. Chronic anxiety has the potential to affect the acute state anxiety (Villada et al., 2017) The STAI tests for both acute state anxiety and chronic trait anxiety allow the control of the moderation of chronic trait anxiety with statistical analysis.

The second potential threat to internal validity was the pre-test/post-test procedure. With the students taking the STAI before the method of orientation, they are aware of the concept of anxiety which could have affected how they answered the post-test STAI. Also, with the pre-and post-test being completed one week from each other, the pre-test could have been a form of intervention that decreases the anxiety level jeopardizing the internal validity (Yu, 2017). The decrease in anxiety levels may have occured as the participants were able to remember how they answered the questions and with knowing that the concept of anxiety was being measured there could have been an effect on how they answered the question during the post-test (Campbell & Stanley, 1963). Due to the timing of the participating groups starting the clinical course and requiring orientation before the first clinical experience, in this study, there was no way to control for this potential threat.

External Validity

A potential threat to external validity, with a non-randomized convenience sample, was to generalize the results to a large group. In this study, just two Midwestern Metro area colleges of nursing that are preparing Bachelor of Science nurses were used to participate. Having just two colleges of nursing school participating excludes non-BSN schools in the Midwestern Metro area, rural and community colleges that are preparing prelicensure nursing students, along with other parts of the country nursing school programs. There may be differences between this study sample and the schools of nursing that were not participants.

The second potential threat to external validity was the effect of the pre-test on the orientation methods. With the students taking the STAI before the method of orientation they were aware of the concept of anxiety that is being studied. Being aware could have affected how much attention the students gave during the traditional method of orientation in the control group or the frequency and duration of the use of the AR 360-photosphere orientation method. Neither of these could have been controlled during the study.

Ethical Procedures

Agreement for permission to allow prelicensure nursing students to participate in the study was completed by contacting Curriculum and IRB Chairs from two colleges of nursing schools, who use the maternal–child clinical site where the AR 360 photosphere orientation is available and have no connections with the study. Permission was obtained from the hospital's Organizational Nursing Research Council specifying the Nursing Colleges involved in the study. Once written permission was obtained from the Nursing Research Council, it was submitted along with the IRB application to each of the participating nursing school's IRB committees. Once IRB approval was achieved with each of these schools, IRB approval was obtained from Walden University on behalf of the researcher.

To ensure that the participants were not a vulnerable population and to ensure no conflict of interest, no educational contact was made by the researcher. Participation in the study was voluntary and was noted throughout the study. Initial consent forms notified the voluntary participation, and this was also repeated at the beginning of the

STAI pre-and post-surveys. A statement notified the participant that at any time they could have withdrawn from the study by not completing either the pre-or post-survey, with the understanding that both the pre-and post-survey needed to be completed for the participant to be included in the study.

The orientation information between the two groups was the same material which nullified any potential for withholding any information required to meet learning outcomes. This study focused on the method of delivery of orientation information and the effects of the orientation method on anxiety. Participants were notified of this information in the consent along with the benefits of the AR 360 photosphere intervention. The benefits include the potential social implications of the consistent, active, and autonomous learning method can have as it can be completed on their time, from any location, and as frequently as they would like to review. The students were also allowed to maintain access to the AR 360 photosphere even after completion of the study while they continue to complete the maternal–child clinical experience at the clinical site of the AR 360 photosphere.

With a focus on anxiety levels of the prelicensure nursing student as they entered a new clinical environment, may have escalated the student's focus and realization of personal anxiety concerns and needs. The potential adverse effects of the realization of anxiety concerns was listed in the student's copy of the inform consent. Referral information to their specific school’s resource personnel to obtain consultation as desired was listed in the student copy initial consent.

To address the ethical concerns of data handling, the participants were notified in the written consent of the use of de-identifying codes to keep the data they entered with the completion of each survey anonymous. Data was placed on the secured Survey Monkey platform that only the primary investigator of the research study had access to, and the data was not shared. The data will be kept on the secured Survey Monkey platform for five years and then appropriately destroyed. Dissemination of the data will be presented in chapter 4 through statistical analysis of the anonymous data and will maintain the confidentiality of the participating schools.

Summary

The purpose of the study was to determine the effect of the use of the AR 360 photosphere on prelicensure nursing students' level of anxiety as they enter a new clinical environment compared to prelicensure nursing students' level of anxiety who do not experience AR 360 photosphere orientation. In this chapter, specific details of the methodology were disclosed. The disclosure included the quasi-experimental design with the use of participants from two Midwestern metro area College of Nursing schools that were conveniently non-randomized into two groups. The experimental group received the experience of the AR 360 photosphere orientation method while the control group did not have the AR 360 photosphere experience but instead had the traditional faculty lead orientation experience. Ethical considerations were reviewed in this chapter with a discussion of the operating procedures that were in place to decrease any potential adverse effects on the participants and threats to validity. The STAI instrument was placed on the secured Survey Monkey platform to collect data on anxiety levels pre-and

post-orientation experience from both groups. The data was exported from Survey Monkey to SPSS 25 where the data was analyzed by comparing the means difference within each group and between each group. Comparison of the two groups was also completed with an ANCOVA analysis to control for the moderator variable of chronic trait anxiety which may affect acute state anxiety. The analysis of the data will be reported with a discussion in Chapter 4.

Chapter 4: Results

The purpose of this study was to determine the effect of the use of AR 360 photosphere orientation on prelicensure nursing students' level of anxiety as they enter a new clinical environment compared to prelicensure nursing students' level of anxiety who did not experience an AR 360 photosphere orientation. The quantitative quasi-experimental study was focused on answering two research questions.

The first research question was: What is the effect of augmented reality 360 photosphere on prelicensure nursing students' level of anxiety as they enter a clinical environment as compared to prelicensure nursing students' level of anxiety that do not experience augmented reality 360 photosphere?

$H_0$1: There will be no difference in the prelicensure nursing students' level of anxiety that experience augmented reality 360 photosphere as they enter a clinical environment as compared to prelicensure nursing students' level of anxiety who do not experience augmented reality 360 photosphere.

H_a1: There will be a decrease in the prelicensure nursing students' level of anxiety that experience augmented reality 360 photosphere as they enter a clinical environment as compared to prelicensure nursing students' level of anxiety who do not experience augmented reality 360 photosphere.

The second research question was: When controlling for chronic trait anxiety, what is the effect of the augmented reality 360 photosphere on prelicensure nursing students' level of acute anxiety as they enter a clinical environment as compared to

prelicensure nursing students' level of acute anxiety who do not experience the augmented reality 360 photosphere?

$H_0$2: When controlling for chronic trait anxiety, there will be no difference in the acute anxiety level in prelicensure nursing students' who experience augmented reality 360 photosphere as they enter a clinical environment as compared to prelicensure nursing students' level of acute anxiety who do not experience the augmented reality 360 photosphere.

H_a2: When controlling for chronic trait anxiety, there will be a decrease in the acute anxiety level in the prelicensure nursing students' who experience augmented reality 360 photosphere as they enter a clinical environment as compared to prelicensure nursing students' level of acute anxiety who do not experience the augmented reality 360 photosphere.

In this chapter, I discuss the data collection and analysis process along with dissemination of the results to compare the effects that each method of orientation had on prelicensure nursing students stated anxiety levels. Determining if AR can help reduce anxiety provides nursing academia with a teaching approach to help prelicensure nursing student as they enter a new clinical setting. Decreasing anxiety levels may give nursing students the opportunity to maximize their clinical experience and achieve learning outcomes.

Data Collection

An approval from the hospital's nursing research council where the AR 360 photosphere orientation is in place was obtained. Then, a collaboration letter and two IRB

approvals were obtained from three Midwestern colleges of nursing over the period of November 16, 2017 to the final IRB approval on January 4, 2018. From the initial proposed demographic descriptive questions, the IRB from one school requested the gender identification question be removed due to the minimal number of male prelicensure nursing students and the question potentially being an identifier.

Initial data collection began at two Midwestern Universities on January 18, 2018. After the initial first round of data collection with response rates lower than expected with the postsurvey, I reviewed the possibility of adding the third college of nursing to the sample. I returned to one of the Midwestern colleges of nursing who was overseeing the data collection to amend the IRB and add this college's accelerated nursing program that was scheduled to start clinical in mid-March at a clinical environment where the AR 360 photosphere orientation method is available. Approval of the amendment was received on February 7, 2018. Walden University IRB approval (approval # 02-13-18-0339097) was obtained to analyze the data on February 13, 2018. An amendment was submitted immediately with the change to add the additional sample site. The amendment to include the data from the third participant site was approved by Walden on February 28, 2018.

