THE RELATIONSHIP BETWEEN TEST OF ESSENTIAL ACADEMIC SKILLS AND

NURSING FINAL COURSE GRADES FOR SOPHOMORE STUDENTS IN A

RESIDENTIAL, UNDERGRADUATE, PRE-LICENSURE BACHELOR OF SCIENCE

NURSING PROGRAM

by

Tracey Milton Turner

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

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APPROVED BY:

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ABSTRACT

In light of the national nursing shortage, there is a heightened need to admit students to schools of nursing who are likely to persist through graduation. The purpose of this quantitative predictive correlational study was to determine if Test of Essential Academic Skills (TEAS) subscale testing scores could predict the final course grade in a fundamentals of nursing course for sophomore students in a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university. Archival data consisting of information related to sophomore, residential, undergraduate, pre-licensure BSN students at a private university during the 2015-2016, 2016-2017, and 2017-2018 academic years were used in this study. The 2015-2016 sample consisted of 138 sophomore nursing students. The 2016-2017 sample consisted of 160 sophomore nursing students. The 2017-2018 sample consisted of 188 sophomore nursing students. Data were analyzed using multiple linear regression. The null hypothesis for the 2015-2016 study sample was rejected. The null hypothesis for the 2016-2017 study sample was rejected. The null hypothesis for the 2017-2018 study sample was rejected. Based on the results of this research study, the TEAS subscale testing scores can predict the final grade in a fundamentals of nursing course. Recommendations for future research include conducting similar research when the 2018 *Essentials of Baccalaureate Education for Professional Nursing Practice* are released and implemented in BSN Schools of Nursing and expanding the research to include Diploma and Associate Degree in nursing (ADN) programs.

Keywords: Test of Essential Academic Skills, Bachelor of Science in nursing, Fundamentals of Nursing, nursing shortage

Dedication

This manuscript is dedicated to my Lord and Savior Jesus Christ, who provides eternal love and guidance for my life.

To my loving husband, John: your encouragement and support make me a better person daily. Your love for Christ and dedication to our family are second to none.

To my son, Brayden: I love you so much. Thank you for your cheerful spirit and wonderful heart. I would not trade a single moment with you. All of the papers that I wrote on a baseball field or by a pool as you swam laps were completely worth it.

To my father, Ken Milton, and in memory of my mother, Stella Milton: I love you and the example of marriage, parenting, love, and work ethic that you shared with Kevin, Todd, and me.

To my father and mother-in-law, Joe and Marina Turner: I cannot express my love and appreciation for your help with Brayden (and John) while pursuing my degree.

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List of Abbreviations

American College Test (ACT)

Assessment Technologies Institute (ATI)

Bachelor of Science in Nursing (BSN)

Grade Point Average (GPA)

Health Education Systems, Inc. (HESI)

National Council Licensure Examination for Registered Nurses (NCLEX-RN)

Nursing Entrance Test (NET)

Registered Nurse (RN)

Scholastic Aptitude Test (SAT)

Test of Essential Academic Skills (TEAS)

CHAPTER ONE: INTRODUCTION

Overview

As a national nursing shortage impacts the nursing profession, patient care outcomes, and healthcare costs, there is an added focus on the need for the retention of Bachelor of Science in nursing (BSN) students. Efforts to prevent student attrition should begin during the admission process. The purpose of this non-experimental quantitative study was to determine if Test of Essential Academic Skills (TEAS) subscale testing scores could predict the final course grade in a fundamentals of nursing course for sophomore students in a residential, undergraduate, pre-licensure BSN program at a private university. Chapter one presents a framework for the current study, establishes a foundation for this research, and presents the basis for the problem of the current study. This chapter covers the following areas: background, the problem statement, the purpose statement, the significance of the study, the research question, and definitions.

Background

Nursing shortages have been reported in the United States since the 1930s. During the post-World War II period, registered nurse positions were difficult to fill because of fewer nurses being present in the workforce, lower nursing school enrollments, and an increased demand for health care related to an increase in the number of hospitals and the establishment of health insurance (Finkelman, 2016; Grando, 1998). During this time frame, the attrition rate for nursing education was over 30% (Jinks, Richardson, Jones, & Kirton, 2014). The primary reason for attrition from nursing schools during this time was examination failure (Cameron, Roxburgh, Taylor, & Lauder, 2011; Jinks et al., 2014). Today, academic failure remains a large contributing factor in nursing school attrition.

Currently, the United States is experiencing a nursing shortage that has the potential to bankrupt the healthcare system as healthcare costs increase and patient outcomes suffer. As nurse-to-patient ratios rise as the result of an inadequate number of nurses to care for patients, there is a positive correlation to readmission rates within 15 to 30 days after discharge (Stalpers, De Brouwer, Kalijouw, & Schuurmans, 2015; Tubbs-Cooley, Cimiotti, Silber, Sloane, & Aiken, 2013; Twigg, Gelder, & Myers, 2015). This is particularly worrisome given that readmission from a healthcare system within 30 days after discharge from that system results in a reduction or the elimination of insurance reimbursement for the associated hospitalization (Finkelman, 2016). Without an adequate number of nurses caring for patients, healthcare outcomes and costs suffer untoward effects. Nationally, federal spending on health care exceeded 3.2 trillion dollars in 2015 (Centers for Disease Control, 2017). The nursing shortage, as it affects patient outcomes and readmission rates, is also having a significant effect on the overall United States economy.

The negative effects of the nursing shortage make the retention of students in nursing education a heightened concern. Student attrition is the departure from a program prior to completing the degree completion plan (Gutl, Rizzardini, Chang, & Morales, 2014). Often, the vacancies left in the nursing program from student attrition remain unfilled, resulting in fewer graduates to fill the registered nurse (RN) vacancies. Additionally, attrition decreases revenue for nursing schools. Beyond attrition, a delay in graduation from nursing school postpones the ability of the individual to impact the workforce and alleviate the impact of the nursing shortage.

Bachelor of Science in nursing (BSN) programs exist within a four-year post-secondary education institution. Post-secondary completion of any degree specialty is positively correlated with higher employment rates, lifetime earnings, aversion to crime, and civil participation (Kyllonen, 2012). Despite student retention investments by institutions, the national graduation

rate for post-secondary education hovers at just over 60% (National Center for Educational

Statistics, 2016; O'Keeffe, 2013; Shapiro et al., 2012). The United States has the lowest

completion rates for higher education of all industrialized countries, hovering at 38% of students

completing a bachelor degree within four years and 58% completing the degree in six years

(National Center for Educational Statistics, 2016; O'Keeffe, 2013). Until student attrition is

effectively addressed, societal issues associated with individuals who do not have a post-

secondary degree will continue to impact society. Students affected by attrition must also bear

the financial handicap associated with non-completion. The documented untoward effects on

lifetime earnings, health status, employment opportunities, and incarceration rates are

complicated by the student debt that accompanies student attrition without the benefit of

obtaining a higher education degree (Raisman, 2011). Because of this, students who attend

college but do not obtain a degree enter student loan defaults at a rate of three times higher than

students who earn a college degree (U.S. Department of Education, 2015). For post-secondary

institutions, state and local governments spend close to three billion dollars to assist in the

educational costs of students who drop out of community colleges (Schneider & Yin, 2011).

Considering the additional federal appropriations that are provided for these students, the costs

associated with these students rise to over four billion (American Institutes for Research, 2011).

