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Standardized Critical Thinking Tests as a Predictor of Success in Nursing Programs

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Walden University
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Abstract

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MSN, Walden University, 2011

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

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Abstract

High attrition rates and a nursing shortage across the nation have led schools of nursing to seek out ways to better identify which applicants will be most successful in graduating from the nursing program and passing the National Council Licensure Examination for Registered Nurses (NCLEX-RN). Nursing programs have historically included standardized entrance exam scores and prerequisite scores among their admission criteria but have not used standardized critical thinking assessments (CTA), even though critical thinking is an integral part of being a successful nursing professional. Using Astin's input-environment-output (I-E-O) model, the purpose of this retrospective correlational study was to determine whether a significant relationship exists between prerequisite grade point average (GPA), Test for Essential Academic Skills (TEAS) composite scores, entrance and exit CTA scores, and nursing GPA and the outcome of interest, passing the NCLEX-RN exam. Archival data for 64 students enrolled in a baccalaureate degree program at a Texas university were analyzed using binary logistic regression. A significant positive relationship was found between prerequisite GPA, TEAS composite scores, entrance and exit CTA scores, and nursing GPA, and the outcome of interest, passing the NCLEX-RN exam. However, in looking at each independent variable separately, no significant relationship was revealed between the individual scores of the prerequisite GPA, TEAS composite, entrance and exit critical thinking assessment, nursing GPA, and the outcome of passing the NCLEX-RN exam on the first attempt. These findings have implications for positive social change by illuminating the complexities of nursing program retention and graduation and informing efforts to train the most talented nurses.

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Dedication

I would first and foremost like to acknowledge God. Without His support and guidance, I would never have been able to complete this journey. I would also like to thank my husband. He has been there through this entire process and has supported me and believed in me when I was at my worst and wanting to give up. He always knew exactly what to say to keep me going. He was, and always will be, my strength and cheerleader. He tolerated many fast-food nights and much errand-running, and even started doing laundry so that he would have clean clothes. I would also like to thank my children for their patience and understanding these past 3 years. I have missed school events, extracurricular activities, and cuddle time due to writing papers and completing assignments.

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Chapter 1: Introduction to the Study

Introduction

Schools of nursing focus on recruiting and accepting students based upon a number of variables including grade point average (GPA), SAT scores, and GPA in basic science undergraduate courses, in an attempt to best predict which students will be successful in the program and in passing the National Council Licensure Exam for Registered Nurses (NCLEX-RN). However, the latest research shows that only about 69% of nursing students who matriculate into a nursing program progress and graduate from the program (National Center for Education Statistics [NCES], 2016). Schools of nursing are reviewing admission screening criteria to improve attrition and better determine which students will be successful throughout the nursing program and on the NCLEX exam. Schools of nursing are judged almost solely by state boards of nursing (SBNs) and higher education accrediting agencies based upon student success in passing the National Council Licensure Exam (NCLEX). Given the high cost of nursing education, estimated from $95,000 to $250,000 per Bachelor of Science degree graduate (Cost Helper, 2016), schools have used various predictors of nursing success with little supporting literature to validate any specific approach.

This problem becomes particularly important as schools try to expand to meet the demand for nurses (American Association of Colleges of Nursing [AACN], 2015) and address the trend of 34% of nurses leaving the profession within 2 years of graduation (Robert Wood Johnson Foundation, 2015). The correct selection of students and the use of interval measures to ensure successful graduation and licensure may assist in

addressing the problem. Increasing the number of nursing graduates who stay in the profession will help to address the issue of the nationwide nursing shortage that is projected to continue through the next 10 years (Bureau of Labor Statistics, 2015).

Critical thinking is a complex phenomenon. Research on critical thinking revealed Scheffer and Rubenfeld's (2000) seminal study on defining critical thinking in nursing. They determined that critical thinking in nursing includes cognitive and affective components. Each component contains attributes that scholars have indicated are necessary for a nurse to be successful in critical thinking. These attributes include "confidence, contextual perspective, creativity, flexibility, inquisitiveness, intellectual integrity, intuition, open-mindedness, perseverance, reflection … analyzing, applying standards, discriminating, information seeking, logical reasoning, predicting and transforming knowledge" (Scheffer & Rubenfeld, 2000, p. 352). As important as critical thinking is to the nursing profession, few studies exist that factor critical thinking assessment into selection criteria for schools.

This chapter has been divided into 10 sections. In the background section, I introduce the current literature on the study topic, identify the gap in knowledge that exists, and describe why this study is needed. The problem statement, purpose of the study, research questions, hypotheses, and theoretical framework are also identified and explained for this study. The nature of the study is briefly described, along with the independent and dependent variables as well as the study methodology. Key definitions are stated, as are assumptions, the scope of delimitations, and limitations. Finally, the significance of the study and social implications are identified.

Background

As healthcare evolves and advances in technology extend lives, expectations of the nursing profession increase. Patients are presenting with multiple chronic conditions, more severe illnesses, and complex medical conditions. Nurses must be able to make appropriate decisions in the healthcare environment. This requires nurses to be able to think independently and react quickly to declining medical conditions (Noohi, Karimi-Noghondar, & Haghdoost, 2012) while using essential critical thinking skills to provide safe, quality care to patients (Kaddoura, 2011). Studies by Noohi et al. (2012) and Ryan and Tatum (2012) found that health care facilities did not have the time or resources to teach graduate nursing students critical thinking skills. Therefore, nurses are expected to acquire these skills during school. These demands led to changes in the NCLEX-RN in 2013. The National Council of State Boards of Nursing (NCSBN, 2013) has asserted that graduate nurses (GNs) taking the NCLEX-RN must now possess critical thinking skills to pass the exam and become licensed registered nurses. These expectations require nursing programs to institute ways to educate and evaluate students on their ability to critically think.

The NCSBN oversees nursing licensure and is in charge of making sure that the licensing exams for nursing professionals meet the expectations of the profession. They update the NCLEX-RN every 3 years to accommodate changes in the nursing profession (NCSBN, 2013). Along with this change, the NCSBN publishes the test plan, a guideline for programs to follow to ensure that students will be adequately equipped to pass NCLEX and practice as competent nursing professionals. Nursing programs also follow

guidelines set by the Quality Safety Education for Nurses (QSEN) Institute, which focuses on program and teaching strategies to educate future nurses for safe, quality practice.

Both the QSEN Institute and the NCSBN have cited critical thinking skills as essential to be successful in nursing (NCSBN, 2013; QSEN Institute, 2014). However, health care facilities lack time and resources to teach critical thinking skills to new graduates, placing the responsibility for this education on nursing programs (Noohi et al., 2012; Ryan & Tatum, 2012). The Institute of Medicine (IOM) and National League for Nursing (NLN) have stated that critical thinking skills need to be taught before students leave a nursing program, giving them the ability to adapt to a fast-paced environment and work autonomously, gathering data and analyzing that data to make appropriate clinical judgements (IOM, 2010; NLN, 2012). Studies by Maneval, Filburn, Deringer, and Lum (n.d.) and Moattari, Soleimani, Moghaddam and Mehbodi (2014) support the need for GNs to possess critical thinking skills to pass the NCLEX-RN.

Nursing programs have taken different approaches to addressing this issue of needing to produce safe, competent graduate nurses who possess critical thinking skills. Some have incorporated active learning activities and the flipped classroom method to engage students in the learning process (Noohi et al., 2012). Others have implemented medium- and high-fidelity simulation and concept-mapping strategies to improve critical thinking skills (Moattari et al, 2014; Wane & Lotz, 2013). Some universities have started offering training specifically on how to define critical thinking and enhance necessary skills in both the classroom and clinical setting (Noohi et al., 2012; Ryan & Tatum,

2012). Several nursing programs in Texas have decided to also incorporate critical thinking scores from standardized critical thinking exams into their admission criteria.

Active learning activities have been found to improve critical thinking skills using standardized critical thinking exams in pretest-posttest quantitative studies (Kaddoura, 2011, 2013; Wane & Lotz, 2013). Atay and Karabacak (2012) and Moattari et al. (2014) used the pretest-posttest approach to determine the effectiveness of concept mapping in improving critical thinking skills. Wane and Lotz (2013) used a standardized critical thinking exam to determine if simulation improves critical thinking. Data are not currently available to support the use of standardized critical thinking exams in this capacity.

Expectations of the nursing profession continue to rise as healthcare evolves and grows. Nurses are expected to use critical thinking skills to identify early signs of deterioration of a patient's health, determine possible causes for the change, collect pertinent data related to that change, and interpret that data to provide quality, competent care to the patient. This emphasis on critical thinking has led to the need for nursing students to exhibit these skills by graduation from their program (Kaddoura, 2013; NLN, 2015; Noohi et al., 2012). The NCSBN (2013) has asserted that critical thinking skills are essential for passing the NCLEX. This expectation means that nursing programs need to assess and develop students' critical thinking skills.