Pre- and post-survey data were collected with the use of Spielberger STAI instrument from a total of four clinical rotations among the three colleges of nursing and was completed from January 18 to June 5, 2018. The only face-to-face contact I had during the study with the participants, was during the initial review of the study and the consent. I reviewed the study and consent with 146 prelicensure nursing students who

could have made the choice to participate by completing the pre-STAI survey at that time and then the post-STAI survey after their orientation method to their first clinical experience on the maternal–child floor.

Data Collection Sample

Three Midwestern colleges of nursing schools were selected to participate in the study as each was a bachelor level program and had at least one clinical group at the maternal–child setting where the AR 360 photosphere could be used as the orientation method. The rest of their clinical groups were at a similar maternal–child setting clinical environment.

The participating sample was a convenience sample, as the prelicensure nursing students consented were entering their maternal–child clinical rotation and the orientation process is a requirement prior to starting the clinical experience. I did not randomize the selection of orientation process between AR and faculty-led as clinical groups were pre-assigned by each school at the beginning of the semester. The prelicensure nursing students' orientation method was dependent on the clinical group's clinical site and the availability of AR 360 photosphere orientation method. The prelicensure nursing students gave consent and were asked to complete the presurvey before or after their theory course the week prior to their first clinical setting. Completing the consent the week before their first clinical setting allowed students who used the AR 360 photosphere orientation method time to autonomously complete the interactive orientation and discover the maternal–child clinical environment.

One discrepancy in the data collection was the timeframe from the presurvey to the post-survey that affected only the AR 360 photosphere orientation method. Some AR 360 photosphere orientation method groups had more than 1 week and up to 3 weeks to view the autonomous orientation method platform. The length of time between the pre- and post-survey was due to two different sets of circumstances. One situation was related to unexpected weather, causing cancellation of school and postponing the clinical experience. The second situation of time discrepancy was related to one school switching between groups who went every other week, thus causing one group to be given an extra week of AR 360 photosphere orientation. The second timeframe discrepancy could have been prevented if I had gone 2 separate weeks to consent and complete the presurvey, but with the students all in one theory class, the specific college of nursing asked that I would consent only on one date. By consenting on one date instead of 2 separate weeks, there were no potential discrepancies in data with the presurvey due to students talking about the study, the pre-STAI survey and sharing of the orientation method prior to the pre-STAI survey.

Sample of Participants

The priori sample size of prelicensure nursing students required was calculated by G*Power 3.0.10 software. The calculation was based on the two-tail statistical independent *t*-test of means difference between two independent groups. The input parameters of the power analysis included a medium effect size of 0.5, an alpha of 0.05, and power of 0.80. The calculated sample size was 128, which meant the sample size of

64 prelicensure nursing students was required for both the control and experimental group.

From the three colleges of nursing, there was a total of 146 prelicensure nursing students who were entering their junior level maternal–child clinical rotation who could have made the choice to participate in the study. One hundred-thirteen prelicensure nursing students completed the pre-survey with 67 of them using the AR 360 photosphere orientation method and 46 using the faculty-led orientation method. Thirty-one participants did not meet inclusion criteria and were excluded from the study by having answered yes to having previous exposure to the maternal–child environment questions. Thus, of those who completed the pre-survey, 50 of AR and 32 of the faculty-led orientation students qualified for the study and were sent a post-survey to complete after their orientation method to their first clinical experience on the maternal–child floor. Thirty post-surveys were completed for the AR group and 17 for the faculty-led orientation.

The participants were all Bachelor of Science prelicensure nursing students in their junior level maternal–child theory and clinical from three private Midwestern College of Nursing programs. The mode experience of clinical hours the participants selected that they had completed at the beginning of their maternal–child rotation was the range of 36 to 71 hours. One-fourth of the participants were unsure of the number of hours they had completed but since they had attended at least one clinical rotation, they had at least 36 hours in areas such as long-term care, medical-surgical, pediatrics, and psychiatric clinical environment sites. Four participants stated that they had no prior

clinical experience and that the maternal–child clinical rotation was their first clinical experience.

The generalizability of my results is limited because I was able to include only three Midwestern Metro area colleges that prepare Bachelor of Science nurses. By not meeting the predicted sample size, the power of the significance of the test was decreased and the generalizability to the population of prelicensure nursing students. There may have been a pre-test post-test effect because the participants completed the STAI before and after the orientation (Warren, 2013). Being aware could have affected how much attention the students gave during the traditional method of orientation in the control group or the frequency and duration of the use of the AR 360-photosphere orientation method.

Orientation Method Precision

Clinical orientation is a required process, by each college of nursing and clinical site, of all students regardless if they decided to participate in the study. The orientation method the prelicensure student received was dependent upon the clinical group that they were assigned to at the beginning of the semester. Faculty-led orientation is a static vicarious learning of the environment as the clinical faculty provide guided tours for the nursing students to the clinical area where they are assigned. With faculty-led orientation, there was no guarantee of the availability to the entire clinical environment at the time of the orientation. There is no specific orientation protocol that nursing faculty use for orientation so what the nursing students experienced in the control groups could not be controlled.

The AR 360 photosphere orientation method is a consistent autonomous orientation method that aligns with Jerome Bruner's discovery learning theory (Bruner, 1996; Bruner, 1966). The AR 360 photosphere orientation is available to the prelicensure nursing student on a technology platform that required the prelicensure student to log in with their username. The ability of the AR 360 photosphere orientation technology to documents the student's login allowed for verification of the completion of the orientation. Of the 30 prelicensure nursing students participating in the study, 28 of the 30 were documented as logging in to the AR 360 photosphere orientation at least once prior to their first clinical experience. To guide the student's autonomous navigation and discovery of the environment's specific areas and equipment, the AR 360 photosphere orientation group was given instructions with items to discover (see Appendix D). Although logging into the AR 360 photosphere orientation can be verified, what the participant chose to view cannot be determined. Therefore, there could be some variation of what participants in the AR groups saw for their virtual orientation.

Results

Descriptive Statistics

Descriptive curriculum characteristic questions were placed at the beginning of the survey to compare participant's characteristics. Due to the prominent characteristics of white female in their early 20's participant pool and per the request of IRB, gender identification was removed from the demographic questions. Ethnicity and age were also removed to prevent identification as the colleges reported none to only one or two

prelicensure nursing students that would not fall into the prominent characteristic identified.

Comparison of characteristics included the similarity of the prelicensure nursing curriculum experience of each group which could have influenced the individuals stated anxiety level. The average age reported by the three metro colleges were early 20's. All participants but one, based upon credit hours were classified as a junior, while one was at a senior semester classification level but in junior level nursing curriculum courses. Documentation of previous clinical experience ranged from four participants having no previous experience, with the maternal–child being their first clinical experience, 21.3% unsure of the number of clinical hours that they had completed but had at least one previous rotation, and the rest have a varied amount of clinical experience. The calculated median of clinical hour experience was in the range of 36-72 hours. The clinical experience varied in different areas including; long-term care (12.8%), medical-surgical (57.4%), pediatrics (12.8%), and psychiatric (14.9%). Table 1 provides the detailed descriptive characteristics of each group.

Table 1

Participants' Prelicensure Curriculum Characteristics

	Total *N* = 47 (%) *n* (% of total)	AR (%)	Faculty Led (%)
Current Semester Level			
Junior 1st	12 (25.5%)	12 (25.5%)	0
Junior 2nd	20 (42.8%)	9 (19.1%)	11 (23.4%)
Junior 3rd	14 (29.8%)	8 (17.0%)	6 (12.8%)
Senior 1st	1 (2.1%)	1 (2.1%)	0
Previous Clinical Hour			
Experience	7 (14.9%)	6 (12.8%)	1 (2.1%)
0-35 hours	7 (14.9%)	7 (14.6%)	0
36-72 hours	8 (17.0%)	4 (8.5%)	4 (8.5%)
72-108 hours	15 (31.9%)	9 (19.1%)	6 (12.8%)
Greater than 108 hours	10 (21.3%)	4 (8.5%)	6 (12.8%)
Not Sure			
Previous Clinical Experiences	6 (12.8%)	6 (12.8%)	0
Long Term Care	27 (57.4%)	13 (27.7%)	14(29.8%)
Medical-Surgical	3 (6.4%)	3 (6.4%)	0
Pediatrics	7 (14.9%)	4 (8.5%)	3 (6.4%)
Psychiatric	4 (8.5%)	4 (8.5%)	0
None			

Spielberger's STAI instrument is a 4-point Likert scale that requires translation of scoring to accurately assess state and trait anxiety levels. Each data question was scored appropriately and the sum of the 20 questions specifically examining trait anxiety completed in the pre-survey was calculated along with the 20 questions specific to state anxiety being calculated for both the pre- and post-survey. The sum of each score for both state and trait scales varies with the minimum 20 to maximum 80, and the lower the sum score the lower the anxiety (Spielberger, Gorusch, Lushene, Vagg, & Jacobs (2015). Spielberger et al. (2015) reported state-anxiety mean 36.47 to 38.76 (male to female) and trait-anxiety mean score of 38.30 to 40.40 (male to female) for college students. The

difference between the pre- and post-survey results were then calculated and utilized for analysis. Descriptive statistics of anxiety scores, provided in Table 2, demonstrated the aggregated mean decrease in state anxiety from the pre- to the post-orientation for both the AR and faculty-led orientation groups.