Student attrition in nursing education often leaves these vacancies unfilled, resulting in fewer

graduates of the program and fewer nurses to alleviate the impact of the national nursing

shortage (Harris, Rosenberg, & O'Rourke, 2014).

  The constraints on retention within the nursing workforce, higher education, and nursing

education make the need for selecting the best-qualified nursing applicants essential. When

students who have a higher probability of success are admitted to schools of nursing, the

likelihood of preventing student attrition increases. The admission selection process should consider student strengths and weaknesses as student applicants are vying for limited seats in the nursing academic major. Over 64,000 qualified applicants were not accepted into schools of nursing because of a lack of resources, qualified faculty, and clinical placements in the year 2016 (American Association of Colleges of Nursing [AACN], 2017). Ideally, students who are granted admission should have a high probability of graduating from the program and passing the National Council Licensure Examination for Registered Nurses (NCLEX-RN) after graduation. The NCLEX-RN is a national standardized examination that each state board of nursing uses to determine if a nursing school graduate is competent to practice as a licensed RN (National Council of State Boards of Nursing, 2017). The nursing education admission requirements vary from school to school but most often include a grade point average (GPA) requirement, prerequisite courses, and an admission examination.

Students who enter post-secondary education with a higher high school GPA have higher retention and completion rates (Kelly & Crellin, 2012; Westrick, Le, Robbins, Radunzel, & Frank, 2015). Nursing school admission tests, such as the Test of Essential Academic Skills (TEAS), Nursing Entrance Test (NET), and Health Education Systems, Incorporated Admission Assessment (HESI A2), provide schools of nursing with a basis for identifying students who may struggle with academic achievement in nursing education based on basic skills in mathematics, reading, science, and the English language (Ascend Learning, 2012; Harris et al., 2014; Newton, 2008; Wolkowitz & Kelley, 2010). The TEAS is commonly administered by schools of nursing as an admission examination to assess the academic preparedness of prospective nursing students as a means of predicting early nursing academic success (Wolkowitz & Kelley, 2010). The test consists of four subscales that identify a student's strengths or weaknesses in mathematics,

reading, science, and the English language. Identifying at-risk students before admission to the school of nursing can prevent program attrition.

The theoretical support for this study was based on Benner's novice to expert nursing theory and Vygotsky's sociocultural theory. These theories offer a strong foundation for the student nurse to improve knowledge, technical skills, and critical thinking skills. Benner's novice to expert theory is a commonly employed theory for nursing programs and nursing research (Kaakinen & Arwood, 2009). Benner's theory posits that nurses, or nursing students, advance from a novice to expert clinician through their classroom, clinical, and simulation learning experiences (Benner, Tanner, & Chesla, 2009). The fundamentals of nursing course under study consists of classroom, clinical, and simulation learning experiences. The application of Benner's theory allows nurse educators to observe students' technical and critical thinking skills. Benner's theory serves as the educational foundation in many educational programs, including the BSN program under study.

Vygotsky's sociocultural theory involves the concept of the "zone of proximal development" in which learners have cognitive movement from potential to actual development (Sanders & Welk, 2005). Vygotsky's theory utilizes scaffolding. Scaffolding refers to building on existing knowledge as new knowledge is obtained, in the same manner that a scaffold is used in construction to aid in building on to an existing structure (Miller, 2011). The four subscale content areas of the TEAS provide the foundation of learning constructs on which nursing knowledge can build. Thus, if an applicant demonstrates adequate knowledge in the TEAS subscale areas of mathematics, reading, science, and the English language, Vygotsky's zone of proximal development allows students to use this foundational knowledge upon which to build nursing knowledge as demonstrated by a higher final course grade.

As the nursing shortage continues to affect patient care outcomes and healthcare costs, the need to successfully graduate new nurses into the profession grows. The selection of qualified nursing school applicants who are likely to persist through nursing education can decrease student attrition and aid in the relief of the nursing shortage. Selecting these qualified students can be done with the assistance of pre-admission testing, such as the TEAS. Pre-admission testing can assist in the identification of students' foundational learning as a basis for future nursing knowledge development using Benner's novice to expert nursing theory and Vygotsky's sociocultural theory.

Problem Statement

Nursing education enrollment challenges include a nursing faculty shortage and limited clinical site placements. Prior research has adequately addressed the problems of student enrollment and faculty shortages in nursing education (American Association of Colleges of Nursing, 2017; McNelis, Fonacier, McDonald, & Ironside, 2011). The success of students in nursing education has been examined using varying predictive cognitive and non-cognitive variables. Bachelor of Science nursing (BSN) student completion rates have been examined using static and non-static predictive variables, including age, race, gender, academic development, faculty interaction, peer interaction, hours worked, and faculty concern (Evans, 2013; Kukkonen, Suhonen, & Salminen, 2016). Grade point average (GPA) from previous education was shown to be predictive of first-semester performance in second-degree nursing students (Kowitlawakul, Brenkus, & Dugan, 2013) while a psychology class may predict nursing education success at another higher education institution (Abele, Penprase, & Ternes, 2013). The TEAS has been utilized to demonstrate success in lower levels of nursing education (Wolkowitz & Kelley, 2010). The problem is that TEAS has been used to predict student success in lower

level nursing education, but the student performance on each subscale of the TEAS has not been used to predict final grades in a fundamentals of nursing class for residential, undergraduate, pre-licensure BSN students at a private university.

Purpose Statement

The purpose of this quantitative predictive correlational study was to determine if Test of Essential Academic Skills (TEAS) subscale testing scores could predict the final course grade in a fundamentals of nursing course for sophomore students in a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university. Multiple regression was used to determine the relationship between the predictor variables and the criterion variable (Gall, Gall, & Borg, 2007). Archival data consisting of information related to sophomore residential, undergraduate, pre-licensure BSN students at a private university during the 2015-2016, 2016-2017, and 2017-2018 academic years were used in this study.

The predictor variables were the TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score. The TEAS is a requirement for application to the School of Nursing under study. The TEAS is designed to be used in the admission process for nursing programs. Wolkowitz and Kelley (2010) found the TEAS to be a significant predictor of first-year nursing student success in BSN programs. The criterion variable was the final grade for fundamentals of nursing course for students from a residential, undergraduate, pre-licensure BSN program at a private university. Fundamentals of nursing is a required course during the sophomore year at the School of Nursing under study. The final grade is based on a 1000 point grading scale where an "A" is 900-1000 points; "B" is 800-899 points; "C" is 700-799 points; "D" is 600-699 points and "F" is less than 600 points.

Significance of the Study

Nursing student success is important for many reasons. First, all student retention and success is important for ensuring financial and institutional stability and sustainability (Levitch & Shaw, 2014). Second, student attrition and retention rates can add to or subtract from the institutional credibility as they are seen as indicators of quality (Angelino, Williams, & Natvig, 2007; Thompson, 1999). Lastly, the national nursing shortage is expected to grow, and nursing graduates are needed to help alleviate the problem. The U.S. Bureau of Labor Statistics projects more than 500,000 experienced registered nurses (RNs) to retire by 2022 bringing the need for new RNs to 1.1 million (American Nurses Association, 2017). The Institute of Medicine (2010) called for an increase in nurses prepared with the Bachelor of Science in nursing (BSN) in the workforce from 50% to 80% by the year 2020. Healthcare systems with a higher staff percentage of BSN-prepared nurses have been associated with lower patient mortality rates, readmission rates, and length-of-stay (Koh, Wang, Richards, & Chan, 2016; Woo, Lee, & Tam, 2017; Yakusheva, Lindrooth, & Weiss, 2014). Over 64,000 qualified applicants are rejected from nursing programs in the United States because of a lack of qualified faculty, clinical preceptors, clinical sites, classroom space, and budgetary constraints (AACN, 2017). This makes the need to retain students who are admitted to BSN programs even more imperative.