Standardized critical thinking exams have been used to assess the critical thinking skills of new employees (Ryan & Tatum, 2012) and to determine the effectiveness of programs to improve critical thinking skills (Kaddoura, 2013; Noohi et al., 2012). One

study did find a correlation between critical thinking exam scores and GPA, and the author concluded that because there is a positive correlation between GPA and success in a nursing program, critical thinking exam scores should be useful in determining student success as measured by the NCLEX (Crouch, 2015). Several nursing programs use standardized critical thinking exam scores as part of their admission criteria (Lone Star College, 2016; Patty Hanks Shelton School of Nursing, 2016; University of Texas [UT] Health School of Nursing, 2016.) If students do not meet or exceed the predetermined score, they will not be accepted into the program.

Problem Statement

There is currently no research literature to guide schools in acceptance criteria and monitoring criteria that may be predictive of success in nursing schools, critical thinking ability, and successful completion of the NCLEX examination.

Purpose of Study

The purpose of this quantitative correlational study was to determine if a relationship exists among entry GPA, Test of Essential Academic Skills (TEAS) scores, entry and exit critical thinking evaluation, and final nursing program GPA and the outcome of interest, passing the NCLEX-RN exam. The study examined data from three cohorts of students from a nursing program at a university in southern Texas. This information may contribute to a suggested profile for admission to nursing schools so that students have a higher likelihood of graduation and passing the NCLEX. Previous studies have shown that prerequisite GPA is a predictor of success in nursing programs (Crouch, 2015), so a relationship between standardized critical thinking exam scores and

cumulative nursing GPA was also tested. Finally, the relationship between standardized critical thinking exam scores at entry and exit from the nursing program and number of attempts needed to pass NCLEX were examined.

Research Question and Hypotheses

RQ1: Is there a relationship among entry GPA, Test of Essential Academic Skills (TEAS) scores, entry and exit critical thinking evaluation, and final nursing program GPA and the outcome of interest, passing the NCLEX-RN exam?

H_0: There is no relationship among entry GPA, TEAS scores, entry and exit critical thinking evaluation, and final nursing program GPA, and the outcome of interest, passing the NCLEX-RN exam.

H_1: There is a relationship among entry GPA, TEAS scores, entry and exit critical thinking evaluation and final nursing program GPA, and the outcome of interest, passing the NCLEX-RN exam.

Theoretical Framework

Astin's input-environment-outcome (I-E-O) model was used as the framework for this dissertation. The I-E-O model states that the input, or students' previous experience and education, along with the environment, or program, will influence the outcome, or success of the program (Astin, 1991, 2012; Thurmond & Popkess-Vawter, 2003). According to Astin, input is fluid, meaning that it can change as the student gains new knowledge and experiences. The environment can include the school, the faculty, and peers. The outcome is the desired goal of the faculty or school. A more detailed explanation of each of the concepts is discussed in Chapter 2.

For the purposes of this dissertation, the input included students' prerequisite GPA, TEAS scores, and ATI (Assessment Technologies Institute) Critical Thinking Assessment (CTA) scores. These scores give an objective assessment of each student's knowledge at the start of the program. The environment was the basic baccalaureate nursing program. The outcome was the overall nursing course GPA and the NCLEX results. According to Astin, both the input and the environment have an effect on the outcome. This study aimed to determine whether ATI CTA scores, TEAS scores, and prerequisite GPA (inputs) have any relationship to the formative measures of success during the program (GPA and graduation) and the outcome measure of passing the NCLEX exam.

Nature of the Study

Quantitative research methods are used for statistical analysis to determine a relationship or correlation between a dependent variable and one or more independent variables (Creswell, 2009). The correlational design was used to determine if a relationship exists between standardized critical thinking exam scores and ATI TEAS scores, preadmission GPA, nursing course GPA, and successful completion of the program as evidenced by passing the NCLEX-RN exam in the first attempt. The data were collected retrospectively through two sources. The GPA and NCLEX-RN results were obtained from the school's database. Critical thinking skills measurements using ATI's entrance exam, TEAS scores, and exit CTA were obtained through ATI's website. Regression analysis was used to determine what relationship exists between the dependent and independent variables. Successful completion of the NCLEX-RN exam

was recorded as 0 for "yes" or 1 for "no." The dependent variable was the NCLEX-RN exam results. The independent variables were prerequisite GPA, nursing course GPA, TEAS score, and critical thinking exam scores.

Logistical regression was used to analyze the data. Logistical regression gives the researcher the ability to compare correlation and relationships among multiple independent variables and one dependent variable. This method allowed me to determine not only whether a relationship existed with the dependent and independent variables, but also whether the independent variables, when put together, influenced the relationships (Field, 2013).

Definition of Terms

The terms for this study were defined as follows:

Assessment Technologies Institute (ATI): A company that produces standardized nursing exams as well as teaching/learning tools for nursing students. These include the Critical Thinking Assessment (CTA) and the Test of Essential Academic Skills (TEAS) (ATI, 2016).

Cohort: A group of students who progress through a nursing program together (Grad School Hub, 2016)

Critical Thinking Assessment (CTA): Exam given in the beginning of the first semester of nursing school to determine each student's critical thinking abilities. This exam, along with an exit exam, is produced by ATI (ATI, 2016).

Grade point average (GPA): The average calculated using end-of-semester letter grades on a 0-4.0 scale (College Board, 2016)

National Council Licensure Exam for Registered Nurses (NCLEX-RN): National exam that every graduate nurse must take and pass before he or she can practice as a registered nurse (NCSBN, 2014).

National Council of State Boards of Nursing (NCSBN): Board that oversees the NCLEX-RN for accuracy, reliability, and validity (NCSBN, 2016).

Test of Essential Academic Skills (TEAS): ATI's entrance exam that nursing students must take as part of the preadmission process into a nursing program (ATI, 2016).

Assumptions, Limitations, Delimitations and Scope

Assumptions

For this study, I assumed that the students filled out the admission paperwork completely and honestly and did not omit any information regarding previous coursework prior to admission to the program. I assumed that the students wanted to successfully pass the NCLEX-RN exam with the first attempt. It was also assumed that the information collected and put into the school of nursing's database was entered meticulously and without error.

Delimitations and Scope

Demographic information was only used to determine the sample size and was not controlled for when looking at the independent variables. This information did not include whether or not the student was an English as a second language (ESL) student. While English comprehension and grammar are addressed using the TEAS test, this

university did not consider subscores within the TEAS test when determining admission to the nursing program.

Limitations

The sample came from one university in southern Texas, thus limiting generalization. It did not extend to other universities. The study was also limited to basic baccalaureate nursing programs that use ATI standardized assessments. If other basic baccalaureate nursing programs compiled the same data and used the same standardized testing, the study could be expanded to a larger population.

Another limitation involved changes in curriculum and faculty during the data collection process. Faculty turnover was high at this university, and only three of the 22 full-time faculty members had been there since 2012. A culture course was added to the curriculum in 2015 and removed from the curriculum in the summer of 2016, which meant that students who started in the program prior to 2015 or after the summer of 2016 did not have a grade for this course. The students were still presented the content from the culture course; it was just presented within other courses. Therefore, when I considered the GPA for nursing courses, all of the participants did not have the same nursing courses. Even with this change, the basic baccalaureate curriculum still conformed to the AACN's Essentials of Baccalaureate Education for Professional Nursing Practice (n.d.).

Significance of the Study

The AACN (2015) and the Bureau of Labor Statistics (2015) emphasized the need for more nursing professionals to enter the workforce. An estimated additional 500,000

registered nurses will be working in healthcare by 2020, yet 1.5 million registered nurse positions are estimated to be needed to meet demands associated with healthcare needs and anticipated retirements from the workforce (AACN, 2015; Bureau of Labor Statistics, 2015). This deficit is partly due to the limited number of students admitted to nursing programs. In 2012, over 80,000 nursing school applicants were denied due to limited availability in nursing programs (AACN, 2015). Of those who are accepted into a program, only 69% will graduate (IPEDS, 2016). Nursing programs are still attempting to determine how to best determine relevant admission criteria to improve retention and graduation (NLN, 2012; Ukpabi, 2008).

In 2010, the Institute of Medicine (IOM) and NLN stated that more needed to be done to align the skills and knowledge obtained in nursing school to those needed in the acute care setting (IOM, 2010). This required the NCSBN to increase the level of difficulty of the NCLEX through a shift from knowledge-based questions to critical thinking and clinical judgement-based questions in 2013. The NCSBN (2013) now asserts that students must have the necessary critical thinking skills to pass the NCLEX exam. Nursing programs have to maintain at least an 80% pass rate on NCLEX; however, they also have to monitor attrition and find ways to keep students in the program. This study examined admission criteria and how to best determine which students are most likely to succeed. This study could give insight into how to best determine which students will be successful in nursing programs.

Implications for Social Change

Determining how to best predict success in a program may give nursing programs a greater chance of ensuring that students will graduate as competent nurses capable of critical thinking and continue their status as accredited providers. The nation is currently experiencing a nursing shortage. If there is improvement in the ability to predict which incoming students are most likely to be successful on NCLEX, the number of students successfully completing nursing programs will increase. This will, in turn, increase the number of new nurses coming into the profession. The result will help to reduce the shortage of nurses in the profession.

Summary

The nursing profession is becoming more autonomous, requiring nurses to be able to think critically right out of nursing school. In order for nursing graduates to enter the profession, they must pass the NCLEX-RN exam. The NCLEX-RN exam contains questions testing the student's critical thinking ability. This requires nursing students to be able to attain critical thinking skills while in nursing school.