Table 2

Descriptive Statistics of Anxiety Scores

	Trait anxiety		Pre-orientation state anxiety		Post-orientation state anxiety		Difference pre- & post-state scores	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
AR orientation	44.40	8.35	50.80	9.29	48.07	11.16	-2.73	9.12
Faculty-led orientation	39.06	9.98	44.35	11.52	37.06	10.77	-7.29	16.20

Note. SD = standard deviation.

Statistical Analysis between Anxiety Levels

An independent *t*-test was conducted to answer the first research question of: What is the effect of augmented reality 360 photosphere on prelicensure nursing students' level of anxiety as they enter a clinical environment as compared to prelicensure nursing students' level of anxiety that does not experience augmented reality 360 photosphere? To assess the assumption of normality, measures of skew, box plots, and histograms were utilized. Skewness for all three analyses of anxiety was close to the normal distribution of zero for both the AR (-0.129 trait anxiety; -0.130 pre-orientation; -0.446 post-orientation) and faculty-led orientation participants (-0.106 trait anxiety; 0.108 pre-orientation; 0.487 post-orientation) along with a fairly well-distributed bell curve histogram. Thus, signifying an assumed normal distribution of the data.

Additional assumptions of randomization and independence were verified in the data sample. I assumed, that at the beginning of the semester each college of nursing

randomly selected the prelicensure nursing students currently enrolled in the maternal–child course as they placed them in the clinical groups. The sum of the dependent variable, anxiety, for each participant, was independent of each other to assume a normal distribution of the data. Homogeneity of variance for the two groups was evaluated with Levene's test of equality, $p < 0.05$ which revealed equal homogeneity between the two groups.

The results of the independent *t*-test revealed no significance. The null hypothesis was retained as there is no significant mean difference in the effect AR 360 photosphere orientation (M= -2.73, SD= 9.12) has on prelicensure nursing student's anxiety compared to faculty-led orientation method (M= -7.29, SD=16.20). The 95% confidence interval for the difference in means ranged from -4.29 to 13.42. Figure 2 shows the results graphically for the two groups.

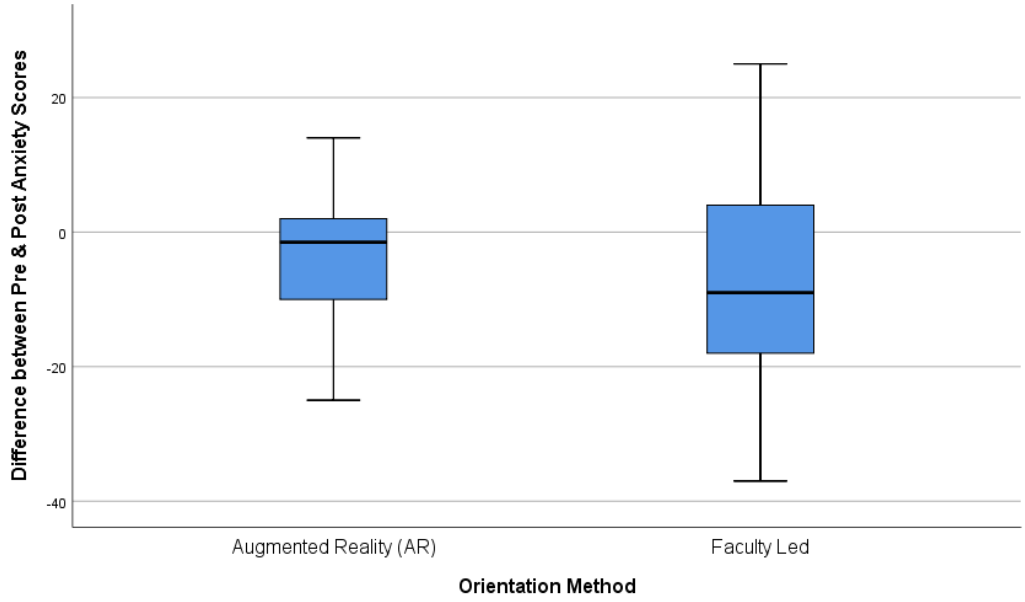

Figure 2. Results of independent sample *t*-test with standard deviation for two samples. Error bars display the mean difference (black solid line) of pre-post state anxiety results

between the two orientation methods with the standard deviation represented above and below the mean by the surrounding blue shaded box.

Statistical Analysis between State and Trait Anxiety Levels

The second research question was: When controlling for chronic trait anxiety, what is the effect of the augmented reality 360 photosphere on prelicensure nursing students' level of acute anxiety as they enter a clinical environment as compared to prelicensure nursing students' level of acute anxiety who do not experience the augmented reality 360 photosphere? To explain some of the unexplained variances noted in the independent *t*-test analysis between the differences of state anxiety, a one-way analysis of covariance (ANCOVA) was completed using the covariate trait anxiety. The STAI survey instrument has two forms. The Y-1 form consists of the first 20 questions which relate only to the individuals stated conscious awareness of anxiety. The Y-2 form contains the second 20 questions which focus on an individual's trait anxiety. By separating the two different concepts of acute state and chronic trait anxiety, the ANCOVA was completed controlling for the covariate variable of chronic trait anxiety evaluating the potential influencing effect chronic trait anxiety has on the dependent outcome variable of state anxiety. If a significance effect exists, the covariate variable of chronic trait, the analysis can then be compared between the two orientation groups to decrease variance error and understand the true mean effects of each orientation method on acute state anxiety levels.

Assumptions underlying ANCOVA were verified. The independent variable orientation method included the two orientation methods of AR and faculty-led

orientation. The dependent variable was state anxiety and the covariate was trait anxiety. ANOVA was used to verify there was no statistical difference between the two orientation methods which is the first assumption needed prior to completing the ANCOVA. There was no statistical difference between the two orientation groups (p=.056) as measured by the dependent variable trait anxiety meeting the first assumption. A preliminary analysis evaluating the homogeneity- of- slope assumption indicated that the relationship between the covariate and the dependent variable did not differ significantly as a function of the independent variable, F (1,43) =.086, MSE 66.23, p=.77, partial n2=.002. The results of the ANCOVA was not significant, F (1,44) =1.13, MSE=64.86, p= .29. Thus, controlling for trait anxiety had no significant effect on the orientation method and the null hypothesis was retained.

Summary

Forty-seven prelicensure nursing students in their maternal–child rotation participated in this study to determine the effect AR 360 photosphere orientation had anxiety levels. Of the two groups in the study, 47 prelicensure nursing students participated, 30 in the AR and 17 in the faculty-led orientation groups. An independent *t*-test and one-way analysis of covariance (ANCOVA) was conducted to analyze the data and test the hypotheses for this study. The analysis revealed there was no statistically significant difference of anxiety between the two methods of orientation to the maternal–child clinical environment, p=.30. When analyzing for potential unexplained variance of the covariate trait anxiety, again there was no statistically significant effect p= .29. In chapter 5, I will interpret these results, discuss the limitations of the study, and provide

recommendations for further research. I will conclude with potential implications for positive social change.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this study was to determine the effect that the use of AR 360 photosphere technology had on prelicensure nursing students' level of anxiety as they entered a new clinical environment compared to prelicensure nursing students' level of anxiety who did not experience AR 360 photosphere orientation. As minimal published literature on the use of AR in nursing education exists, a quasi-experimental approach was used to understand if AR has value in nursing education by reducing nursing student anxiety levels. This study's focus was on AR as a new teaching approach to orientation that will give nursing students the opportunity to maximize their clinical experience and achieve learning outcomes.

There were 146 potential prelicensure BSN students from the three private Midwestern College of Nursing programs that were entering their junior level maternal–child clinical experience. To be included in the study, the prelicensure nursing student had to complete both the pre- and post-STAI survey and meet the inclusion questions of the study. Forty-seven nursing students met the criteria and were included in the study with 30 in the AR group and 17 in the faculty-led orientation group. An independent *t*-test was conducted to compare the mean difference score from the pre- and post-survey of the dependent variable of state anxiety between the two groups. The variance of the two groups was assumed as not equal $t(21.87) = 1.07$, $p = .30$, and the null hypothesis was retained because there was no significant mean difference in the effect AR 360 photosphere orientation ($M = -2.73$, $SD = 9.12$) has on prelicensure nursing student's

anxiety compared to faculty-led orientation method (*M* = -7.29, *SD* = 16.20). The 95% confidence interval for the difference in means ranged from -4.29 to 13.42.