This study was important to the topic of nursing student retention in relation to School of Nursing admission Test of Essential Academic Skills (TEAS) subscale scores' predictive value on final course grades for a fundamentals of nursing course for a residential, undergraduate, pre-licensure BSN program at a private university. The use of predictive analytics to identify at-risk students in a thoughtful way so that more evidence-based intervention strategies can be employed with residential, undergraduate, pre-licensure BSN students will benefit higher

education, the field of nursing, and the national economy. The intent of this study was to utilize predictive analytics to identify at-risk students in a BSN program. The identification of these students can guide data-based institutional intervention strategies for student success and retention beginning in lower level nursing education.

Research Questions

RQ1: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2015-2016 academic year?

RQ2: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2016-2017 academic year?

RQ3: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2017-2018 academic year?

Definitions

1. *Bachelor of Science in Nursing:* An academic degree in the science and principles of nursing from an accredited tertiary institution (United States Department of Labor, 2017). Graduates are eligible to sit for the NCLEX-RN.

2. *National Council Licensure Examination for Registered Nurses (NCLEX-RN)*: The national standardized examination that each state board of nursing uses to determine if a nursing

school graduate is competent to practice as a licensed RN (National Council of State Boards of Nursing, 2017).

3. *Nursing:* "The protection, promotion, and optimization of health and abilities; prevention of illness and injury; alleviation of suffering through the diagnosis and treatment of human response; and advocacy in the care of individuals, families, communities, and populations" (American Nurses Association, 2010, p. 8).

4. *Student attrition:* Departure from a program prior to completing the degree completion plan (Gutl et al., 2014).

5. *Student retention:* A measure of the rate at which students persist in their educational program at the institution (Hagedorn, 2005). For this study, student retention is expressed in student re-enrollment in a subsequent academic year (fall to fall) to the School of Nursing without a nursing course failure.

6. *Test of Essential Academic Skills (TEAS)*: The TEAS is a standardized exam created by Ascend Learning that is used to assess academic preparedness for nursing and allied health programs. The test consists of 170 multiple choice questions covering the subscale content areas of mathematics, reading, science, and English language (Ascend Learning, 2012).

CHAPTER TWO: LITERATURE REVIEW

Introduction

Chapter two presents a discussion of the theoretical framework of the study and a review of recent literature. The theoretical framework includes a theory grounded in nursing, Benner's novice to expert theory, and an educational theory, Vygotsky's sociocultural theory. The review of literature examines nursing education curriculum, types of Registered Nurse (RN) degrees, National Council Licensure Examination for Registered Nurses (NCLEX-RN), the fundamentals of nursing class found within nursing curricula, nursing student attrition, predictors of nursing student success, the Test of Essential Academic Skills (TEAS), and the TEAS subscales of mathematics, reading, science, and the English language.

Theoretical Framework

The theoretical support for this study is based on Benner's novice to expert theory and Vygotsky's sociocultural theory (Benner, 2001; Vygotsky, 1978). Benner's theory is from the realm of nursing while Vygotsky's theory stems from education. Both theories have an underlying theme of moving students into a higher level of learning or functioning based on previous knowledge and experience. Before students enter higher education, foundational knowledge and experiences are needed as a point of reference upon which new learning can occur. As students enter lower level nursing courses, such as health assessment and fundamentals of nursing, this baseline learning is challenged, bringing students to a new level of understanding of nursing knowledge. Knowledge from lower level nursing courses allows students to understand more complex medical situations and interact with these medical conditions in the clinical setting.

As new graduates, individuals are initially provided a preceptor to orient them to the needed knowledge and skill set for the selected patient population. As the nursing graduate develops a baseline of clinical experience and knowledge, he or she is entrusted with more complex patient scenarios and less supervision. Expertise is developed for nursing students and new practitioners when educational and clinical experience test and refine theories and hypotheses (Benner, 2001). The four subscale content areas of the Test of Academic Skills (TEAS), mathematics, reading, science, and English language, provide a foundation of learning constructs on which nursing knowledge and safe clinical practice can grow.

Benner's Novice to Expert Theory

Patricia Benner's novice to expert theory is founded on the Dreyfus model of skill acquisition (Benner, 2001). The Dreyfus model of skill acquisition describes how learners acquire skills through instruction and practice. The Dreyfus model demonstrates how instructors facilitate learning, growth, and competence development based on a learner's position on the scale of novice, advanced beginner, competent, proficient, and expert (Ahlstrom, 2014). Benner took the Dreyfus model and applied it to nursing. Nursing research and nursing programs commonly use the novice to expert theory as a framework upon which to build nursing curriculum (Kaakinen & Arwood, 2009).

Within the novice to expert theory, Benner describes the same five stages of skill development that the Dreyfus brothers applied to the military. Benner's (2001) theory recognizes that learners cannot be responsible for what is beyond their learning and experience. Benner explains her theory in the context of the current national nursing shortage and nursing educational growth constraints of lack of faculty and lack of clinical placements. The novice stage describes learners who benefit from instruction and close supervision. The novice learner's

thought process is more rigid and inflexible (Benner, 2001). In the advanced beginner phase,

learners begin to develop situational awareness related to prior learning experiences. As the

advanced beginner moves to the competent stage, the individual is able to determine what

aspects of the experience are important and what aspects can be ignored, based on a perspective

of prior learning experiences. From competent, learners move to the proficient stage where

situations are put into perspective based on experience and recent learning. Situations are able to

be interpreted as a whole versus in compartmentalized aspects. In the expert stage, learners

develop intuition with situations and display a deep understanding of the total clinical situation

(Benner, 2001).

Nursing faculty expect lower level students to establish their nursing knowledge on the

basis of memorization and the ability to recall information. As new challenges in learning occur,

an understanding of the material that students have put to memory transpires. For example, basic

anatomy and physiology of the heart is common knowledge for lower level nursing students.

From this basic understanding of heart anatomy and physiology, students can develop a

knowledge of the pathophysiologic changes that occur during a myocardial infarction. From this

understanding, students can apply this knowledge to the care of the patient experiencing a

myocardial infarction. Applying this knowledge involves an analysis of each part of the patient

scenario including age, co-morbidities, medications, and past medical history. Evaluating

interventions is the next level of understanding where students determine if interventions were

effective. This scenario demonstrates learning through the use of the nursing process (assessing,

diagnosing, planning, implementing, evaluation) (Ackley & Ladwig, 2014). In this learning

process, students can progress on Benner's novice to expert spectrum.

As nursing students acquire new skills within classroom and clinical learning experiences, they can transition on the novice to expert continuum, making new experiences more meaningful to the impact on educational goals and patient care outcomes (Benner, Tanner, & Chesla, 2009). Knowledge acquisition for nursing students begins with life experiences and nursing education pre-admission knowledge. Nursing students develop nursing knowledge through building on prior knowledge and skills with experiential learning as they progress through the nursing curriculum (Homard, 2013). The concept of utilizing previous classroom and clinical experiences within nursing education connects Benner's novice to expert theory to Vygotsky's sociocultural theory.