Nursing schools are attempting to better detect which students will be successful in their programs and in passing the NCLEX-RN exam. Such efforts may reduce attrition rates and improve the number of nursing professionals entering the nursing profession. This study aimed to determine whether a relationship exists among entry GPA, TEAS scores, entry and exit critical thinking evaluation scores, and final nursing program GPA and the outcome of interest, passing the NCLEX-RN exam.

Chapter 2 identifies the origins of Astin's I-E-O model, how it has been used in past studies, and how it fit this study. The results of a complete literature review on the study's concepts are also explained in detail. In Chapter 2, I show what literature exists on critical thinking, how it applies to nursing, and the studies already performed in the nursing profession. Chapter 2 also indicates the gap in the literature and why this study is important to nursing.

Chapter 2: Literature Review

Introduction

Nursing programs need to be able to determine which students will be most successful in their programs. Program directors use specific items, called *predictors of success*, which are meant to show how likely a student is to succeed both in the program and on the NCLEX-RN exam. One way in which programs in Texas have sought to identify qualified students is to use standardized critical thinking evaluation scores as predictors of success. However, there is currently no research literature to guide schools in acceptance criteria and monitoring criteria that may be predictive of success in nursing schools, critical thinking ability, and successful completion of the NCLEX examination with the first attempt. The purpose of this study was to determine whether a relationship exists among entry GPA, TEAS scores, entry and exit critical thinking evaluation scores, and final nursing program GPA and the outcome of interest, passing the NCLEX-RN exam.

Studies have been conducted to determine whether or not a relationship exists between prerequisite GPA scores and successful completion of the NLCEX-RN exam (Crouch, 2015; McCarthy, Harris, & Tracz, 2014; Simon et al., 2012; Ukpabi, 2008). Researchers have also studied the use of the TEAS (Abele, Penprose, & Ternes, 2013; McCarthy et al., 2014; Wolkowitz & Kelley, 2010) exam and CTA as predictors of success on the NLCEX-RN exam (Newton & Moore, n.d.; Ukpabi, 2008). Additionally, researchers have sought to determine the relationship between nursing GPA and success on the NCLEX-RN exam (Lavandera et al., 2011; Romeo, 2013; Yucha et al., 2009).

Emory (2013) looked for a way to identify students at risk for failure early in nursing programs. The program Emory used in the study already uses standardized tests from ATI as summative assessments for the fundamentals, pharmacology, and mental health courses taken within the first year of the program. The author took the results from these assessments and performed a correlational study to determine if a relationship exists between the assessment results and success in first-time NCLEX-RN pass rates. While the fundamentals and pharmacology standardized tests showed a positive relationship with success in the program, no relationship existed between the mental health ATI exam and first-time NCLEX-RN pass rates. This information can be used to identify students early in programs who would benefit from faculty and remediation staff working with them on becoming successful.

Each research study that I found was able to identify specific relationships between the independent and dependent variables to help the program in use. However, the studies had limitations due to sample size, only using one cohort, or conflicting results. Few studies used a standardized critical thinking exam as a predictor. None of the studies used all of the variables that were used in this study.

The literature review is separated into the following major sections: literature search strategy, theoretical foundation, conceptual framework, and key variables and concepts. In the section on the literature search strategy, I explain how the search was completed, including key words, databases, and websites used. In addressing the study's theoretical foundation, I provide a detailed explanation of Astin's I-E-O model as well as how this foundation has been used in previous research studies. In presenting the

conceptual framework, I define the concept of critical thinking as it relates to nursing, Gendrop and Eisenhauer's transactional model of critical thinking, and how the definition and conceptual model were applied to this dissertation.

Literature Search Strategy

The literature review was completed after performing a search of electronic databases, Internet websites, and book chapters. The electronic databases included CINAHL, EBSCO host, ERIC, ProQuest, Education Research Complete, OVID, and Google Scholar. Internet websites included those of the NLN, the American Nurses Association, Sigma Theta Tau International, and the AACN. I used the following key words and/or phrases with each database: *critical thinking*, *nursing*, *nursing education*, *nursing program*, *critical thinking exam*, *ATI critical thinking*, *predictor of nursing success*, *attrition*, *retention*, *nursing GPA*, *prerequisite*, *Astin's I-E-O model*, and *standardized nursing exams*. Only articles including Astin's I-E-O model, quantitative methodology, critical thinking, predictors of success in nursing programs/ NLCEX-RN exams, and nursing curricula related to my dissertation were included in the study.

Theoretical Foundation

Astin's input-environment-outcome (I-E-O) model was used as the framework for this dissertation. Astin was working for the National Merit Scholarship Corporation as a researcher when he formed his model (Astin, 1991). He found that the output of a program or institution was influenced by both the input and the environment, rather than just the input (Astin 1991). His model was first considered a conceptual framework but is now considered a middle range theory (Thurmond & Popkess-Vawter, n.d.).

The I-E-O model explains the relationship between inputs, the environment, and outcomes in higher education (Astin, 1991). Astin (1991) asserted that students' accomplishments, or talents, are not solely based on their inputs, or what they bring into the program or university (Astin, 1991, 2012). The environment must also be included, as it influences the end result (Astin, 1991, 2012). In the following sections, I describe Astin's three characteristics—input, environment, and outcome—as well as why and how this model supports the dissertation.

Input

Input includes any "personal qualities the student brings initially to the educational program (Astin, 2012, p. 19). Examples can include, but are not limited to, high school GPA, course grades, advanced placement exam results, standardized assessment exams for professional programs, and demographic information (Astin, 2012). According to Astin (2012), inputs can be independent, antecedent, or control variables. Inputs also are dependent on how they are going to be used for the study as well as the designated outputs (Astin, 1999, 2012).

A literature review resulted in four studies supporting my input characteristics of GPA, demographic data, and academic entrance exams. Kjelgaard and Guarino (2012) used the student's major, his or her undergraduate and graduate GPA, and his or her GRE scores as environmental variables. Heaney and Fisher (2011) used GPA, demographic information, and ACT scores. York, Gibson, and Rankin (2015) identified GPA, ACT scores, and demographics as inputs that affected output, using Astin's model. Johnson (2012) identified demographic data, high school GPA, SAT scores, and the results of the

sense of belonging pretest as inputs in Astin's I-E-O model. These studies support the use of the student's prerequisite GPA, TEAS scores, CTA scores, and demographic information as input for this dissertation.

Environment

The environment includes "the student's actual experiences during the educational program" (Astin, 2012, p. 19). Examples include specific classes, faculty, the facility, available resources, and extracurricular activities (Astin, 2012). As with inputs, the environment can also include independent, antecedent, or control variables (Astin, 1991, 2012). Astin (2012) recognized that not all aspects of the environment can be accounted for, or measured, even though they influence the outcomes.

The same studies mentioned identify various environmental characteristics. Kjelgaard and Guarino (2012) cited course GPA and GRE scores as their independent variables for the environmental characteristic. Heaney and Fisher (2012) looked at student orientation, academic integration, and social integration using data from survey tools as independent variables. York et al. (2015) looked at specific program learning outcomes and retention as environmental characteristics. Johnson (2012) used the academic year, faculty and peer interactions, academic problems, and Carnegie classification. For this dissertation, the environment is the nursing program.

Outcome

The outcome is what programs/ universities "are trying to develop in educational program(s)" (Astin, 2012, p. 19). Examples include GPA, exit exams, and success on certification exams (Astin, 2012). The outcome can change based on what is being

studied. What is used in one study as the input or environment could be used in another as the output. The dependent variable is most often used at the outcome characteristic.

Kjelgaard and Guarino (2012) used the Praxis scores as the outcome. The Praxis exam is the certification exam used to determine if a graduate of a speech pathologist program could certify (Educational Testing Service [ETS], 2016). Heaney and Fisher (2011) used students' GPA at graduation as well as attrition as outcomes. York et al. (2015) defined outcomes as academic achievement, student learning, and retention. These are all similar to this dissertation's outcome characteristic of the NCLEX-RN exam results.

Rationale for Use of Astin's I-E-O Model

Astin's I-E-O model not only defines the three characteristics of input, environment, and outcome, but also explains how they influence one another. Figure 1 shows the relationship between the characteristics along with the variables used for the dissertation.

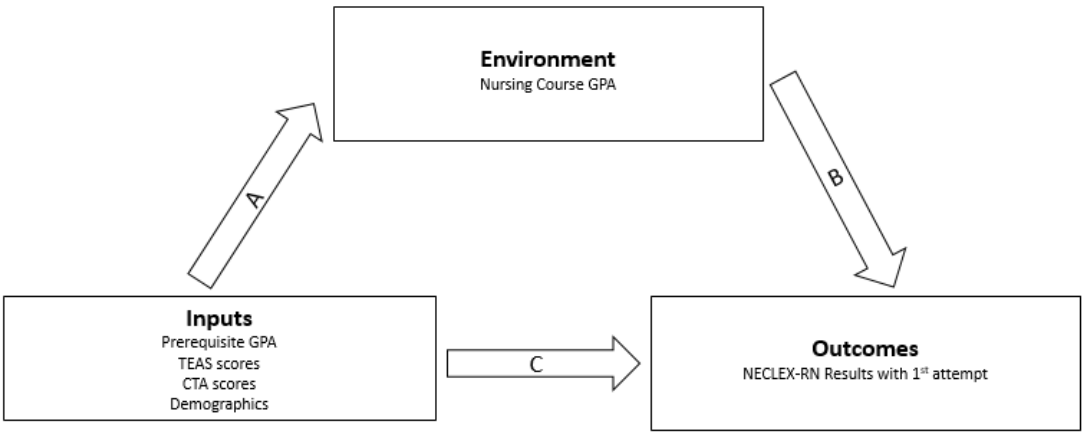

Figure 1. Astin's I-E-O model with dissertation variables.