A one-way analysis of covariance (ANCOVA) was completed using the covariate trait anxiety. The result of the ANCOVA was not significant, F (1,44) = 1.13, MSE = 64.86, *p* = .29. Thus, the null hypothesis was retained. In this chapter, I will interpret these results, discuss the limitations, and provide recommendations for further research. I will conclude with potential implications for positive social change.

Interpretation of the Findings

The research question was to understand the effect that the technology of augmented reality 360 photosphere orientation method had on prelicensure nursing students' anxiety levels as compared to prelicensure nursing students' level of anxiety that did not experience augmented reality 360 photosphere.

The results of my study are similar to one conducted by Baksi, Gumus, and Zengin (2017), who compared anxiety levels in a group of nursing students who did not receive the preparatory clinical orientation course and anxiety levels to a group who did receive a 2-week preparatory clinical orientation course. There was no statistical difference in anxiety levels between the two groups. Turner and McCarthy (2017) also had inconclusive results after reviewing 26 studies focused on identifying the unique stressors and exacerbation of anxiety that occur when undergraduate nursing students have their first clinical rotation or are introduced to the clinical setting for the first time. However, they recommended the development of an effective method that could be used

both immediately and long-term to reduce anxiety that would benefit students, faculty, healthcare employers, and patients. (Turner & McCarthy, 2017).

The discussion of anxiety-reducing methods for both short- and long-term benefits was also reflected in a phenomenological study on undergraduate student nurses' lived experiences of anxiety during their first clinical practicum (Sun et al., 2016). Sun et al. (2016) found that nursing students anxiety levels increased with uncertainties related to the clinical area not only before the first clinical experience but exacerbated during the clinical setting until towards the end of the rotation when they became accustomed to the clinical setting. Having an orientation to a clinical environment that focus on multiple methods over time may be the most beneficial for students during the initial and long-term clinical learning experience (Baksi et al., 2017; Cowen et al., 2016; Turner & McCarthy, 2017).

Though there was no significant difference in pre- and post-clinical orientation anxiety levels between the two prelicensure nursing student orientation method groups, other findings are important to note with the potential benefit to the standardization AR 360 photosphere orientation methodology offers. In Spielberger et al.'s (2015) score interpretation, there are specific psychometric properties to full-time college students. The full-time college student state anxiety level has a psychometric average range that has been noted as 36.47 to 38.76 (males versus females) with a *SD* of 10.02 and 11.95 and Alpha reliabilities 0.91 and 0.93 respectively (Spielberger et al., 2015). However, my results differed from Spielberger et al.'s psychometric properties norms with the pre- to post-score differences standard deviation. The difference of state anxiety in the

prelicensure nursing students in the faculty-led orientation method was *M* = -7.29 with a *SD* = 16.20 compared to AR 360 photosphere orientation *M* = -2.73, *SD* = 9.12. The 95% confidence interval for the difference in means ranged from -4.29 to 13.42. The faculty-led orientation method had a large standard deviation that is higher than Spielberger et al.'s reported norm of full-time college students 10.02 or 11.95, dependent on sexual orientation. The AR 360 photosphere orientation method standard deviation was lower than Spielberger et al.'s reported norm. Conversely, the results of this study aligned with the work of Wedgeworth (2016), who compared prelicensure nursing student's scores to normal non-nursing college students finding early nursing state anxiety levels at 51.16 with a *SD* of 9.29

The large difference in standard deviation of the prelicensure nursing students stated anxiety levels within the faculty-led orientation could reflect the variance of the orientation method. For instance, Killam and Heerchap (2013) reported inconsistencies with clinical orientation between clinical educators and the preferences of clinical units regardless of the expectation set by the educating institution. Dunker, Manning, and Knowles (2017) acknowledged that novice and seasoned clinical nurse instructors are overwhelmed in giving a thorough student clinical orientation on the first day entering the clinical environment. A thorough orientation can be difficult and overwhelming leading to the development of a standardized orientation checklist. Variances including the faculty inconsistency of the orientation or the availability of the clinical environment to allow the orientation to occur at the fullest potential. Despite the difficulty in giving thorough orientations, Cowen et al. (2017) recommended an in-depth orientation to the

clinical setting to decrease anxiety. Lea, Andrews, Stronach, Marlow, and Robinson (2017) also studied the importance of a strategic constructed orientation that would support nursing students.

Literature supporting the use of self-discovery AR in a new clinical setting was confined to a clinical lab environment where prelicensure nursing students were able to self-direct their ability to obtain new knowledge on clinical skills (Garret et al., 2015). No literature was found on the benefits or challenges of AR applications being used as an orientation method to a new clinical environment to decrease prelicensure nursing or healthcare students level of anxiety.

The results of this study showed no difference in anxiety levels between the two orientation methods. Previous researchers such as Baksi et al. (2017), Cowen et al., (2016), and Turner and McCarthy (2017) all suggested the potential benefit of an orientation method that offers both short- and long-term benefits to students highlights the opportunity that self-directed learning AR has in becoming the standardized orientation method to a new clinical environment. Based on the framework of Bruner's discovery learning theory, the technology of AR 360 photosphere ensures prelicensure nursing students receive the same information and the ability to discover the new clinical environment. The discovery of learning can occur before the first clinical experience and during the entire clinical rotation, allowing the prelicensure nursing student to continue to discover or reinforce their awareness to previous encounters within the clinical environment. With each encounter in the clinical setting one becomes more comfortable

in the environment and there is the potential to decrease the anxiety experienced when entering the clinical setting.

Limitations

Limitations were noted that may have limited the generalizability of the study. The first limitation was the small sample size that did not meet the rigor of statistical power. Convenience and the non-randomized sample that was limited to a Bachelor of Science programs limited the generalizability of the study to other prelicensure students not in bachelor level programs. The specificity of the exclusion question with any contact to the maternal–child clinical setting also removed potential participants who role and anxiety were different than as a prelicensure nursing student, again limiting the generalization of the study findings.

Another limitation was the quantitative quasi-experimental method. Using just the quantitative method, I was unable to understand if there were any other variables affecting the participants state-anxiety level during the study time period. By doing the post-survey only once right after the participants time of orientation and with their first clinical experience I was unable to determine the long-term benefit of each orientation method. Completing a post-survey at the end of the clinical rotation to understand the long-term benefit was not feasible as each college of nursing's clinical rotation time period are organized differently from the number of hours completed over different time periods.

The final limitation was the consistency of the faculty-led orientation. More than one faculty member from each of the colleges of nursing was involved with the faculty-

led orientation method. With the group of faculty members, each of them had different levels of experience from full-time faculty member to new specialty adjunct instructors. The different experience levels and the familiarity with the specific clinical site may have affected the faculty-led orientation consistency among the different clinical groups. Each of these clinical instructors may have a different investment in the prelicensure nursing student and in understanding the effect of the orientation method on the prelicensure nurse's anxiety level. Another potential variation to the consistency of the faculty-led orientation was the availability of the clinical environment. There were no guarantees, at the time of the faculty-led orientation, that the specific areas that were to be included in the orientation, such as a patient room, were available for the faculty to orientate.

Recommendations

To increase the generalization to the prelicensure nursing student population, future studies will need to focus on including additional colleges of nursing to obtain a larger sample that is more diverse including the different types of nursing degrees. Adjusting the exclusion question to only having those excluded who have previous experience with direct patient care in the maternal–child environment, such as a CNA or nurse tech where roles are like the prelicensure nursing student. Thus, those who have had contact with the environment but in a different role such as the patient, support person, or visitor would still be included in the study as during their previous experience these individuals would not be focused on the required awareness of the environment from the role of a prelicensure student nurse.

Future studies should explore a mixed methods study that would allow a qualitative exploration of the prelicensure nursing student's level of state anxiety. Anxiety has multiple sources from intrinsic, extrinsic, personal, and professional factors that students have that can be elevated when be triggered by an additional stressor such as the beginning of their first clinical experience (Levett-Jones, Pitt, Courtney-Pratt, Harbrow, & Rossiter, 2015). Qualitative interviewing prior to the study would allow the understanding of other potential variables affecting the prelicensure nursing students stated anxiety level at the moment. A qualitative exploration may also elicit personal concerns that the prelicensure students had with each method of orientation allowing the understanding from the participant's viewpoint on the benefits and downfalls of each orientation method on their stated anxiety level and preference of orientation based upon their anxiety level.