Vygotsky's Sociocultural Theory

Vygotsky's sociocultural theory proposes that cognitive development is derived from social interactions (Sanders & Welk, 2005). The theory originally focused on the adult transfer of knowledge to children. According to Vygotsky, adults have a responsibility to share knowledge with children and other "less advanced members of society in order to advance their cognitive development" (Miller, 2011, p. 169). Central to Vygotsky's theory is the zone of proximal development. The zone of proximal development is the distance between the "actual developmental level as determined by independent problem solving and the level of potential development as determined by problem-solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). The goal of a nursing educator is to provide direction and stimuli for students to move to a higher level of cognitive thinking, scaffolding on the existing knowledge of the learner.

The pedagogical term scaffolding refers to providing sufficient support for learners in order to stimulate learning when concepts and skills are first introduced. The support is gradually

withdrawn as the learner progresses along the learning spectrum and begins to assume an increasingly independent role in the learning process (Kable et al., 2018). As new material is introduced, learners may experience a disequilibrium when new learning challenges prior knowledge. Using the zone of proximal development, or scaffolding, the learner can be assisted through the disequilibrium phase and assimilate new skills and knowledge into their nursing practice (Clapper, 2015).

Scaffolding implies that learners are adequately supported by prior related curriculum learning experiences before being fully immersed in more difficult learning concepts and clinical experiences. Scaffolding has been used in numerous studies within nursing education encompassing all levels of nursing education (Herrington & Schneidereith, 2017; Kable et al., 2018; Kelsey & Hayes, 2015). Scaffolding in nursing education involves assisted performance where modeling, feedback, instruction, questioning, and cognitive structuring are utilized (Sanders & Welk, 2005). As the learner demonstrates the ability to practice independently, the faculty can remove or lessen the scaffold for the student. The zone of proximal development and scaffolding allow the instructor and student to recognize knowledge-in-waiting as they utilize knowledge-in-use to move learners along the Benner novice to expert continuum.

Nursing Education Curriculum

Undergraduate nursing education curriculum is guided by the accrediting agencies for nursing education. The Accreditation Commission for Education in Nursing (ACEN) accredits Diploma, Associate Degree in nursing (ADN), and Bachelor of Science in nursing (BSN) undergraduate registered nurse programs. The Commission on Collegiate Nursing Education (CCNE) is a subsidiary of the American Association of Colleges of Nursing (AACN). The CCNE accredits BSN undergraduate programs only and is recognized by the U.S. Secretary of

Education. This recognition affects funding and reimbursement for BSN programs (AACN, 2018). The program under study has full accreditation with CCNE.

Bachelor of Science in nursing education curriculum is framed by *The Essentials of Baccalaureate Education for Professional Nursing Practice*, a publication of AACN that is designed to prepare BSN nurses for the 21st-century healthcare system (AACN, 2008). This document was an update of the same document that was previously released in 1998 (AACN, 1998). A BSN-prepared nurse is expected to fulfill the roles of care provider, manager/coordinator of care, and member of the nursing profession (AACN, 2008). It is important to note that AACN does not dictate the exact course that must cover each *Essential* content; rather AACN states that the content must be adequately addressed throughout the nursing curriculum. The content of each *Essential* is interwoven into every nursing course in such a way that students are often unaware that the *Essentials* exist (Flinders, 2013). The curriculum of the nursing program under study is based on the 2008 *Essentials of Baccalaureate Education for Professional Nursing Practice*. Table 1 provides a listing of the nine *Essentials of Baccalaureate Education for Professional Nursing Practice*.

Table 1

The Essentials of Baccalaureate Education for Professional Nursing Practice (2008)

Essential I: Liberal Education for Baccalaureate Generalist Nursing Practice	A solid base in liberal education provides the cornerstone for the practice and education of nurses.
Essential II: Basic Organizational and Systems Leadership for Quality Care and Patient Safety	Knowledge and skills in leadership, quality improvement, and patient safety are necessary to provide high-quality health care.
Essential III: Scholarship for Evidence-Based Practice	Professional nursing practice is grounded in the translation of current evidence into one's practice.
Essential IV: Information Management and Application of Patient Care Technology	Knowledge and skills in information management and patient care technology are critical in the delivery of quality patient care.
Essential V: Health Care Policy, Finance, and Regulatory Environments	Healthcare policies, including financial and regulatory, directly and indirectly influence the nature and functioning of the healthcare system and thereby are important considerations in professional nursing practice.
Essential VI: Interprofessional Communication and Collaboration for Improving Patient Health Outcomes	Communication and collaboration among healthcare professionals are critical to delivering high quality and safe patient care.
Essential VII: Clinical Prevention and Population Health	Health promotion and disease prevention at the individual and population level are necessary to improve population health and are important components of baccalaureate generalist nursing practice.
Essential VIII: Professionalism and Professional Values	Professionalism and the inherent values of altruism, autonomy, human dignity, integrity, and social justice are fundamental to the discipline of nursing.
Essential IX: Baccalaureate Generalist Nursing Practice	The baccalaureate graduate nurse is prepared to practice with patients, including individuals, families, groups, communities, and populations across the lifespan and across the continuum of healthcare environments. The baccalaureate graduate understands and respects the variations of care, the increased complexity, and the increased use of healthcare resources inherent in caring for patients.

Types of Registered Nurse Degrees

The National Council of the State Boards of Nursing (NCSBN) recognizes three entry levels of practice for registered nurses (RNs). These basic levels of RN education include Diploma, Associate Degree in nursing (ADN) and Baccalaureate (NCSBN, 2017). A baccalaureate is considered the same as a Bachelor of Science in nursing (BSN). Upon graduation from an accredited school of nursing, individuals must pass the National Council Licensing Examination for Registered Nurses (NCLEX-RN). In 2014, there were 1,869 schools of nursing in the United States. Of these, 67 were Diploma programs, 1,092 were ADN programs, and 710 were BSN programs (National League for Nursing [NLN], 2014).

A Diploma in nursing education is typically based out of a hospital nursing school rather than a higher education institution (American Association of Colleges in Nursing [AACN], 2018). Diploma programs routinely last three years. Diploma nursing programs represented 4% of all nursing programs in the United States in 2014 (NLN, 2014). As the nursing profession has gained a solidified theoretical foundation, the number of Diploma programs has declined (Institute of Medicine, 2011). Graduates of Diploma programs are eligible to sit for the NCLEX-RN.

An ADN is typically offered in a community college setting. Associate Degree in nursing programs routinely lasts two to three years. Associate Degree in nursing programs represented 58% of all nursing programs in the United States in 2014 (NLN, 2014). Because graduates can enter the nursing workforce within two or three years, ADN programs serve as a good source of relief in the national nursing shortage. Graduates of ADN programs are eligible to sit for the NCLEX-RN.