For this dissertation, I sought to determine whether the inputs and environment predict the results. This model is used to explain relationships between inputs with outcomes as well as inputs, along with environment and outcomes. If this theory is accurate, the method shows how the prerequisite GPA, TEAS scores, CTA scores, demographics, and nursing school GPA relate to NCLEX-RN results with the first attempt.

Conceptual Framework: Critical Thinking

Seven articles defined critical thinking as it pertained to the dissertation. The authors of these seven articles asserted the importance of critical thinking in nursing and how it needs to start in the academic setting (Atay & Karabacak, 2012; Kaddoura, 2013; Maneval et al., n.d.; Moattari et al., 2014; Newton & Moore, 2013; Noohi et al., 2012). Critical thinking has been defined in nursing as well as in education, psychology, and philosophy (Atay & Karabacak, 2012; Kaddoura, 2013; Moattari et al., 2014; Scheffer & Rubenfeld, 2000).

Kaddoura (2013) included analysis, open mindedness, and information seeking as necessary to attain a higher level of knowledge and think critically. An article by Moattari et al. (2014) used a definition by Scheffer and Rubenfeld (2000), which included "17 dimensions of critical thinking under two domains" (p. 70). Atay and Karabacak (2012) defined critical thinking in nursing as the ability to "critically assess and interpret situations and use our knowledge correctly" (p. 233). Maneval et al. (n.d.) found critical thinking to include analysis, application, synthesis, and evaluation of patient data. Noohi et al. (2012) asserted that critical thinking is a skill that can be

developed and includes problem solving and questioning data findings as well as current orders and protocols. Newton and Moore (2013) stated that critical thinking is a process and is deliberate.

The literature reviewed did not focus on the events leading to critical thinking, but on the attributes and consequences of the concept. Two articles did mention antecedents. In the clinical setting, Kaddoura (2013) noted that the change in patient status and gathering of patient data preceded critical thinking. Prompting and discussions led by the instructor were noted as precursors to critical thinking in the classroom (Kaddoura, 2013; Moattari et al., 2014). Critical thinking is prompted by abnormal findings in a physical assessment, a concern by the patient or caregiver, an abnormal diagnostic test or laboratory results, or the nurse's intuition.

Attributes

Defining attributes of a concept give the concept meaning and are used as a guide for the researcher in the concept analysis (Walker & Avant, 2011). The literature revealed a multitude of attributes associated with critical thinking. Those most consistently used include interpretation, analysis, application, reasoning, and synthesis (Kaddoura, 2013; Maneval et al., n.d.; Moattari et al., 2014; Newton & Moore, 2013; NLN, 2008; Scheffer & Rubenfeld, 2000). Interpretation occurs after information about the patient is gathered. The information is determined to be normal or abnormal in the context of the patient and his or her situation. During analysis, the abnormal findings become the focus and are broken down to determine a possible cause. Reasoning occurs during this phase, focusing on possible causes and drawing conclusions based on

evidence and best practices. During synthesis, the individual findings are brought back together and applied to the specific patient, and a course of action is determined.

Consequences

Overall, the literature showed the same consequences of critical thinking, which included high-quality, evidence-based decisions resulting in improved quality of patient care (Kaddoura, 2013; Noohi et al., 2012; Scheffer & Rubenfeld, 2000). Abnormal findings and adverse effects are caught and acted on earlier than if critical thinking were not done, leading to decreased length of hospital stay and improved patient satisfaction. Having nursing students graduate with the ability to critically think will increase pass rates on NCLEX. It will decrease the amount of time needed to train new nurses, and facilities may be more willing to hire new graduates.

Conceptual Relationships

Critical thinking was assessed as it relates to undergraduate nursing programs and standardized testing. Standardized tests have been used for years as a way to track and compare nursing success (Fero et al., 2010; NCSBN, 2013). Correlations have been identified between entrance exams and passing NCLEX the first time (Fero et al., 2010). Standardized tests for nursing focus on English comprehension, grammar, mathematics, and science (Maneval et al., n.d.; Seidl & Sauter, 1990).

As critical thinking became crucial to success in nursing, researchers started developing standardized tests in an attempt to quantify critical thinking skills and the ability to think critically in a given situation. Seidl and Sauter (1990) developed the Scale of Judgmental Ability in nursing to assess the student's ability to think critically.

Nursing schools have used the California Critical Thinking Skills Test as part of admission scores. However, this test was not designed specifically for nursing, leading some researchers to question its ability to be used in the nursing profession (Kaddoura, 2013; Newton & Moore, 2013; Wangensteen, Johansson, Bjorkstroim, & Nordstrom, 2011). Health Education Systems Incorporated (HESI) and ATI developed a standardized exam specific to the nursing profession to determine the critical thinking ability of nurses and nursing students.

The Transactional Perspective on Critical Thinking

In 1996, Gendrop and Eisenhauer sought to develop a critical thinking model to explain critical thinking skills and processes in the nursing profession. They saw critical thinking as transactional, taking into account the interplay between the nurse, the environment, and personal attributes (Gendrop & Eisenhauer, 1996). They described critical thinking as "a unitary act of reflection, inquiry, and action, highly influenced by non-cognitive attributes and external social and contextual conditions" (Gendrop & Eisenhauer, 1996, p. 336). A holistic approach allows the nurse to look at not only the patient's current diagnosis and past medical history, but also the patient's social, familial, and environmental situation. Gendrop and Eisenhauer developed the transactional model of critical thinking and identified three main components within the model: personal attributes, antecedent characteristics, and environmental conditions.

Personal attributes refer to the nurse's attitudes, developmental level, professional knowledge, and empathetic response (Gendrop & Eisenhauer, 1996). Antecedent characteristics include the nurse's age, gender, intelligence level, learning style,

educational level, professional and personal experiences, and socioeconomic conditions (Gendrop & Eisenhauer, 1996). Environmental conditions include how the nurse views healthcare administration and how the facility supports the profession. Is the facility able to provide continuing education opportunities? Does leadership allow staff to speak freely and ask questions? Are the necessary resources made available to provide quality care? The answers to these questions effect the nurse's actions and response to analysis and interpretation results.

Each attribute effects the nurse's perspective and approach to the patient's care. A nurse who is confident, motivated, and ethical will approach and analyze a patient and subsequent assessments differently than one who is passive, unsure, and just wanting to get through the shift. A graduate nurse with limited clinical experience will respond more linear and methodically than a seasoned nurse given the same situation. The nurse's knowledge also effects how and to what level critical thinking skills can be applied. Nurses use their own knowledge along with past experiences (both personal and professional) when providing care for patients.

The literature search revealed one study using the model in the nursing academic setting. Bittencourt and Crossetti (2012) sought to determine how critical thinking skills were reflected in the nursing process. A qualitative design utilized focus-group sessions to obtain data from a group of nursing students. Descriptive analysis identified the critical thinking skills used within the different stages of the nursing process. The study showed analysis, application, and interpretation of data, logical reasoning, and discernment as the main critical skills apparent when using the nursing process. One

major limitation of this study is the small sample size of 7 students and the fact that the sample was a convenience sample.

Key Variables/Concepts

The key variables chosen for this study included critical thinking, prerequisite GPA, TEAS scores, CTA scores, and nursing course GPA. The following section will discuss these concepts and the literature found supporting its use. The limitations of the studies and how they support the need for further research are also be explained.

Critical Thinking

Defining critical thinking in nursing. Critical thinking definitions vary depending on discipline. Psychology, philosophy, education, and nursing professionals define critical thinking in their discipline based on the needs and skills defined for that discipline (Atay & Karabacak, 2012; Kaddoura, 2013; Moattari, Soleimani, Moghaddam, & Mehbodi, 2014; Scheffer & Rubenfeld, 2000). There is no single accepted definition in nursing. Critical thinking is a complex, multifaceted phenomenon (Atay & Karabacak, 2012; Cavalcanit & Pereira, 2014; Gendrop & Eisenhauer, 1996; Scheffer & Rubenfeld, 2000). Several authors have attempted to define critical thinking in nursing.

Scheffer and Rubenfeld (2000) polled multiple nurse-scientists and nurse-leaders to best define critical thinking. The results identified 17 different attributes separated into two dimensions; physical and cognitive. Several studies identified analysis, application, synthesis, problem-solving, and evaluation as critical thinking attributes (Atay & Karabacak, 2012; Crouch, 2015; Kaddoura, 2013; Maneval et al., n.d.; Newton & Moore, 2013; Scheffer & Rubenfeld, 2000). Critical thinking requires data-collection and

analysis and interpretation, identification of abnormal findings and potential complications, and the ability to act on the findings. It is deliberate (Facione, 1990; Newton & Moore, 2013) and a process that can be refined and improved upon as a nurse grows in his or her profession (Noohi, Karimi-Noghondar, & Haghdoost, 2012).