Completing an additional post-survey of the STAI at the end of the maternal–child clinical rotation would allow the comparison of the two methods and understand if there is a long-term benefit on the student's level of anxiety as the AR orientation method is available to the prelicensure student during their entire clinical rotation to view.

Implications for Practice

Though the results of my study showed no difference between the faculty-led and AR 360 photosphere orientation methods in the immediate clinical time period, the AR 360 photosphere orientation method was noted as having a smaller standard deviation, highlighting the advantage and potential opportunity that self-directed AR learning has in standardizing the orientation method ensuring that each student receives the same

awareness of the new clinical environment. Dunker, et al. (2017) acknowledged the need for standardized orientation for faculty and developed a checklist based upon Quality and Safety Education for Nursing Institute outcomes of preparing nurses to provide safe and quality patient care. Even with a standardized orientation checklist, clinical faculty's ability to overcome variances to ensure standardized delivery of the checklist can be challenging. The comprehensive learning activities with the Quality and Safety Education for Nursing Institute orientation checklist, including the scavenger hunt of the clinical environment, were difficult to complete during the time allotted (Dunker, et al., 2017). With the shift in the current health care and educational demographics moving towards decreased numbers of clinical sites, preceptors, and faculty, the clinical education model of training in the clinical environment povides limited time to achieve clinical outcomes (Quail et al., 2016; Rosseter, 2015). Thus, healthcare educators are looking for innovative methods to effectively and efficiently engage learners while meeting meet learning outcomes.

With limited time for clinical experiences, the technology platform of AR 360 photosphere orientation allows the flexibility of autonomous orientation without having to overcome clinical environment variances. An additional benefit realized by the implementation of the autonomous 360 photosphere platform is the potential reduction in the burden of distraction and interruptions placed on clinical sites from students physically orientating in the healthcare environment. Visitors and other nursing and healthcare providers are the main sources of distractions and interruptions that contribute to patient care errors (Beyea, 2014; Monteiro, Avelar, & Pedreira, 2015). By orientating

the student prior to entering the clinical environment, through the use of AR 360 photosphere, the burden of distraction and interruptions in the clinical environment can be reduced. Thus, AR 360 photosphere orientation may be more feasible than faculty-led orientation in the time allotted in order to reduce anxiety to overcome the variance, and promote safe and quality care.

AR 360 photosphere is not only a standardized orientation method that can be viewed prior to the first clinical experience but it can be viewed throughout the clinical rotation on demand. The self-discovery of AR 360 photosphere provides an on-demand potential for prelicensure students to re-orientate themselves to an environment multiple times throughout a clinical experience. Results of a study on prelicensure students showed that during weekly clinical experiences the students had difficulty in remembering required care items such as supplies, which in turn decreased their comfort level and increased the need to re-orientate themselves (Rohatinsky et al., 2017). With nursing academia having to overcome challenges such as limitations in clinical faculty and the availability of clinical hours, minimal opportunities are available to meet learning outcomes which emphasizes the needs for learners to be aware of their learning environment. Having a standardized orientation method that the prelicensure nursing student can use for self-discovery of the clinical setting on-demand allows them the potential to decrease anxiety and increase their ability to maximize their clinical experience and meet learning outcomes.

The results reveal a new method to replace the practice of bolus delivery faculty-led orientation method (Kissel & Filipek, 2017; Quail et al., 2016). I found no statistical

difference was found between the two methods of orientation on prelicensure nursing students anxiety level. Therefore, the AR360 photosphere orientation method has the potential to change the practice of the orientation method that prepares prelicensure nursing students for their first clinical experience (Rebueno et al., 2017; Kissel & Filipek, 2017). Allowing students to have the knowledge of the clinical environment prior to their first clinical experience, maximized their clinical experience to meet learning outcomes.

Implication to Positive Social Change

Th results of my study contribute to positive social change by incorporating the technology of AR 360 photosphere as a method of clinical orientation. By incorporating a standardized, self-guided, and individualized active learning orientation method, the prelicensure nursing student can autonomously familiarize themselves with the clinical environment improving their awareness and response to the anxiety-producing stimuli of entering a new environment (Andert & Alexakis, 2015; Riva et al., 2016). With the achievement of decreasing anxiety levels associated with the new environmental setting, the learner will not have to divide their focus between the environment and the learning outcome which will allow them singular focus on meeting the learning outcome requirements (Dunleavy, 2014; Jun & Lee, 2017). Focus on achieving learning outcomes impacts the safety and quality of care being provided to patients.

The social impact of the proposed study was to decrease anxiety in student nurses. However, the standardized AR 360 photosphere orientation can be utilized to orientate existing nurses and inter-professional health care team members to a new setting, a new piece of equipment, or an evidence-based practice (Garrett, et al., 2015; Vera, et al.,

2014). This is beneficial to the safety and quality of care of care provided because those who are more familiar with the clinical setting can spend more time focusing on patient care (Parvin, et al., 2016).

The value added by adopting the use of AR 360 photosphere as an orientation method is realized by having a single standardized orientation method that is economically feasible. AR can be utilized multiple times after the initial investment, and its use can increase both student and educator productivity and satisfaction through the realized time savings and schedule flexibility achieved using AR (Fonseca, et al., 2014; Yilmaz, & Batdi, 2016). Productivity gains can be realized as the learner may access information on-demand, and the instructors can share information with their audience on a mass scale versus a one-on-one basis.

The awareness of the value of the technology is also beneficial to nursing programs and care facilities because resources can be freed up to allow students, faculty, and staff to focus on care processes rather than using face to face time for environmental map learning. It is reasonable to expect learners to utilize the technology for this structural learning. Programs and organizations can then use their scarce resources in face to face learning or developing other learning materials. Thus, AR technology has the potential to foster development of learners in areas that can be standardized easily These approaches can free faculty and staff time for facilitating learning in the complex and variable responses of clients to their healthcare plan of care.

Conclusion

In conclusion, this study was to determine the effect of augmented reality 360 photosphere on prelicensure nursing students' level of anxiety as they entered a new clinical environment compared to prelicensure nursing students' level of anxiety who did not experience augmented reality 360 photosphere orientation. Even though there was no statistical difference in anxiety levels between the AR and faculty-led orientation groups, value was brought forth in the form of standardization of information delivered and in reduced faculty and student time commitments which has a direct impact on faculty productivity. Using AR 360 photosphere as a standardized, autonomous, and active orientation method, nursing academia can adopt a new standardized clinical orientation approach that initially occurs prior to the first clinical experience that can be referenced on-demand as needed throughout the clinical rotation, giving the nursing students the opportunity to maximize their clinical experience to achieve learning outcomes. The increased focus on achieving learning outcomes realized by the implementation of AR has a direct impact upon the safety and quality of care being provided to patients and the achievement of desired outcomes that lead to safe and quality patient care.

The sample size was small and I could only examine the immediate effects of each orientation method. However, future research is needed to evaluate the benefits of the standardized AR 360 photosphere orientation method on long-term anxiety levels with only prelicensure nursing students but also with other healthcare professionals. AR 360 photosphere also provides an additional benefit by providing a novel approach to orientate health care providers to a clinical environment that is cost effective and time

efficient at both the individual and organizational levels. Efficiency of learning is possible because the AR 360 photosphere is always available for review, so individuals can learn at their own pace.

References

Aliakbari, F. Parvin, N. Heidari, M., & Haghani, F. (2015). Learning theories application in nursing education. *Journal of Education and Health Promotion, 4*(2) doi:10.4103/2277-9531.151867

American Psychological Association (2017). The state-trait anxiety inventory (STAI). Retrieved from http://www.apa.org/pi/about/publications/caregivers/practice-settings/assessment/tools/trait-state.aspx

Andert, D., & Alexakis, G. (2015). Virtual teaming and digital learning strategies: Preparing students for a global workplace. *MERLOT Journal of Online Learning and Teaching, 11*(1), 146-177. Retrieved from http://jolt.merlot.org/vol11no1/Alexakis_0315.pdf

Azuma, R. T. (1997). A survey of augmented reality. *Presence: Teleoperators and virtual environments, 6*(4), 355-385. doi:10.1162/pres.1997.6.4.355

Baksi, A., Gumus, F., & Zengin, L. (2017). Effectiveness of the preparatory clinical education on nursing students' anxiety: A randomized controlled trail. *International Journal of Caring Sciences, 10*(2), 1003-1012. Retrieved from http://www.internationaljournalofcaringsciences.org/docs/40_zengin_original_10_2.pdf

Barnes, L. B., Harp, D., & Jung, W. S. (2002). Reliability generalization of scores on the Spielberger state-trait anxiety inventory. *Educational and PsychologicalMeasurement, 64*(4), 603-618. Retrieved from http://ejournals.ebsco.com.cuhsl.creighton.edu/direct.asp?ArticleID=G6UE1J7UNED2MA9AE1X0>

Bayoumi, M. M. M., Elbasuny, M. M. M., Mohamed mofereh, A., Mohamed assiri, M., & Alfesal, A. H. (2012). Evaluating nursing students' anxiety and depression during initial clinical experience. *International Journal of Psychology and Behavioral Sciences, 2*(6), 277-281. doi:10.5923/j.ijpbs.20120206.12.