A BSN is a four-year degree provided from a college or university. Bachelor of Science in nursing programs represented 38% of all nursing programs in the United States in 2014 (NLN, 2014). Diploma and ADN curricula are encompassed in a BSN degree. However, BSN students also receive more in-depth knowledge acquisition of physical science, social science, nursing research, community health, management, leadership, and the humanities (AACN, 2018). As the Affordable Care Act has shifted the focus of health care to a community-based setting, BSN graduates have been intentionally exposed to this concept within their nursing curriculum, making the importance of a BSN education heightened. Graduates of BSN programs are eligible to sit for the NCLEX-RN.

In 2010, the Institute of Medicine called for an increase in the number of BSN-prepared nurses to 80% of the nursing workforce by the year 2020 (Institute of Medicine, 2010). Almost 79% of healthcare facilities currently express a strong preference for BSN-prepared nurses, and 45% require newly hired RNs to have a BSN (AACN, 2018). Magnet is a nursing recognition program under the umbrella of the American Nurses Credentialing Center (ANCC, 2017). Magnet status is the highest recognition that a nursing organization can achieve. Magnet recognition for hospitals is very hard to obtain and maintain. A hospital with Magnet certification is recognized for high-quality nursing care, use of best practices, and improved patient care, safety, and satisfaction. Benefits of Magnet designation are improved RN retention, lower nurse burnout, increased RN satisfaction, improved patient satisfaction, decreased mortality rates, decreased pressure ulcer rates, and decreased patient falls (ANCC, 2017). Having Magnet designation is a strong recruiting tool for hospital systems. Because of the plethora of RN vacancies in current healthcare workforce, new graduates seek out hospitals with Magnet status because these organizations are known for their positive work environment and positive patient

care outcomes. Magnet certified hospitals are required to have all nursing leadership with a BSN or a master of science in nursing and a plan in place for the nursing workforce to be at least 80% BSN-prepared by 2020. Magnet, the top national recognition for nursing organizations, recognizes the benefits of a BSN-prepared RN workforce.

Patient outcomes improve when care is delivered by a BSN-prepared RN. Patient deaths have an average reduction of 2.12 per 1000 for every 10 point increase in the percentage of BSN-prepared RNs within a hospital setting (Kutney-Lee, Sloane, & Aiken, 2013). Healthcare systems with a higher staff percentage of BSN-prepared nurses have been associated with lower readmission rates and length-of-stay (Koh et al., 2016; Woo et al., 2017; Yakusheva et al., 2014). Additional benefits that have been associated with a higher percentage of BSN-prepared nurses are lower congestive heart failure mortality and lower incidence of decubitus ulcers, postoperative deep vein thrombosis, and postoperative pulmonary embolisms (Blegen, Goode, Park, Vaughn, & Spetz, 2013). Improved patient outcomes lead to a decrease in healthcare spending.

The push for more BSN-prepared nurses extends beyond the Institute of Medicine and the ANCC. In 1996, the National Advisory Council on Nurse Education and Practice (NACNEP) stated that two-thirds of the nursing workforce should be BSN-prepared or higher (NACNEP, 1996). New York recognized the need for a nursing workforce that is prepared with the BSN. As a result of the Institute of Medicine, ANCC, and NACNEP recommendations, New York passed Senate Bill S2145, "BSN in 10," requiring all nurses to obtain a BSN within ten years. Failure of an RN to do so results in license suspension. Nurses currently in the New York state workforce are grandfathered in, regardless of their degree level (New York Senate, 2016). As the call for

more BSN-prepared registered nurses continues, effectively selecting candidates for nursing education is of heightened importance.

National Council Licensure Examination for Registered Nurses

Nursing school success goes beyond grade point average (GPA) and graduation rates. Nursing school accreditation measures nursing school success as passing the National Council Licensure Examination for Registered Nurses (NCLEX-RN). The Commission on Collegiate Nursing Education (CCNE) requires accredited schools to maintain an annual NCLEX-RN pass rate for all test takers of at least 80% (American Association of Colleges of Nursing, 2018). Passing the NCLEX-RN is also regarded as an indicator of nursing program quality (Langford & Young, 2013; Taylor, Loftin, & Reyes, 2014). All individuals who complete an accredited registered nurse (RN) program, whether a Diploma, Associate Degree in nursing (ADN), or Bachelor of Science in nursing (BSN) program, must pass the NCLEX-RN in order to practice as a licensed RN. The NCLEX-RN is governed by the National Council for State Boards of Nursing (NCSBN). The NCSBN is a not-for-profit organization consisting of jurisdictional boards of nursing from all 50 states, the District of Columbia, and four U.S. territories (NCSBN, 2017). The NCSBN also governs the National Council Licensure Examination for Practical Nurses (NCLEX-PN). The mission of NCSBN is to provide regulatory excellence in the areas of public health, safety, and welfare.

The NCLEX-RN is a standardized exam that each state board of nursing requires in order to determine if a nursing school graduate is prepared for entry-level nursing practice, meaning that the candidate has the minimum knowledge, skills, and abilities required to deliver safe, effective care (NCSBN, 2017). The NCLEX-RN is administered on a computer using computer adaptive testing. As the licensure candidate answers questions, the computer program estimates

the candidate's ability to safely practice as an RN based on all previous answers. The exam ends when the computer program can determine with 95% confidence that a candidate is above or below the passing standard (NCSBN, 2017). The number of questions on the NCLEX-RN can range from 75 to 265 over a six-hour time period based on when the candidate demonstrates a passing or failing competence. In 2016, first time NCLEX-RN test takers passed the exam 84.6% of the time regardless of the degree type. For BSN students, first time NCLEX-RN testers passed 87.8% of the time (NCSBN, 2017).

Fundamentals of Nursing

Fundamentals of nursing is a lower level nursing class that is typically taught during the first year in nursing school. The overarching learning outcome of the course revolves around helping novice student nurses develop a more solid foundation in critical thinking, evidence-based practice, and nursing theory while teaching students how to perform medical skills and procedures (Perry, Potter, Stockert, & Hall, 2017). As the course name implies, the course focuses on meeting the fundamental needs of the patient population that the nurse is working with. The American Nurses Association (ANA, 2010) defines nursing as, "the protection, promotion, and optimization of health and abilities; prevention of illness and injury; alleviation of suffering through the diagnosis and treatment of human response; and advocacy in the care of individuals, families, communities, and populations" (p. 8). The fundamentals of nursing course is designed to enable students to carry out the ANA definition of nursing in their nursing education and within their nursing practice.

The nursing skills and thought processes that are developed and refined in fundamentals of nursing allow students to enter the patient care setting with foundational knowledge to utilize and build upon with patient care experiences. The course contains didactic and clinical

components where both components allow for coordinated and coherent sequencing of instruction so that previous knowledge can be supplemented with new knowledge (Jun, Lee, Park, Chang, & Kim, 2013). The didactic portion of the course covers content and rationales and enhances critical thinking. The clinical component of the course provides hands-on nursing skill and patient care experiences upon which students can enhance understanding and improve clinical practice.

The National Council Licensure Examination for Registered Nurses (NCLEX-RN) test plan consists of management of care (20%), pharmacological and parenteral therapies (15%), physiological adaptation (14%), reduction of risk potential (12%), safety and infection control (12%), basic care and comfort (9%), psychosocial integrity (9%), and health promotion and maintenance (9%) (National Council of State Boards of Nursing, 2016). Final course outcomes for fundamentals in nursing can correlate to NCLEX-RN success. Final course grades of less than or equal to "C" in lower level nursing courses such as fundamentals in nursing was a significant predictor variable for passing the NCLEX-RN (Kaddoura, Flint, Van Dyke, Yang, & Chiang, 2017). The Fundamentals of Nursing Health Education Systems, Incorporated (HESI) exam was a significant predictor of first attempt NCLEX-RN outcomes, making the fundamentals of nursing course a significant part of a student's nursing education (Schooley & Kuhn, 2013). Much of the NCLEX-RN content is introduced during the fundamentals of nursing course, making academic performance in the course foundational to the student's ability to practice as a registered nurse.