Critical thinking is the central phenomenon for this study and is essential in the nursing profession. The NLN and NCSBN assert critical thinking is essential to pass NCLEX (NCSBN, 2013; NLN, 2008). Healthcare facilities do not have the time or finances to teach critical thinking skills to new graduates (Noohi et al., 2012; Ryan & Tatum, 2012). They want new nurses and graduates to possess these skills at the start of employment. This means nursing students must learn and adapt these skills during the nursing program (Maneval et al., n.d.; Moattari et al., 2014).

Standardized critical thinking tests are one way to assess critical thinking skills. Nursing programs use these tests to determine how capable students are at thinking critically at the beginning or conclusion of a program (Ryan & Tatum, 2012). The standardized tests give a reliable tool for studies to collect and compare data. This study looks to see if critical thinking abilities can predict success in a nursing program and passing NCLEX.

Measuring critical thinking. Critical thinking can be measured throughout the course in different ways. Faculty use concept mapping in the clinical setting to evaluate a students' critical thinking skills (Atay & Karabacak, 2012; Maneval et al., n.d.; Moattari et al., 2014). Critical thinking skills are tested in the classroom setting through case studies (Kaddoura, 2013) and test questions that require analysis and synthesis of

information (Kaddoura, 2011). Simulation is another way to test critical-thinking skills and abilities (Fero et al., 2010; Wane & Lotz, 2013). However, the evaluation tools are made by either the professor or the school of nursing, and are not standard evaluation tools.

Nursing programs are using standardized critical thinking exams to test baseline critical thinking abilities at entrance into a program. The Watson-Glaser Critical Thinking Appraisal, California Critical Thinking Disposition Inventory, the critical thinking exam by Health Education Systems Incorporated (HESI), and the critical thinking entrance exam by Assessment Technologies Institute (ATI). The Watson-Glaser Critical Thinking Appraisal and California Critical Thinking Disposition Inventory exams are not specific to the nursing profession (Crouch, 2015; Kaddoura, 2013; Morrison, Adamson, Nilbert, & Hsia, 2008). Both ATI and HESI claim to be specific to the nursing profession (Assessment Technologies Institute [ATI], 2001; Kaddoura, 2013; Newton & Moore, 2013; Ukpabi, 2008).

This study utilized ATI's critical thinking entrance and exit exams. Each critical thinking exam consists of 40 multiple-choice questions (ATI, 2001). Students took the exam online in the classroom setting with a faculty member present during the entire exam. The results include a final score as well as scores for each of the six critical thinking skills tested (ATI, 2001). The test itself was developed by a team of experts on critical thinking in nursing. Reliability testing showed a Cronbach's alpha of .68 (ATI, 2001). These skills included in the assessment include interpretation, analysis, evaluation, inference, explanation, and self-regulation.

Prerequisite GPA

A specific predetermined prerequisite GPA is used by many nursing programs as admission criteria. The literature review revealed studies supporting the use of prerequisite GPA as a predictor of success in nursing programs. McCarthy, Harris, and Tracz (2014) led a retrospective correlational research study with basic baccalaureate students, gathering data from graduating cohorts from a two-year span. They found a significant relationship between prerequisite GPA and passing NCLEX-RN with the first attempt with a p-value < 0.001 (McCarthy et al., 2014).

Simon et al. (2012) wanted to determine if prerequisite course GPA and transfer credits could predict success in nursing programs. They also used statistical analysis to determine if the NLN readiness exam score and nursing course GPA showed a positive relationship. The authors collected data on 171 students and used multiple regression analysis to test their hypotheses. The study revealed that the science prerequisites as well as the prerequisite GPA could be used as predictors of success in the nursing program.

Ukpabi (2008) completed a study with 18 independent variables to determine which could predict success in the nursing program due to decreasing pass rates on the NCLEX-RN exam at the university. The results showed a significant positive relationship between the prerequisite GPA and passing the NCLEX-RN exam with the first attempt. However, the sample only consisted of 39 student records and the study is eight years old.

Crouch (2015) performed a discriminant analysis to determine whether a relationship existed between prerequisite GPA, The NLN preadmission test score, and the

Watson-Glaser Critical Thinking Appraisal score with the nursing course GPA. The study showed a significant relationship ($p < 0.001$) between all independent variables with the dependent variable. The study results are limited as Crouch (2015) did not analyze if their independent variables and the NCLEX-RN results had a relationship. Crouch (2015) assumed that, since the results showed a significant relationship with the nursing course GPA, the independent variables could be used to predict success on the NCLEX-RN exam.

TEAS

The TEAS exam is used widely across the nation by nursing programs. It tests the student's aptitude in science, mathematics, reading, English, and language (ATI, 2009). Students are required to take this exam and obtain a pre-determined score before being accepted into the program (ATI, 2009; Lone Star College, 2016; Patty Hanks Shelton School of Nursing, 2016; UT Heath School of Nursing, 2016). The schools use the TEAS composite scores as part of the admission criteria because studies have shown it to be a predictor of success on passing the NCLEX-RN exam with the first attempt (Abele, Penprase, & Ternes, 2013; McCarthy et al., 2014; Wolkowitz & Kelley, 2010).

McCarthy et al. (2014) studied the TEAS exam subscores and their relationship to passing the NCLEX-RN on the first attempt. They completed a retrospective study, gathering and analyzing data from four universities, including a total of 794 students' information (McCarthy et al., 2014). The results showed a significant relationship between the TEAS reading, math, and science portions of the exam ($p < 0.001$, $r = 0.197$, 0.158, 0.171 respectively) (McCarthy et al., 2014). The results did not show a significant

relationship between the TEAS English subscore and passing NCLEX-RN with the first attempt. This student did not evaluate the TEAS composite score.

Wolkowitz and Kelley (2010) sought to determine which academic areas could be used to detect success in nursing programs at the earliest stage. The researchers used the TEAS subscores as they have been shown as predictors of success in nursing programs already. The researchers reached out to multiple nursing programs and obtained TEAS scores on over 14,000 students (Wolkowitz & Kelley, 2010). They found a strong correlation between science and success in nursing programs within the first year (Wolkowitz & Kelley, 2010). This study also did not use the TEAS composite as a variable in the study.

CTA

Researchers have used ATI's Critical Thinking Assessment instrument in various ways to determine critical thinking skills of nursing students. Newton and Moore (n.d.) conducted an exploratory descriptive study to determine if there was a difference in critical thinking skills between basic and accelerated second-degree baccalaureate nursing students at program entry and exit. Two hundred eighty three (283) students from four cohorts completed both the entrance and exit CTA instrument. While students in the accelerated program started with higher CTA scores, there was no significant difference found between the two groups at the end of the program. This study supports the use of standardized critical thinking exams to gauge nursing students' critical thinking skills. However, it did not evaluate the CTA instrument in relationship to the NCLEX-RN exam.

Ukpabi (2008) tested 18 variables as predictors of success on the NCLEX-RN exam. One of those 18 variables included the CTA. The results showed a significant relationship with a Wilks Lambda of .696 and p value of .008. This study's results are limited due to the small sample size (38 students) and that fact that the study was conducted at one university over 8 years ago.

Nursing Course GPA

Previous studies have shown a positive correlation between nursing course GPA and successful completion of the NCLEX-RN exam with the first attempt. Romeo (2013) performed a comparative retrospective study with 182 student files, testing the relationship between the nursing program GPA and passing the NCLEX-RN exam with the first attempt. Romeo's study showed a positive relationship between the two with $r = .606$ and $p < .001$. Furthermore, logistic regression determined the nursing GPA to be the best predictor of success on the NCLEX-RN, when compared to the other independent variables: the SAT results and the assessment test composite results.

Lavandera et al. (2011) conducted hierarchical logistic regression analysis to determine predictors of success on the NCLEX-RN exam. The independent variables included nursing GPA, the HESI exit exam, and receiving a failing grade in a math or science course prior to entering the program. Results showed that, with every increase of 1 standard deviation in nursing GPA, the odds of passing the NCLEX-RN on the first attempt increased 1.58 times (Lavandera et al., 2011). However, when the nursing GPA and HESI were analyzed together, no statistically significant results were shown for nursing GPA.

Yucha at el. (2009) completed a study to determine the effects of anxiety on different variables. Within this study, they also tested the relationship between nursing GPA and the mock NCLEX-RN exam with passing the NCLEX-RN exam on the first attempt. Yucha et al. (2009) found a positive relationship between the nursing GPA and passing the NCLEX-RN on the first attempt. Yucha et al. (2009) reported that those who passed NCLEX-RN on the first attempt had a higher nursing GPA then those who did not pass on the first attempt. This study, however, does not account for other variables that could also affect the study.