Behzadan, A. H., & Kamat, V. R. (2013). Enabling discovery-based learning in construction using telepresent augmented reality. *Automation in Construction, 33*, 3-10. doi: 10.1016/j.autcon.2012.09.003

Beyea, S. (2014). Interruptions and distractions in health care: Improved safety with mindfulness. *AHRQ Patient Safety Network.* Retrieved from https://psnet.ahrg.gov/perspectives/perspective/152/interruptions-and distractions-in-health-care-improved-safety-with-mindfulness

Blattner, G., & Lomicka, L. (2012). Facebook-ing and the social generation: A new era of language learning. *Alsic, 15*(1). Retrieved from https://alsic.revues.org/2413

Bissonnette, J., Dube, F., Provencher, M., & Moreno Sala, M. (2016). Evolution of music performance anxiety and quality of performance during virtual reality exposure training. *Virtual Reality, 20*(1), 71-81. doi:10.1007/s10055-016-283y

Booth, R. W., Sharma, D., & Leader, T. I. (2016). The age of anxiety? It depends where you look: changes in STAI trait anxiety, 1970-2010. *Social Psychiatry & Psychiatric Epidemiology, 51*, 192-202. doi:10.1007/s00127-015-1096-0

Brodt, S., Pohlchen, D., Flanagin, V. L., Glasauer, S., Gais, S., & Schonauer, M. (2016). Rapid and independent memory formation in the parietal cortex. *Proceeding of the National Academy of Sciences, 113*(46), 13251-13256. doi:10.173/pnas.1605719113.

Bruner, J. (1966). *Toward a theory of instruction.* Cambridge, MA: Harvard University Press.

Bruner, J. (1996). *The culture of education.* Cambridge, MA: Harvard University Press.

Campbell, D. T. & Stanley J. C. (1963). *Experimental and quasi-experimental designs for research.* Boston, MA: Houghton Mifflin Company.

Chandler, D., & Munday, R. (2016). *A dictionary of media and communication: Augmented reality* (2nd ed.). New York, NY: Oxford University Press.

Chernomas, W. M. & Shapiro, C. (2013). Stress, depression, & anxiety among Undergraduate nursing students. *International Journal of Nursing Education Scholarship, 10*(1), 255-266. doi:10.1515/ijnes-2012-0032

Cheung, R. Y., & Au, T. K. (2011). Nursing students' anxiety and clinical performance. *Journal of Nursing Education, 50*(5), 286-289. Doi:10.3928/0184834-20110131-08

Clemenson, G. D., & Stark, C. E. (2015). Virtual environmental enrichment through video games improves hippocampal-associated memory. *Journal of Neuroscience, 35*(49), 16116-16125. doi:10.1523/JNEUROSCI.2580-15.2015.

Costello, M. (2017). The benefits of active learning: Applying Bruner's discovery theory to the classroom: Teaching clinical decision-making to senior nursing students. *Teaching and Learning in Nursing,12*(3), 212-213. doi:10.1016/j.teln.2017.02.005

Cowen, K. J., Hubbard, L. J., & Hancock, D. C. (2016). Concerns of nursing students beginning clinical courses: A descriptive study. *Nurse Education Today, 43*, 64-68. doi:10.1016/j.nedt.2016.05.001

Dede, C. (2014). The role of digital technologies in deeper learning. Students at the Center: Deeper Learning Research Series. *Jobs for the Future*. Retrieved from http://files.eric.ed.gov/fulltext/ED561254.pdf

Dunker, K. S., Manning, K., & Knowles, S. (2017). Utilizing a QSEN based clinical orientation checklist as a standard for orientation. *International Journal of Nursing & Care,1*(7),1-7. Retrieved from http://www.cmepub.com/pdfs/utilizing-a-qsen-based-clinical-orientation-checklist-as-a-standard-for-orientation-254.pdf

Dunleavy, M. (2014). Design principles for augmented reality learning. *TechTrends: Linking Research and Practice to Improve Learning, 58*(1), 28-34. doi:10.1007/s11528-013-0717-2

Eskandari, M., & Soleimani, H. (2016). The effect of collaborative discovery learning using MOODLE on the learning of conditional sentences by Iranian EFL learners. *Theory & Practice in Language Studies, 6*(1), 153-163. doi:10.17507/tpls.0601.20

Ferguson, C., Davidson, P. M., Scott, P. J., Jackson, D., & Hickman, L. D. (2015). Augmented reality, virtual reality and gaming: An integral part of nursing. *Contemporary Nurse, 51*(1), 1-7. doi:10.1080/10376178.2015.1130360

Foley, D. (2016). The doorway assessment: Reducing anxiety and promoting critical thinking in nursing students: Observing the patient from the doorway on the first clinical day helps ease students' fears. (focus on... education). *American Nurse Today, 11*(5), 54. Retrieved from CINAHL Complete

Fonseca, D., Martí, N., Redondo, E., Navarro, I., & Sánchez, A. (2014). Relationship between student profile, tool use, participation, and academic performance with the use of Augmented Reality technology for visualized architecture models. *Computers in Human Behavior, 31,* 434-445. doi:10.1016/j.chb.2013.03.006

Garrett, B. M., Jackson, C., & Wilson, B. (2015). Augmented reality m-learning to enhance nursing skills acquisition in the clinical skills laboratory. *Interactive Technology and Smart Education, 12*(4), 298-314. doi:10.1108/ITSE-05-2015-0013

Giard, F., & Guitton, M. J. (2016). Spiritus ex machina: Augmented reality, cyberghosts and externalized consciousness. *Computers in Human Behavior, 55*(Part B), 614-615. doi:10.1016/j.chb.2015.10.024

Gonzalez, L., & Kardong-Edgren, S. (2017). Deliberate practice for mastery learning in nursing. *Clinical Simulation in Nursing 13*(1), 10-14. doi:10.1016/j.ecns.2016.10.005

Gonzalo, A. (2011). Hildegard E. Peplau - Theoretical foundations of nursing. Retrieved from http://nursingtheories.weebly.com/hildegard-e-peplau.html

Horsley, T. L., & Wambach, K. (2014). Effect of nursing faculty presence on students' anxiety, self-confidence, and clinical performance during a clinical simulation experience. *Clinical Simulation in Nursing*, doi:10.1016/j.ecns.2014.09.012

Institute of Medicine. (2011). *The future of nursing: Leading change, advancing health.* Washington, DC: National Academies Press

Julian, L. J. (2011). Measures of anxiety: State-trait anxiety inventory (STAI), beck anxiety inventory(BAI), and hospital anxiety and depression scale-anxiety (HADS-A). *American College of Rheumatology,63*(s11), S467-S472. doi:10.1002/acr.20561

Jun, W., & Lee, G. (2017). The role of ego-resiliency in the relationship between social anxiety and problem solving ability among South Korean nursing students. *Nurse Education Today, 49*(17-21). doi:10.1016/j.nedt.2016.11.006

Kameg, K. M., Szpak, J. L., Cline, T. W., & Mcdermott, D. S. (2014). Utilization of standardized patients to decrease nursing student anxiety. *Clinical Simulation in Nursing, 10*(11), 567-573. doi:10.1016/j.ecns.2014.09.006

Karpicke, J. D. (2012). Retrieval-based learning: Active retrieval promotes meaningful learning. *Current Directions in Psychological Science,21*(3), 157-163. doi:10.1177/0963721412443552

Khalaila, R. (2014). Simulation in nursing education: An evaluation of students' outcomes at their first clinical practice combined with simulations. *Nurse Education Today, 34*(2), 252-258. doi:10.1016/j.nedt.2013.08.015

Khor, W. S., Baker, B., Amin, K., Chan, A., Patel, K., & Wong, J. (2016). Augmented and virtual reality in surgery—the digital surgical environment: Applications, limitations, and legal pitfalls. *Annals of Translational Medicine, 4*(23), 454. doi:10.21037/atm.2016.12.23

Killam, L. A. & Heerchap, C. (2013). Challenges to student learning in the clinical setting: A qualitative descriptive study. *Nurse Education Today, 33,* 684-691. doi:10.1016/j.nedt.2012.10.008

Kissel, K., & Filipek, C. (2017). Reconceptualizing Nursing Orientation: Reducing Cognitive Load to Improve Learner Outcomes. *Canadian Journal of Critical Care Nursing*, *28*(2). 36. Retrieved from http://web.b.ebscohost.com.ezp.waldenulibrary.org/ehost/

Koohang, A., Paliszkiewicz, J., Goluchowski, J., & Nord, J. H. (2016). Active learning for knowledge construction in E-learning: A replication study. *Journal of Computer Information Systems*, *56*(3), 238-243. doi:10.1080/08874417.2016.1153914

Lea, E. J., Andrews, S., Stronach, M., Marlow, A., & Robinson, A. L. (2017). Using action research to build mentor capacity to improve orientation and quality of nursing students' aged care placements: what to do when the phone rings. *Journal of clinical nursing*, *26*(13-14), 1893-1905. doi:10.1111/jocn.13502

Ledermuller, K. & Fallmann, I. (2017). Predicting learning success in online learning environments: Self-regulated learning, prior knowledge, and repetition. *Journal for Higher Education Development, 12*(1), 79-99. doi:10.3217/zfhe-12-01/05.