Nursing Student Attrition

Graduates from schools of nursing hold heightened importance in light of the national nursing shortage. By the year 2022, there is expected to be a registered nurse (RN) job vacancy

of 1.1 million (American Nurse Association, 2017). Fulfilling the RN vacancies with nursing school graduates has several limiting factors. Every year, nursing schools are unable to admit all qualified applicants. Budgetary constraints and a lack of qualified faculty, clinical preceptors, clinical sites, and classroom space result in over 64,000 qualified applicants being denied admission to schools of nursing (American Association of Colleges of Nursing [AACN], 2017).

Of the individuals who are admitted to nursing education, attrition rates can be as high as 50% (Harris et al., 2014). The impact of nursing school attrition has a significant societal impact as demands for health care are expected to steadily rise because of an aging population and the expansion of access to care (AACN, 2017; Juraschek, Zhang, Ranganathan, & Lin, 2012). Often the vacancies left because of attrition remain unfilled, further impacting the ability of new RN graduates to fill nursing vacancies. Attrition can also affect school accreditation, financial aid, and the reputation of the school (Levitch & Shaw, 2014). For these reasons, using benchmarks for nursing student success in an effort to select qualified applicants with the highest likelihood of being retained in schools of nursing is needed in an effort to help alleviate the national nursing shortage.

Predictors of Nursing Student Success

Admission criteria for nursing education can contain multiple aspects of a student's academic performance and preparation. Often, components of the admission criteria include standardized testing such as the Scholastic Aptitude Test (SAT) and/or American College Test (ACT), prerequisite courses, grade point average (GPA), and pre-admission tests such as the Health Education Systems, Incorporated Admission Assessment (HESI A2), Nursing Entrance Test (NET), or Test of Essential Academic Skills (TEAS). Each component of the admission

process for nursing education contains some predictive component to the student's success in nursing school.

Scholastic Aptitude Test

The Scholastic Aptitude Test (SAT) was first introduced in 1926 as a standardized test for college admissions (College Board, 2016). In 2016, more than 1.6 million college prospective students took the SAT in preparation for admission to a higher education institution. The SAT is designed to assess an individual's college readiness. The correlation between increased SAT scores and first-year grade point average (GPA) in higher education has hovered in the mid-.60s across multiple correlations (Mattern & Patterson, 2014). The strongest predictive ability of SAT scores on higher education academic performance is seen only when SAT scores are combined with high school GPA (Hannon, 2014; Kobrin, Patterson, Shaw, Mattern, & Barbuti, 2008; Mattern & Patterson, 2014). Within nursing education, SAT scores have been shown to be predictive of National Council Licensure Examination for Registered Nurses (NCLEX-RN) passage rates such that students entering higher education with higher SAT scores passed the NCLEX-RN on the first attempt (Romeo, 2013). The correlation of SAT scores and higher education performance on first-time test taker's NCLEX-RN success increased when GPA was factored into the correlation (Romeo, 2013).

American College Test

The American College Test (ACT) was introduced in 1959 by McCarrel and Lindquist as a curriculum-based measure of students' college readiness (ACT, 2015). The ACT is comprised of four subsections including mathematics, reading, science, and the English language. The ACT has shown a dependable linear relationship between college readiness scores and first-year GPA (Allen & Sconing, 2005). The probability of a first-year student earning a GPA of 3.0 or higher

is 0.66 as the ACT composite score increases to 30 (Sawyer, 2010). Subscores and composite

ACT scores have also shown the ability to predict student success in community college courses

(Harris & King, 2016). Like SAT scores, ACT scores demonstrate a higher predictive value of

higher education academic success when combined with high school GPAs (Bridgeman, Pollack,

& Burton, 2008; Kobrin et al., 2008; Sawyer, 2010; Westrick et al., 2015). Nursing school

completion and higher ACT composite scores have demonstrated correlation using retrospective

data (Gilmore, 2008). Increased nursing school completion was shown in students with a higher

ACT reading subscore (Gilmore, 2008) and ACT science subscore (Grossbach & Kuncel, 2011).

Nursing School Prerequisite Courses

Admission to schools of nursing often requires successful completion of prerequisite

coursework. One fallacy in evaluating prerequisite courses as a predictor of success in nursing

education is that variability exists in the number of credits assigned to a course, and there is

variation in a school's requirement of a course as a nursing prerequisite course versus a core

nursing course (Benner, Sutphen, Leonard, & Day, 2010; Giddens & Meyer, 2016). While

nursing education prerequisite courses vary from institution to institution, the requirements of

schools of nursing often contain foundational science courses such as anatomy and physiology,

chemistry, and microbiology.

A grade of "B" or better in prerequisite courses has been associated with student success

in first semester courses in nursing education (Korvick, Wisener, Loftis, & Williamson, 2008).

Conversely, nursing students with a final course grade of "D" or "F" in prerequisite courses in

science or mathematics were found to be significantly less likely to pass the National Council

Licensure Examination for Registered Nurses (NCLEX-RN) on the first attempt (Lavandera et

al., 2011). Final course grades for the science prerequisite courses of chemistry, anatomy,

microbiology, pharmacology, and pathophysiology showed predictive value for student success on their first attempt on the NCLEX-RN (Elder, Jacobs, & Fast, 2015). Pathophysiology is the study of altered function in the human body because of disease. Lower final course grades in pathophysiology have been associated with lower first time NCLEX-RN pass rates (Herrera & Blair, 2015). Non-nursing courses in psychology (Abele et al., 2013) and philosophy (Elder et al., 2015) have also shown predictive value in the successful completion of nursing education.

Grade Point Average

Grade point average (GPA) evaluation is a common component of admission to institutions of higher education. Within nursing education, GPA upon admission can serve as a predictor for student retention and passage of the National Council Licensure Examination for Registered Nurses (NCLEX-RN) upon graduation. Students who enter post-secondary education with a higher high school GPA have higher retention and completion rates (Kelly & Crellin, 2012; Westrick et al., 2015). Grade point average from previous higher education was shown to be predictive of first-semester performance in second-degree nursing students (Kowitlawakul et al., 2013). Nursing school admission GPAs have shown a significant relationship to graduation GPAs ($r = .376$; $p \leq .001$) (Crouch, 2015). National Council Licensure Examination for Registered Nurses passage rates have demonstrated a positive correlation to higher education cumulative GPAs and nursing GPA (Elder et al., 2015; Giddens & Gloeckner, 2005; Gilmore, 2008; McCarthy, Harris, & Tracz, 2014; Yin & Burger, 2003).