Summary and Conclusions

Literature shows the complexity of critical thinking skills as well as how and why they are necessary in the nursing profession. The literature also shows that multiple researchers throughout the United States have sought to determine which predictors would be best to be used to predict success on the NLCEX-RN exam as well as early identification of those at risk for not completing the nursing program. However, none of the studies used the same variables and only one of the studies used standardized critical thinking exams as a potential variable. Despite this limitation, nursing programs are using standardized critical thinking exams as part of the preadmission criteria. This study took variables shown to have a significant positive relationship with success on the NCLEX-RN exam and add the CTA to determine whether or not a relationship exits. Determining this relationship will further nursing programs' abilities to accept students most likely to succeed on the NCLEX-RN exam and become nursing professionals. This

will narrow the gap with the nursing shortage. Chapter 3 explains exactly how the study was conducted.

Chapter 3: Research Method

Introduction

The purpose of this study was to determine if a relationship exists among entry GPA, TEAS scores, entry and exit critical thinking evaluation, and final nursing program GPA and the outcome of interest, passing the NCLEX-RN. In the following chapter, I describe the research method used for the study. It includes the following sections: research design and rationale, methodology, threats to validity, and ethical considerations. This methodology chapter contains descriptions of the population, sample and sampling procedure, procedures for recruitment, participation, data collection, and instrumentation and operationalization of constructs.

Research Design and Rationale

For this quantitative study, I looked at multiple variables related to nursing programs. The dependent variable was the outcome, the NCLEX-RN exam result. The results were recorded as either *passed* or *did not pass*. The independent variables were prerequisite GPA, TEAS score, ATI CTA score, and overall nursing GPA. The university uses the 0-4.0 GPA scale. The ATI CTA is scored as a percentage. The TEAS test is given a score based on the subscores, using a complex mathematical equation.

Quantitative research methods are used for statistical analysis to determine a relationship or correlation between a dependent variable and one or more independent variables (Creswell, 2009). A retrospective correlational design was used to determine if a relationship exists between standardized critical thinking exam scores, TEAS scores, preadmission GPA, nursing course GPA, and successful completion of the program as

evidenced by passing the NCLEX-RN exam on the first attempt. Regression analysis, specifically logistical binary regression, was used to determine what, if any, relationship exists.

Logistic regression is used when the dependent variable is dichotomous and not continuous. For this study, the dependent variable was success, or failure, on the NCLEX-RN exam. This type of analysis determines the odds, or probability, that the independent variables will affect the outcome of the dependent variable. The independent variables included prerequisite GPA, TEAS scores, entrance and exit CTA scores, and nursing program GPA.

Setting and Sample

Population

A basic baccalaureate nursing program offered by a local state university in a rural area of southern Texas was used for the study. According to a 2016 report published by thon the nursing program's website, the School of Nursing accepts 60 students per cohort and admits two cohorts per year. Student data from three cohorts were available for use in this study.

Sampling and Sampling Procedure

Convenience sampling was used for this study. Convenience sampling uses subjects who are readily available and allows for samplings of specific populations that would otherwise not be available for sampling (Grove, Burns, & Gray, 2013). This study required a specific population (basic baccalaureate nursing students) with specific variables, requiring a purposive sample to be used.

Inclusion Criteria

Students were included from the program if they had graduated from the school of nursing; had taken the ATI critical thinking entrance exam scores; had records indicating prerequisite GPA, GPA for nursing courses for each semester, and overall GPA; and had taken the NCLEX exam with reported results.

Exclusion Criteria

Students who did not complete the program, who had not completed the ATI critical thinking entrance exam, or who had incomplete transcripts were not used in the study. The sample was representative of the student population within the nursing program because students within the school of nursing were used.

Sample Size

G*Power was used to compute the sample size for this study. G*Power is a program that can be used to determine the effect size and minimum number of participants needed in a study. The researcher must know the method of analysis as well as the effect size, error of probability, and Power to use the program (Trochim, 2006). Because there were no studies similar to this study, a medium effect size of 0.3 was used. The error of probability is 0.5. Two Powers were used. With a Power of 0.8, the sample size would be a minimum of 64 participants. With a Power of 0.95, the sample size would be a minimum of 111 participants.

Procedures for Recruitment, Participation, and Data Collection

Recruitment of participants was not necessary for this study, in that it was retrospective in nature. All of the information was accessed from data collected by the school of nursing. Demographic information was obtained during the data collection process and reported. Demographic information included age, gender, ethnicity, and previous degrees completed, if any. The demographic data were not used for analysis purposes in this study. However, these data may be used in subsequent analysis for future studies.

Data were collected from the school of nursing's data analyst, who tracks and records all data in a database. The data collected were organized in a Microsoft Excel spreadsheet. IRB approval was obtained through the university and presented to Walden's IRB prior to data collection. When students are accepted into the program, the students are coded, and then their demographic information is entered into the database. The analyst keeps a list of the students' names with their codes in a locked filing cabinet in his office. The analyst continues to add information into the database, including prerequisite GPA, ATI test results, and letter grades for courses. Student NCLEX results are kept by the resource nurse. This information can be added to the database by the analyst as well. The database only included the student codes. The student names and university identification numbers were omitted from the analyst's database.

Instrumentation and Operationalization of Constructs

ATI Critical Thinking Assessment

In 2000, ATI consulted with a group of experts to develop the CTA tool to determine critical thinking abilities of nursing students and nursing professions. The tool includes 40 multiple-choice questions in total, testing six critical thinking skills: interpretation, analysis, evaluation, inference, explanation, and self-regulation (ATI, 2001). The initial validation of the assessment tool included 435 students from 18 different schools nationwide (ATI, 2001). After interpretation of the results by the experts and modification to the assessment tool, ATI recruited 1,630 students from 44 nursing programs nationwide for further reliability and validity testing (ATI, 2001). The results showed a Cronbach's alpha = 0.70.

Validity of the instrument was also addressed by ATI. Construct validity was established through both a literature review and consultation with experts in the field of nursing. The six critical thinking skills measured were determined to "adequately and appropriately represent the chosen constructs of ATI's critical thinking model" (ATI, 2001, p. 22). Content validity was established with the use of expert review of each question as well as alpha and beta testing of the assessment. Revisions were made based on item analysis from the alpha and beta tests (ATI, 2001). The CTA items were found to "reflect the critical thinking skills that are presumed important for students throughout their nursing education" (ATI, 2001, p. 23).

TEAS

ATI consulted with nursing experts in 1999 to develop the TEAS tool for nursing programs to use to determine readiness of potential nursing students to enter into a program. A detailed analysis was conducted to identify the high school graduation requirements from 13 schools around the nation (ATI, 2007). This established the essential subsets of the exam: math, English, language usage, and science. Through the use of surveys, nurse educators were then recruited to determine which objectives within the subsets were most relevant for success in a nursing program (ATI, 2007). The survey results analysis resulted in the objectives for all four subsets having an interrater reliability coefficient of 0.99 (ATI, 2007, p. 9).

The final tool consisted of 179 multiple-choice questions, testing knowledge in math, English and language usage, and science. The internal consistency of the tool was last tested in 2007, with a Cronbach's alpha of 0.90 in each of the knowledge areas tested (ATI, 2007). The most recent tool revision, conducted in 2009, resulted in a decrease of question items to 170 questions (ATI, 2009).

GPA

A student's preadmission (GPA) and nursing course GPA were based on the 4.0 scale. The GPA was calculated by taking the total number of earned grade points and dividing that by the total number of earned credit hours. The resulting average was shown on each student's transcript along with each individual course grade and number of credit hours for each course. All prerequisite course grades were used to determine the

students' preadmission GPA. All nursing course grades were used to determine the students' nursing GPA.

Threats to Validity

Validity of each of the instruments has been discussed in the above sections. Threats to internal validity included single group, history, and maturation. History involves the effects of variables not addressed by the independent variables in the study (Polit & Beck, 2014). Maturation refers to the variables occurring during the study (Polit & Beck, 2014). In this case, history and maturation could have been a threat because they could have influenced the results of the nursing GPA and success on the NCLEX-RN exam and could not be controlled for. Single group can threaten internal validity because there is no second, or control, group with which to compare the results of the data. While this study could not control for these threats, data were collected from multiple cohorts. This allowed data collection and analysis of varied participants with varied uncontrolled variables. The only constants were the chosen independent variables.

Ethical Procedures

Confidentiality of student information was upheld throughout the study. Student information was coded, and the spreadsheet identifying which student had which code was kept on an encrypted flash drive, which was locked in the desk of the data analyst responsible for coding the information. All data collected and stored on my computer were kept in a secure, password-protected file. IRB approval was obtained through the Texas university's panel first and then through Walden University.

Transition and Summary

In summary, the purpose of this study was to determine whether a relationship exists among entry GPA, TEAS scores, entry and exit CTA scores, and final nursing program GPA and the outcome of interest, passing the NCLEX-RN exam on the first attempt. A minimum of three cohorts from a basic baccalaureate nursing program at a Texas university were used. Data were collected in an Excel spreadsheet and transferred to SPSS for analysis. The logistic regression model was used to analyze the data. This analysis is reported and explained in Chapter 4.