Lee, K. (2012). Augmented reality in education and training. *TechTrends, 56*(2), 13-21. Retrieved http://link.springer.com/article/10.1007/s11528-012-0559-3

Lee, E., & Noh, H. K. (2016). The effects of a web-based nursing process documentation program on stress and anxiety of nursing students in South Korea. *International Journal of Nursing Knowledge, 27*(1), 35-42. doi:10.1111/2047-3095.12072

Levett-Jones, T., Pitt, V., Courtney-Pratt, H., Harbrow, G., & Rossiter, R. (2015). What are the primary concerns of nursing students as they prepare for and contemplate their first clinical placement experience? *Nursing Education in Practice, 15*(4), 304-309. doi:10.1016/j.nepr.2015.03.012

Liao, R. & Liu, Y. (2015). The impact of structural empowerment and psychological capital on competence among Chinese baccalaureate nursing students: A questionnaire survey. *Nurse Education Today 36*, 31-36. doi:10/1016/j.nedt.2015.07.003

Lyon, J. (2017). Augmented reality goes bedside. *Jama, 317*(2), 127. doi:10.1001/jama.2016.20270

Monteiro, C., Avelar, A. F. M., & Pedreira, M. da L.G. (2015). Interruptions of nurses' activities and patient safety: an integrative literature review. *Revista Latino-Americana de Enfermagem, 23*(1), 169-179. doi:10.1590/0104-1169.0251.2539

Mind Garden, Menlo Park, CA 94025. (URL:). Retrieved 7/29/2017 from http://www.mindgarden.com/ index.htm.

Nardi, D. A., & Gyurko, C. C. (2013). The global nursing faculty shortage: Status and solutions for change. *Journal of Nursing Scholarship*, *45*(3), 317-326. doi:10.1111/jnu.12030

National Council of State Boards of Nursing. (n.d.). Boards & Regulation NCSBN. Retrieved from https://www.ncsbn.org/boards.htm

National Council of State Boards of Nursing (2005). Clinical instruction in prelicensure nursing programs. Retrieved from https://www.ncsbn.org/Final_Clinical_Instr_Pre_Nsg_programs.pdf

National League for Nursing (2016). Nursing student demographics 2015-2016. Retrieved from http://www.nln.org/newsroom/nursing-education-statistics/nursing-student-demographics

National League for Nursing Commission for Nursing Education Accreditation. (2016, February). *Accreditation standards for nursing education programs*. Retrieved from http://www.nln.org/docs/default-source/accreditation- services/cnea-standards-final-february-01613f2bf5c78366c709642ff00005f0421.pdf?sfvrsn=10

Olds, D., & Dolansky, M. A. (2017). Quality and safety research: Recommendations from the quality and safety education for nursing (QSEN) institute. *Applied Nursing Research, 35,* 126-127. doi:10.1016/j.apnr.2017.04.001

O'Shea, P. & Elliott, J. (2015). Augmented reality in education: An exploration and analysis of pedagogical design in mobile augmented reality applications. In D. Slykhuis & G. Marks (Eds.), Proceedings of Society for Information Technology & Teacher Education International Computing in Education (AACE). Retrieved December 5, 2016, from https://www.learntechlib.org/p/150614.

Parvin, N., Aliakbari, F., Rafiee Vardanjani, L., Dadkhah, N., & Mahasti Jouybari, L. (2016). Nurses' attitude towards attendance of nursing students in the clinical setting in Shahrekord in 2015. *Journal of Nursing and Midwifery Sciences, 3*(4), 20-27. doi:10.18869/acadpub.jnms.3.4.20

Porter, J., Haberling, K., & Hohman, C. (2016). Employer desired competencies for undergraduate health administration graduates entering the job market. *The Journal of Health Administration Education*, *33*(3), 355-375. Retrieved from https://www.ingentaconnect.com

Potter, M. L. & Moller, M. D. (2016). *Psychiatric-mental health nursing: From suffering to hope* (1st ed.). New York, NY: Pearson Press Mind Garden, Menlo Park, CA 94025. (URL:). Retrieved 7/29/2017 from http://www.mindgarden.com/ index.htm.

Quail, M., Brundage, S. B., Spitalnick, J., Allen, P. J., & Beilby, J. (2016). Student self reported communication skills, knowledge and confidence across standardized patient, virtual and traditional clinical learning environments. *BMC Medical Education,16*(17). doi.10.1186/s12909-016-0577-5

Rebueno, M.C.D. R., Tiongco, D. D. D., & Macindo, J. R. B. (2017). A structural equation model on the attributes of a skills enhancement program affecting clinical competence of pre-graduate nursing students. *Nurse Education Today,* 49, 180-186. doi:10.1016/j.nedt.2016.11.030

Riva, G., Banos, R. M., Botella, C., Mantovani, F., & Gaggioli, A. (2016). Transforming experience: The potential of augmented reality and virtual reality for enhancing personal and clinical change. *Frontiers in Psychiatry, 7.* doi:10.3389/fpsyt.2016.00164

Robertson, C., Hermann, K., Mynick, A., Kravitz, D., & Kanwisher, N. (2016). Neural representations integrate the current field of view with the remembered 360° panorama in scene-selective cortex. *Current Biology, 26*(18), 2463-2468. doi:10.1016/j.cub.2016.07.002

Rohatinsky, N., Chachula, K., Compton, R. M., Sedgwick, M., Press, M. M., & Lane B. (2017). Nursing student preference for block versus nonblock clinical models. *Journal of Nursing Education, 56*(3), 152-157. doi:10.3928/01484834-20170222-06

Ross & Carney, 2017. The effect of formative capstone simulation scenarios on novice nursing students' anxiety and self-confidence related to initial clinical practicum. *Clinical Simulation in Nursing13* (3), 116-120. doi: 10.1016/j.ecns.2016.11.001

Rosseter, R. (2015) Nursing faculty shortage fact sheet. *American Association of Colleges of Nursing.* Retrieved from http://www.aacn.nche.edu/media-relations/FacultyShortageFS.pdf

Rossignol, M. (2017). Effects of video-assisted debriefing compared with standard oral debriefing. *Clinical Simulation in Nursing, 13*(4), 145-153. doi.org10.1016/j.ecns.2016.12.001

Rowney, J., Hermida, T., & Malone, D. (2010). Anxiety disorders. *Cleveland Clinic*. Retrieved from http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/psychiatry-psychology/anxiety-disorder/

Sadock, B. J., Sadock, V. A., & Ruiz, P. (2015). *Kaplan & Sadock's synopsis of psychiatry: Behavioral science clinical psychiatry* (11th ed.). Philadelphia, PA: Wolters Kluwer.

Skiba, D. J. (2014). The connected age: implications for 2014. *Nursing Education Perspectives*, *35*(1), 63-65.

Smith, M. L. & Foley, M. R. (2016). Transforming clinical education in obstetrics and gynecology: Gone is the day of the sage on the stage. *Obstetrics & Gynecology 127*(4), 763-767. doi:10.1097/AOG.0000000000001356

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E., (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologist Press

Spielberger CD, Gorusch RL, Lushene R, Vagg, P. R. & Jacobs, G. A. (2015) State-Trait Anxiety Inventory for Adults Manual. Mind Garden Inc.

Spielberger, C. D. & Sarason, I. G. (1975). *Stress and Anxiety: The Series in Clinical Psychology*. Washington, D. C.: Hemisphere Publishing Corporation, Washington, D.C.