Health Education Systems, Incorporated Admission Assessment

Elsevier education offers an Evolve Health Education Systems, Incorporated Admission Assessment (HESI A2) exam for use in nursing school admissions for Associate Degree in nursing (ADN) and Bachelor of Science in nursing (BSN) programs. The purpose of the HESI

A2 exam is to assess the readiness of prospective students for health-related programs within

higher education (Elsevier Education, 2016). Reliability coefficients for the HESI A2 exam are

calculated using item analysis data from all previous administrations of the test items. The HESI

A2 consists of exams on the academic areas of English language (reading comprehension,

vocabulary and general knowledge, grammar), mathematics (basic mathematical skills), science

(biology, chemistry, physics, anatomy and physiology), and learner profile (learning style,

personality profile). The Elsevier Education recommendation for HESI A2 administration is to

select three main academic areas from English language, mathematics, and science, and two

personal assessment areas (Elsevier Education, 2016). However, schools can select which tests

they want to assess in their applicants. The exam length varies depending on how many

subscales the school selects to test applicants on.

The HESI A2 exam has demonstrated the ability to predict nursing school success

beyond the first year in the nursing program. The conceptual framework used in the development

of HESI A2 exam is based on classical test theory and critical thinking theory (Morrison,

Adamson, Nibert, & Hsia, 2004). Classical test theory, or true score theory, consists of the use of

test scores to analyze test results for improved reliability (Wu, Tam, & Jen, 2017). Critical

thinking theory focuses on understanding the learning process while taking into account the

interaction of foundational knowledge and ongoing learning processes (Norris & Phillips, 1987).

For 68 ADN students, composite HESI A2 scores demonstrated significant positive correlation

with eight of nine nursing course final grades throughout all levels of the program (Murray,

Merriman, & Adamson, 2008). For 69 BSN students, HESI A2 composite scores demonstrated

significant positive correlation with 10 of 20 nursing course final grades throughout all levels of

the program (Murray et al., 2008). Underwood, Williams, Lee, and Brunnert (2013) revealed

statistically significant correlation in HESI A2 subscores with final grades in the first three nursing courses within a BSN program.

Nursing Entrance Test

The Kaplan Nursing Entrance Test (NET) is an assessment for nursing school applicants that aids in the determination of whether or not an applicant has the necessary academic skills for success in a school of nursing (Kaplan Nursing, 2012). The Kaplan NET is nursing-content focused with subscales in reading comprehension, writing, mathematics, science, and critical thinking. Nursing content on the Kaplan NET focuses on mathematical skills for clinical competence and anatomy and physiology knowledge that is appropriate to a high school graduate. The Kaplan NET is a 91-question multiple choice exam designed for students with a high school education (Kaplan Nursing, 2012). Reading comprehension on the Kaplan NET consists of 22 questions limited to a 45-minute timeframe. The mathematics portion of the Kaplan NET consists of 28 questions and has a 45-minute time limit for completion. The writing section contains 21 questions with a 45-minute timeframe of completion. The science section contains 28 questions with a 30-minute completion time. Bondmass, Moonie, and Kowalski (2008) found a significant correlation in Kaplan NET testing scores and National Council Licensure Examination for Registered Nurses (NCLEX-RN) success rates.

Test of Essential Academic Skills

The purpose of the Assessment Technologies Institute (ATI) Test of Essential Academic Skills (TEAS) is to evaluate an individual's overall academic preparedness for an education system within nursing or allied health (ATI, 2016). Allied health consists of a group of health care-related professions that have an adjunctive role with the work of physicians and other healthcare specialists (Committee on Allied Health Education & Accreditation, 1987). Allied

health professionals can include speech pathologists, nutritionists, audiologists, and occupational therapists. Test development consisted of content analysis and a blueprint survey according to the American Educational Research Association (AERA), American Psychological Association (APA), and National Council on Measurement in Education (NCME) *Standards for Educational and Psychological Testing* (ATI, 2016).

The TEAS consists of four subscales: mathematics, reading, science, and the English language. The test design is that individuals taking the assessment will complete all four content areas and that the total score, based on the four content areas, would be the value used to assist in decisions regarding a candidate's entry into a nursing or allied health program. The subscale scores can be used to identify areas where applicants may need additional study but should not solely be used in making admission decisions (Ascend Learning, 2012; ATI, 2016; Wolkowitz & Kelley, 2010). The use of the TEAS as a tool in the admission process versus the deciding factor supports the AERA, APA, and NCME (2014) Standard 12.10, "In educational settings, a decision or characterization that will have major impact on a student should take into consideration not just scores from a single test but other relevant information" (p. 198).

The ATI TEAS has been shown to predict early nursing success in Associate Degree in nursing (ADN) and Bachelor of Science in nursing (BSN) programs (Ascend Learning, 2012; Bremner, Blake, Long, & Yanosky, 2014; Wolkowitz & Kelley, 2010). Assessment Technologies Institute TEAS subscores have demonstrated predictability of testing results for ATI nursing specialty test scores, such as fundamentals, medical surgical, nursing care of children, mental health, and maternal newborn (McCarthy et al., 2014). The linear combination of the ATI TEAS subscores predicted the testing scores of individuals on the ATI Fundamentals of Nursing assessment scores with statistical significance ($F(4, 4100) = 256.467$, $p < 0.01$, $R^2 =$

0.20) (Wolkowitz & Kelley, 2010). The ATI Fundamentals of Nursing assessment is a standardized test provided by ATI that is administered in the fundamentals of nursing course within the nursing curriculum (ATI, 2016). Fundamentals of nursing is a course that is most often required during a student's first year in nursing school.

Predictability beyond first-year success in schools of nursing for ADN or BSN programs is limited. However, Wambuguh, Eckfield, and Hofwegen (2016) showed that a TEAS score of 82 or higher increased a nursing student's odds of graduating from nursing education by a factor of 2.14. When looking at first time National Council Licensure Examination for Registered Nurses (NCLEX-RN) pass rates, a TEAS score of 82 or higher demonstrated a 96% correlation (p-value of 0.96) (Wambuguh et al., 2016). The NCLEX-RN passage probability was increased to 98% ($p = 0.98$) when a TEAS of greater than 82 was combined with a pre-admission science courses GPA of at least 3.8. Assessment Technologies Institute TEAS scores have shown the ability to demonstrate a correlation to student attrition in nursing schools. As ATI TEAS scores increase, nursing school attrition decreases (ATI, 2016). For every 10-point increase in the class average of ATI TEAS scores, a 3% decrease in student attrition has been demonstrated with an effect size of 0.002 (ATI, 2016). Research on the predictability of the ATI TEAS on nursing school success is limited to research conducted by the developer of the test, ATI, and Wolkowitz and Kelly (2010).

The TEAS consists of 170 multiple choice questions covering the domains of mathematics, reading, science, and the English language. One hundred fifty of the test questions are scored, and 20 of the TEAS questions are pretest questions that are unscored and evenly distributed across each of the content domains. The TEAS content is 22% mathematics, 31% reading, 31% science, and 16% English language. The mathematics content area contains

questions on numbers, algebra, measurement, and data. The reading content area contains questions on key ideas and details, craft and structure, and integration of knowledge and ideas. The science content area contains questions on human anatomy and physiology, life science, physical science, and scientific reasoning. The English language content area contains questions pertaining to conventions of standard English, knowledge of language, and vocabulary acquisition (ATI, 2016). The TEAS is intended for use in admission to nursing or allied health programs within the United States.