Chapter 4: Results

Introduction

Using Astin's I-E-O model, this quantitative correlational study of 64 nursing students from an undergraduate baccalaureate nursing program sought to determine if a relationship exists among the input variables (prerequisite GPA, TEAS composite scores, CTA entrance scores), environment variable (nursing course GPA), and outcome (passing the NCLEX-RN exam with the first attempt). Logistic regression was used to determine what, if any, relationship exists between prerequisite GPA, TEAS scores, entry critical thinking evaluation, and final nursing program GPA and the outcome of interest, passing the NCLEX-RN exam. Descriptive statistics were used on the demographic data obtained to verify the external validity of the sample size. In Chapter 4, I describe the data collection process, the results of the study, and the answer to the research question.

Data Collection

This retrospective study initially collected data from six cohorts of students who graduated from the nursing program between May 2014 and December 2016, yielding data from 173 students. After elimination of all of the students whose data were incomplete (entry GPA, TEAS scores, final nursing program GPA, NCLEX-RN exam results, or entrance and exit critical thinking scores), data from 64 students remained. This met the minimum requirements determined by the G*Power in Chapter 3 using a Power of 0.8.

The sample consisted mainly of female students, which was consistent with Texas State Board of Nursing (TBON) and NLN national survey results (NLN, 2015; TBON,

2015). The sample consisted of multiple ethnicities, including Caucasian, African American, Hispanic, Asian, and American Indian. The percentage of minorities in the sample was slightly higher than national statistics but slightly lower than the state average. However, it is representative of the ethnic diversity at the university, with the university minority population accounting for 56% of the student population (College Factual, 2016). It is important to note that the TBON categories for minorities are not the same as those of the school of nursing and NLN. TBON reports specifically on Caucasian, African American, and Hispanic ethnicities but not on Asian and American Indian. These ethnic groups are placed in the "Other/ Unknown" category (TBON, 2015).

Table 1

Demographic Descriptive Statistics vs. National Demographic Statistics of Nursing Students in the United States

	Demographics (%)	*NLN (%)	**TBON (%)
Males	17.2	15	16.8
Females	82.8	85	83.2
African American	12.5	12.2	14.4
Hispanic	10.9	8.1	26.5
Asian	6.3	5.9	NA
American Indian	3.1	1.5	NA
Other/Unknown	6.3	7.5	9.7
Caucasian	60.9	64.8	49.4

*National statistics obtained from NLN Nursing Student Demographics 2013-2014.
**State statistics obtained from Texas Board of Nursing Student Demographics 2014.

The age, gender, and ethnicity of the sample population were nonnormally distributed with a skewness of 2.27 (*SE* = .30), -1.78 (*SE* = .30), 1.30 (*SE* =.30) and kurtosis of 5.58 (*SE* = .59), 1.21 (*SE* = .59), .188 (*SE* = .59), respectively. The

Kolmogorov-Smirnov test also showed nonnormal distribution with a significance of p = .000.

Results

Descriptive statistics revealed a prenursing GPA of M = 3.55, nursing program GPA of M = 3.35, TEAS composite score of M = 0.74, critical thinking entrance assessment score of M = 0.72, and critical thinking exit assessment score of M = 0.77 and indicated that 90.62% of the sample (N = 58) passed the NCLEX-RN exam with the first attempt. All variables were normally distributed, with the exception of the exit CTA assessment scores, which showed nonnormal distribution with skewness of -.85 (SE = .30) and kurtosis of 1.43 (SE = .59); however, the Kolmogorov-Smirnov test did show normal distribution at p = .07.

The pass rate of the sample was higher than the average NCLEX-RN pass rate for the school of nursing, which was 84.8% (TBON, 2016). One reason for this could be that the school of nursing is a newer program and has only had eight cohorts graduate; in the second year (2014), the pass rate was only 73.9% (TBON, 2016). A paired-samples t test showed a significant difference in the scores for the entrance CTA (M = 0.72, SD = 0.09) and the exit CTA (M = 0.77, SD = 0.08); t(63), p < .000. This significant positive difference is consistent with other studies (Kaddoura, 2011; Newton & Moore, n.d.).

Table 2

Descriptive Findings of Independent Variables

	Min	Max	*M*	*SD*
Prenursing GPA	3.0	4.0	3.55	0.28
Nursing GPA	2.97	3.79	3.35	0.18
TEAS composite	0.56	0.91	0.74	0.08
CTA entrance	0.48	0.88	0.72	0.09
CTA exit	0.48	0.9	0.77	0.08

Research Question 1 Hypothesis

H_0: There is no relationship among entry GPA, TEAS scores, entry and exit critical thinking evaluation, and final nursing program GPA and the outcome of interest, passing the NCLEX-RN exam.

H_1: There is a relationship among entry GPA, TEAS scores, entry and exit critical thinking evaluation, and final nursing program GPA and the outcome of interest, passing the NCLEX-RN exam.

Binary logistic regression was performed to determine whether there was a relationship between GPA, TEAS scores, entry ATI Critical Thinking Assessment scores, final nursing GPA, and passing the NCLEX-RN exam on the first attempt. In order for binary logistic regression analysis to be appropriate, certain assumptions must be met. First, the dependent variable must be dichotomous and the variable labeled as "1" must be the desired outcome (Field, 2013). This assumption was met, as the dependent variable was either "true" if the student passed the NCLEX-RN exam on the first attempt or "false" if the student did not pass the NLCEX-RN exam on the first attempt. The desired outcome, passing the NCLEX-RN exam on the first attempt, was labeled as "1."

The analysis showed a significant relationship between passing the NCLEX-RN exam on the first attempt and the independent variables ($x^2(5, N = 64) = 11.443$, $p = .043$). Cox and Snell's *R*-square show a weak relationship between the dependent variable and the independent variables, at 16.4% and 35.3%, respectively. The Hosmer and Lemeshow test was nonsignificant at .693, which supports the independent variables predicting the dependent variable, as it is closer to 1 than 0 (Field, 2013). However, the Wald statistic did not show a significant relationship between each independent variable and the dependent variable. See Table 3 for details.

Table 3

Independent Variables Wald Statistics

	B	Wald	Sig
Prerequisite GPA	1.63	0.67	.41
Nursing GPA	4.90	1.78	.18
TEAS composite	-9.52	1.58	.21
CTA entrance	9.11	0.92	.34
CTA exit	4.23	0.28	.60

Summary

This study's results did show a significant relationship between prerequisite GPA, TEAS composite scores, CTA entrance and exit scores, and the student's ability to pass the NCLEX-RN exam on the first attempt. However, the individual variables did not show significant relationships with passing the NCLEX-RN exam on the first attempt. The demographic data findings and descriptive statistics of the study can be used for future studies. In the following chapter, I describe the interpretations of the results, the

limitations of the current study, recommendations for future studies, and application of the study to society as well as the nursing profession.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this study was to determine whether a significant relationship exists between prerequisite GPA, TEAS composite scores, entrance and exit critical thinking assessment scores, and nursing GPA and the outcome of interest, passing the NCLEX-RN exam on the first attempt. Schools of nursing average an attrition rate of 31% across the nation; attrition costs students and their families tens of thousands of dollars (IPEDS, 2016). Currently, there is no one way to ascertain which variables can be used upon admission to best determine the success of a student both in a nursing program and on the NCLEX-RN exam. This study found that while there was a significant relationship between the independent variables collectively and the dependent variable, each independent variable, when looked at separately, did not show a significant relationship with the dependent variable.

Interpretation of the Findings

While multiple studies found in the literature review showed use of prerequisite GPA as a predictor of success in nursing programs and on the NCLEX-RN exam (Crouch, 2015; McCarthy et al., 2014; Simon et al., 2012; Ukpabi, 2008), this study did not show a relationship between the two variables ($p = .41$). The literature review produced multiple studies in which TEAS scores showed a significant relationship with success on the NCLEX-RN exam (Abele, Penprase, & Ternes, 2013; McCarthy et al., 2014; Wolkowitz & Kelley, 2010). However, the literature mostly focused on subscores and not composite scores, which this dissertation examined. This dissertation found no

significance (p = .21) in the relationship between the TEAS composite score and passing the NCLEX-RN exam on the first attempt. Further study would be needed to determine if, given the same sample population, a significance would be seen in TEAS subscores and passing the NCLEX-RN exam.

Nursing course GPA did have a positive effect on passing the NCLEX-RN exam in previous studies (Lavandera et al., 2011; Romeo, 2013; Yucha, 2009); however, each study consisted of different variables, and each individual variable affected the significance of the relationship between the nursing course GPA and passing the NCLEX-RN exam. In its findings, this dissertation is similar to those studies. The nursing course GPA showed a significant relationship with the dependent variable at p = .03 without the CTA assessment scores variable added. However, when the CTA assessment score was added, the nursing course GPA became nonsignificant at p = .18. This variance shows that the covariates used can and will affect the relationship of the other independent variables with the dependent variable.

Given that no studies have examined the relationship between critical thinking assessment scores and passing the NCLEX-RN exam, this study's results could be used to further the knowledge of the field. In that the results showed a small significance in the relationship of the dependent variable with the independent variables, further research should be conducted to determine whether standardized critical thinking entrance assessment scores can be used to determine success of the student on the NCLEX-RN exam. Further research also needs to be done to determine which covariates enhance the

significance of the relationship between critical thinking assessment scores and passing the NCLEX-RN exam.