Spoto, S., Bourhaleb, F., & Petrone, G. (2016). 200 - augmented reality supporting innovation and accuracy in advanced radiation therapy facilities. *Radiotherapy & Oncology, 1*(118), S97. doi:10.1016/S0167-8140(16)30200-6

Sun, F.K, Long, A., Tseng, Y. S, Huang, H., You, J., & Chiang, C. (2016). Undergraduate students nurses' lived experiences of anxiety during their first clinical practicum: A phenomenological study. *Nurse Education Today, 37*,21-26. doi:10/1016/j.nedt.2015.11.001

Swift, A., Efstathiou, N., & Lameu, P. (2016). Is LabTutor a helpful component of the blended learning approach to biosciences? *Journal of Clinical Nursing, 25*(17-18), 2683. doi:10.1111/jocn.13175

Tapscott, D. (1998). *Growing up digital: The rise of the Net Generation.* New York, NY: McGraw-Hill.

Teixeira, C., Kusumota, L., Pereira, M., Braga, F., Gaioso, V., Zamarioli, C., & de Carvalho, E. (2014). Anxiety and performance of nursing students in regard to assessment via clinical simulations in the classroom versus filmed assessments. *Investigación Y Educación En Enfermería, 32*(2), 270-279. doi:10.1590/S0120-53072014000200010

Trochim, W. M. K. (2006). *Research methods knowledge base* (2nd ed.). Retrieved from http://www.socialresearchmethods.net/kb/index.php

Trossman, S. (2016). Creating a culture of safety. *American Nurse, 48*(1), 9. Retrieved from https://www.questia.com/magazine/1P3-4038107911/creating-a-culture-of-safety

Turner, K., & McCarthy, V. L. (2017). Stress and anxiety among nursing students: A review of intervention strategies in literature between 2009 and 2015. *Nurse Education in Practice, 22*, 21-29. doi:10.1016/j.nepr.2016.11.002

Vaughn, J., J., Lister, J., M., & Shaw, J., R. (2016). Piloting augmented reality technology to enhance realism in clinical simulation. *CIN: Computers, Informatics, Nursing, 34*(9), 402-405. doi:10.1097/CIN.0000000000000251

Vera, A. M., Russo, M., Mohsin, A., & Tsuda, S. (2014). Augmented reality telementoring (ART) platform: a randomized controlled trial to assess the efficacy of a new surgical education technology. *Surgical Endoscopy*, *28*(12), 3467-3472. doi:10.1007/s00464-014-3625-4

Villada, C., Hidalgo, V., Almela, M., & Salvador, A. (2016). Individual differences in the psychobiological response to psychosocial stress (trier social stress test): The relevance of trait anxiety and coping styles. *Stress & Health: Journal of the International Society for the Investigation of Stress, 32*(2), 90-99. doi:10.1002/smi.2582

Warner, R. M. (2013). *Applied statistics: From bivariate through multivariate techniques* (2nd ed.). Los Angeles, CA: Sage Publication, Inc.

Wedgeworth, M. (2016). Anxiety and education: An examination of anxiety across a nursing program. *Journal of Nursing Education and Practice, 6*(10), 23-32. doi: 10.5430/jnep.v6n10p23

Wong, B. (2016). New cameras and apps drive augmented and virtual reality. *Electronic Design, 64*(4), 48. Retrieved from https://www.electronicdesign.com/blog/new-cameras-and-apps-drive-augmented-and-virtual-reality

Yew, E. H. J., & Goh, K. (2016). Problem-based learning: An overview of its process and impact on learning. *Health Professions Education, 2*(2), 75-79. doi:10.1016/j.hpe.2016.01.004

Yilmaz, Z. & Batdi, V. (2016). A meta-analytic and thematic comparative analysis of the integration of augmented reality applications into education. *Egitim Ve Bilim, 41*(188), n/a. doi:10.15390/EB.2016.6707

Yu, C. (2017). Threats to validity of research design. Retrieved from http://www.creative-wisdom.com/teaching/WBI/threat.shtml

Appendix A: Demographic Questions Include in the STAI Survey

The following demographic questions and answer choices will be added to Spielberger's State Trait Anxiety Inventory (STAI) Survey. These demographic questions will be at the beginning of the survey to decide if the student meets inclusion criteria and do not need to be excluded from the study according to answers toquestions number three, six, and seven.

1. Are you a:
    - Male
    - Female
2. List the number of semesters you have completed in your prelicensure nursing program.
    - (1 thru 10 semesters)
3. What is your current semester level of your prelicensure nursing program?
    - Junior 1st semester
    - Junior 2nd semester
    - Junior 3rd semester
    - Senior 1st semester
    - Senior 2nd semester
4. How many hours have you completed in the clinical setting?
    - 0-35 hours
    - 36-72 hours
    - 72-108 hours
    - Greater than 108 hours
    - I am not sure
5. What clinical experience have you had this far in your prelicensure nursing curriculum
    - Long term Care/Older Adult
    - Medical Surgical Adult
    - Pediatrics
    - Psychiatric
    - None-This is my first clinical experience
6. Have you previously been in a maternal–child clinical course with your current Nursing School or a different nursing school?
    - Yes
    - No
7. Have you ever worked or been exposed to the specific maternal–child clinical area you are about to enter? (for example as a nursing student, volunteer, worker such as a CNA or Tech, or a patient/visitor?)
    - Yes
    - No

Appendix B: Clinical Faculty Instructions for Onsite Maternal–child Orientation

After the participants have completed the informed consent and pre State-Trait Anxiety Inventory form, you are asked to complete the onsite faculty lead orientation during the week before the prelicensure nursing student's first maternal–child clinical experience. During the onsite orientation of the clinical floor, please deliberately point out the following areas and equipment the prelicensure nursing student would use in the clinical experience.

1. On the Floors
    a. Dirty utility room
    b. Clean linen room
    c. Nutrition area
    d. Conference room
    e. Staff/Student Bathrooms
2. Patient Postpartum Room
    a. Call light
    b. Emergency equipment (ie: Code button, oxygen, suction catheter, code cart)
    c. Vital equipment (BP cuff, thermometer)
    d. Linen and Garbage drawers
3. Patient Labor Room
    a. Call light
    b. Emergency equipment (ie: Code button, oxygen, suction catheter, code cart)
    c. Vital equipment (BP cuff, thermometer)
    d. Fetal monitors
    e. Delivery Cart
    f. Newborn Warm/Equipment
    g. Linen, Garbage, and Red Bag drawers

Step 2: The day before the prelicensure nursing student is to enter the clinical environment for their first clinical day and after the completion of the faculty-led orientation, the researcher will again have the unique survey link with the post-survey of Spielberger's State-Trait Anxiety Inventory sent to just those prelicensure nursing student de-identifying codes who completed the initial survey. This unique link will be sent by the online, password secured, 3rd party platform.

Appendix C: Student Instructions for Augmented Reality 360 Photosphere Orientation

Student Directions for Access to the AR 360 Photosphere: (The instruction video found on the main page of the website demonstrates steps 1-3)

1. Log onto the provided link with your de-identifying code.
2. You will be directed to select one of two floors (Postpartum; Labor and Delivery). Select the desired floor that you would like to first view and complete your orientation to that floor. You will need to view both floors for your clinical orientation to prepare you for your clinical experience. After the completion of the first floor, go back to the home page and select the other floor to view and complete your orientation.
3. Once you have selected your desire floor you will be able to navigate the floor as follows:
   a. To obtain the 360 view of the environment, use your mouse to turn right, left, up or down, and to zoom in and out.
   b. Any Gray Tag that is highlighted in yellow ("See More," "Main Menu, Floor Plan" "To Hall/Hallway," etc.) may be clicked on to continue navigation down the halls, to open doors, or to be provided additional rationale on the floor.
4. As you navigate the floor, the specific areas to locate are as follows, for both the Postpartum and Labor floor:
   a. Nurses Stations
   b. Dirty utility room
   c. Clean linen room
   d. Nutrition area
   e. Conference room
   f. Staff/Student Bathrooms
   g. Patient rooms
5. As you navigate the Patient Postpartum Room locate the following:
   a. Call light
   b. Emergency equipment (i.e., Code button, oxygen, suction catheter, code cart)
   c. Vital equipment (BP cuff, thermometer)
6. As you navigate the Patient Labor Room locate the following:
   a. Call light
   b. Emergency equipment (i.e., Code button, oxygen, suction catheter, code cart)
   c. Vital equipment (BP cuff, thermometer)
   d. Fetal monitors
   e. Delivery Cart
   f. Newborn Warm/Equipment

You may log in and view the AR 360 Photosphere orientation as frequently as you would like throughout your maternal–child clinical rotation.

Appendix D: State Trait Anxiety Inventory (STAI) Permission

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