This dissertation was based on Astin's I-E-O model, which states that the student's history, the student's current status upon entering a program, and the program itself affect the student's outcome, and that one should not exclude the influence of the inputs or environment on the outcome. The results of this study showed that, although the independent variables separately showed no significance, when all variables were considered together, a significant relationship was evident ($p = .043$). Further studies would need to be performed to determine to what extent the independent variables influence one another as well as their relationship with the dependent variable.

Limitations of the Study

The generalization of this study is limited for several reasons. First, the study only used participants from one basic baccalaureate nursing program in Texas. The study was only able to obtain complete data from 64 participants, which is a relatively small sample size. The use of the ATI standardized assessment also limits the applicability of the study to other schools that use the same tools. However, any standardized critical thinking entrance exam should be able to be used to replicate the study, as long as the exam has been tested for validity and reliability.

Recommendations

It is recommended that this study be replicated next year with the addition of two more cohorts to obtain a larger sample size. The results of the new study should be compared to the results of this study. This study did show that the critical thinking

assessment, along with the other variables, affected the outcome variable; a larger sampling size would further confirm these results. Once a larger sampling is used, this study could be expanded to other nursing schools to determine how to best screen for students who would be successful both in the program and in passing the NCLEX-RN exam.

Another consideration would be to look at the TEAS subscores along with the composite score, as the literature review did show a significant relationship between the subscores and success in nursing programs. This was not used for the current study because the school of nursing used for the dissertation did not consider the subscores. However, it would be beneficial to determine whether the subscores should be used as compared to the TEAS composite score.

Implications

Positive Social Change

Determining how to best predict success in nursing programs has long been a question that schools have struggled to answer (Abele et al., 2013; Crouch, 2015; McCarthy et al., 2014; Wolkowitz & Kelley, 2010). By increasing the number of successful students, the institution increases revenue and the number of nurses entering the profession. The first step in this process is to determine which variables affect the success of a student. Researchers must not only look at each variable individually, but also consider how one variable can impact another. This study did examine the variables that historically showed a relationship with success in a program and, more importantly, analyzed how the variables interacted to determine success in a nursing program.

Determining which variables are crucial in more accurately predicting success in nursing and passing the NCLEX could support positive social change by increasing the number of graduates, which would address the issue of the nursing shortage across the nation. This study revealed that there is a relationship between the independent and dependent variables, even with the small sample size. These results show the need for further research using a larger sample size to confirm that a relationship exists on a larger scale.

Currently, institutions in the research area are using standardized exams even though there is not sufficient research to determine whether this is a sound practice. This and further studies may determine whether the practice is sound, or whether institutions should re-evaluate their current practices. Either way, the studies would add to the current level of knowledge and give institutions a basis for more informed decisions. If the practice is found to be sound, this research, along with the results of larger studies, would help to improve retention and, as a result, increase the number of students graduating and entering the field of nursing.

Conclusions

The nursing profession is currently suffering a nursing shortage, and this shortage is predicted to not only continue, but worsen through 2025 (AACN, 2015). This is, in part, due to limited space in nursing programs for potential future nurses. By improving the school's ability to determine which students will be most successful in the program, more students will be able to graduate and become new nurses. This will, in turn, add to the number of professional nurses and help to lessen the shortage of nurses across Texas and the United States and impact positive social change. While this study plays a very

small role in identifying which variables need to be further investigated, it provides a method for systematically examining what contributes to success in nursing school.

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Appendix A: Walden University IRB Approval

IRB Materials Approved - Jaimee Kastler
Dissertation x

IRB <irb@waldenu.edu> 10/21/16

to me, Catherine

Dear Ms. Kastler,

This email is to notify you that the Institutional Review Board (IRB) confirms that your study entitled, "Using Standardized Critical Thinking Tests as a Predictor of Success in Nursing Programs," meets Walden University's ethical standards. Our records indicate that you will be analyzing data provided to you by Sam Houston State University as collected under its oversight. Since this study will serve as a Walden doctoral capstone, the Walden IRB will oversee your capstone data analysis and results reporting. The IRB approval number for this study is 10-21-16-0127965.

This confirmation is contingent upon your adherence to the exact procedures described in the final version of the documents that have been submitted to IRB@waldenu.edu as of this date. This includes maintaining your current status with the university and the oversight relationship is only valid while you are an actively enrolled student at Walden University. If you need to take a leave of absence or are otherwise unable to remain actively enrolled, this is suspended.

If you need to make any changes to your research staff or procedures, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive confirmation with a status update of the request within 1 week of submitting the change request form and are not permitted to implement changes prior to receiving approval. Please note that Walden University does not accept responsibility or liability for research activities conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with the policies and procedures related to ethical standards in research.

When you submitted your IRB materials, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to the researcher.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained at the IRB section of the Walden website: http://academicguides.waldenu.edu/researchcenter/orec

Researchers are expected to keep detailed records of their research activities (i.e., participant log sheets, completed consent forms, etc.) for the same period of time they retain the original data. If, in the future, you require copies of the originally submitted IRB materials, you may request them from Institutional Review Board.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKlmdiQ_3d_3d

Sincerely,
Libby Munson
Research Ethics Support Specialist
Office of Research Ethics and Compliance
Email: irb@waldenu.edu
Fax: 626-605-0472
Phone: 612-312-1283

Office address for Walden University:
100 Washington Avenue South, Suite 900
Minneapolis, MN 55401

Information about the Walden University Institutional Review Board, including instructions for application, may be found at this link: http://academicguides.waldenu.edu/researchcenter/orec

2. *Preparation of the LDS.* *Data Provider shall prepare and furnish to Data Recipient a LDS in accord with any applicable HIPAA or FERPA Regulations*

3. *Data Fields in the LDS.* *No direct identifiers such as names may be included in the Limited Data Set (LDS). In preparing the LDS, Data Provider or shall include the data fields specified as follows, which are the minimum necessary to accomplish the doctoral project: demographic information (gender, age, ethnicity, previous degrees completed), TEAS scores, prerequisite GPA, nursing program GPA, CTA entrance and exit scores.*

4. *Responsibilities of Data Recipient.* *Data Recipient agrees to:*

    a. *Use or disclose the LDS only as permitted by this Agreement or as required by law;*

    b. *Use appropriate safeguards to prevent use or disclosure of the LDS other than as permitted by this Agreement or required by law;*

    c. *Report to Data Provider any use or disclosure of the LDS of which it becomes aware that is not permitted by this Agreement or required by law;*

    d. *Require any of its subcontractors or agents that receive or have access to the LDS to agree to the same restrictions and conditions on the use and/or disclosure of the LDS that apply to Data Recipient under this Agreement; and*

    e. *Not use the information in the LDS to identify or contact the individuals who are data subjects.*

5. *Permitted Uses and Disclosures of the LDS.* *Data Recipient may use and/or disclose the LDS for the present project activities only.*

6. *Term and Termination.*

    a. *Term.* *The term of this Agreement shall commence as of the Effective Date and shall continue for so long as Data Recipient retains the LDS, unless sooner terminated as set forth in this Agreement.*

    b. *Termination by Data Recipient.* *Data Recipient may terminate this agreement at any time by notifying the Data Provider and returning or destroying the LDS.*

    c. *Termination by Data Provider.* *Data Provider may terminate this agreement at any time by providing thirty (30) days prior written notice to Data Recipient.*

d. *For Breach.* *Data Provider shall provide written notice to Data Recipient within ten (10) days of any determination that Data Recipient has breached a material term of this Agreement. Data Provider shall afford Data Recipient an opportunity to cure said alleged material breach upon mutually agreeable terms. Failure to agree on mutually agreeable terms for cure within thirty (30) days shall be grounds for the immediate termination of this Agreement by Data Provider.*

e. *Effect of Termination.* *Sections 1, 4, 5, 6(e) and 7 of this Agreement shall survive any termination of this Agreement under subsections c or d.*

7. *Miscellaneous.*

a. *Change in Law.* *The parties agree to negotiate in good faith to amend this Agreement to comport with changes in federal law that materially alter either or both parties' obligations under this Agreement. Provided however, that if the parties are unable to agree to mutually acceptable amendment(s) by the compliance date of the change in applicable law or regulations, either Party may terminate this Agreement as provided in section 6.*

b. *Construction of Terms.* *The terms of this Agreement shall be construed to give effect to applicable federal interpretative guidance regarding the HIPAA Regulations.*

c. *No Third Party Beneficiaries.* *Nothing in this Agreement shall confer upon any person other than the parties and their respective successors or assigns, any rights, remedies, obligations, or liabilities whatsoever.*

d. *Counterparts.* *This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.*

e. *Headings.* *The headings and other captions in this Agreement are for convenience and reference only and shall not be used in interpreting, construing or enforcing any of the provisions of this Agreement.*

IN WITNESS WHEREOF, each of the undersigned has caused this Agreement to be duly executed in its name and on its behalf.

Partner Organization

Signed: Denise Neill

Print Name: Denise Neill

Print Title: Interim Director

Doctoral Student

Signed: Jaimee Kastler

Print Name: Jaimee Kastler

Print Title: Doctoral Candidate