   Test of essential academic skills subscale mathematics. The mathematics subscale of the Test of Essential Academic Skills (TEAS) consists of 22% of the total test. The topics of numbers, algebra, measurement, and data are contained in this portion of the test (ATI, 2016). Success in mathematics courses is a strong predictor of a student's ability to achieve academic success in nursing curriculum (Newton, 2008). Mathematics in nursing is used for clinical competence in medication administration. The ability to calculate medication dosages and intravenous drip rates is a basic but critical component for safe nursing practice (Barra, 2013). An example of a medication order that registered nurses (RNs) and student nurses may encounter in the patient care setting is an order to give 600 mg of Ampicillin intramuscular every eight hours. The directions for dilution on the 2 gm Ampicillin vial states that the medication is to be reconstituted with 4.8 mL of sterile water to obtain a concentration of 400 mg per mL (University of Kentucky, n.d.). The correct dosage for administration would be 1.5 mL Ampicillin.

   Medication administration errors are one of the most common and costly causes of patient harm that occurs within the healthcare system. Medication errors negatively affect around 1.5 million people every year, costing at least $3.5 billion annually and contributing to 7,000

patient deaths per year (Lahue et al., 2012). Faddis (1939) was one of the first to document the concern over medication errors, specifically caused by dosage miscalculations, within health care. Factors contributing to an increased incidence of medication errors include staff interruptions, high nurse-to-patient ratios, failure to use safety checks, and administering an increased volume of medications (Gonzales, 2010; Roberts & Campbell, 2017). The basic mathematical concepts of addition, subtraction, division, and multiplication have been identified as a deficit in many student nurses and practicing RNs. Without the understanding of these concepts, calculating medication dosages and using formulas for medication administration is difficult for student nurses and RNs (Wright, 2012). In a study of 155 student nurses in each level of their education, 22% reported difficulty performing calculations without a calculator; 50% lacked knowledge on how to multiply mixed fractions; and 46% did not know how to divide a decimal number by 100 (Bagnasco et al., 2016).

The most common identified difficulties for students related to medication calculations were the interpretation of information, converting units of measure, calculating intravenous drip rates, and conceptualization of calculations (Arkell & Rutter, 2012; Bagnasco et al., 2016). For RNs to correctly administer drug doses, knowledge of mathematics is essential to ensure safe patient outcomes. As new graduates are hired into healthcare systems, they are required to take drug calculation exams with 100% proficiency before being allowed to work on a hospital unit (Shelton, 2016). A solid baseline knowledge of mathematics has the potential to increase the employment potential for nursing graduates.

Essentials I, II, IV, and *V* of *The Essentials for Baccalaureate Education for Professional Nursing Practice* address the need for knowledge of mathematics within Bachelor of Science in nursing (BSN) education curricula. *Essential I* identifies the requirement of a liberal education

where students have mathematic requirements as part of the curriculum. *Essential II* guides

quality care and patient safety. Every BSN curriculum is required to prepare graduates to be able

to recognize safety and quality concerns, like mathematical errors in medication administration.

Essential IV dictates that BSN curricula should include education on managing data and

information in such a way that safe patient care is delivered. *Essential V* addresses finance

education within the BSN curriculum to include healthcare financing, reimbursement, and

economics of health care (American Association of Colleges of Nursing [AACN], 2008). Pre-

nursing school mathematical knowledge allows students to build upon their foundational

knowledge as they learn to apply this knowledge to constructs specific to the medical profession.

 Test of essential academic skills subscale Reading. Thirty-one percent of the Test of

Essential Academic Skills (TEAS) assesses reading. The topics covered in this TEAS domain

include reading comprehension looking at key ideas and details, craft and structure, and

integration of knowledge and ideas (ATI, 2016). Literacy proficiency is closely linked to higher

education performance and career success (Carnegie Corporation of New York, 2010; Flippo,

2011). In this manner, literacy serves as a gateway into a higher socioeconomic status. Given that

the Scholastic Aptitude Test (SAT) and American College Test (ACT) are a large part of the

higher education admission process, the ability to read, interpret, and analyze the content of these

tests is an important component to success in higher education.

 Within the nursing profession, students cannot deliver safe patient care and optimize

patient outcomes by simply utilizing memorization and recollection. The nursing process

consists of assessing, diagnosing, planning, implementing, and evaluating (Ackley & Ladwig,

2014). The use of the nursing process in organizing patient care requires the ability to analyze

patient presentations, synthesize all data, and think critically to improve patient outcomes.

Higher literacy levels in higher education have shown to be associated with higher grade point average (GPA) for students obtaining a professional degree (Fulks, 2010). The National Council Licensure Examination for Registered Nurses (NCLEX-RN) is the last step that nursing school graduates must take in order to practice as a licensed registered nurse (RN). The content of the NCLEX-RN recognizes that from the first day a person steps into the role of an RN, every individual is responsible for making complex clinical decisions and ensuring that patient care is delivered in a manner that promotes health restoration (National Council of State Boards of Nursing, 2017). Obtaining basic reading proficiency before beginning nursing education aids students in the comprehension of more complex testing, application of knowledge, and proficiency in delivering safe patient care.

The American Association of Colleges of Nursing's (AACN) *Essential I* addresses the requirement of a liberal education for Bachelor of Science in nursing (BSN) students, to include humanities (literature and theology), with an emphasis on the written and spoken word. *Essential VI* states the need for BSN curricula to equip students with the ability to provide effective interprofessional communication and collaboration for improving patient health outcomes. As *Essential I* addressed, communication can be written or spoken, making reading proficiency a requirement of the BSN curriculum. *Essential VIII* focuses on professionalism and professional values within the BSN curriculum. This essential addresses nurse practice acts, scope of practice, professional codes of conduct, and professional standards (AACN, 2008). Knowledge of these documents begins on the first day of a student's nursing education. Reading literacy is needed to assist students in understanding RN practice limitations and professional conduct.

Test of essential academic skills subscale science. The Test of Essential Academic Skills (TEAS) content is 31% science related. The science domain of the TEAS covers the topic

areas of human anatomy and physiology, life science, physical science, and scientific reasoning (ATI, 2016). The TEAS science subscore has demonstrated a correlation to early nursing education success (Wolkowitz & Kelley, 2010). Anatomy and physiology, microbiology, and chemistry are often part of the prerequisite course requirements for schools of nursing. Final course grades for these nursing prerequisite courses have correlated to first-time success on the National Council Licensure Examination for Registered Nurses (NCLEX-RN) (Elder et al., 2015). Science overlaps with nursing education through biological, behavioral, and social sciences.

The sciences are an essential aspect of nursing education to ensure that graduates have the skills needed to quickly recognize research-driven changes and new technologies (American Association of Colleges of Nursing [AACN], 2008). Pre-admission and comprehensive nursing examinations should assess students' core knowledge in the sciences. Students who have pre-admission grade point average (GPA) of greater than or equal to 3.8 have a 61% probability of graduating from their nursing education with a GPA of 3.25 ($p = 0.61$). Within the same student population, this probability drops to 47% ($p = 0.47$) with a pre-admission GPA of less than 3.8 (Wambuguh, Eckfield, & Hofwegen, 2016). Higher pre-admission science grades demonstrate statistical significance with nursing program completion (Robert, 2018).

The AACN (2008) requires that the Bachelor of Science in nursing (BSN) degree must contain a liberal education containing physical sciences (physics, chemistry), life sciences (biology, genetics), mathematical sciences, and social sciences (psychology, sociology). As part of *The Essentials for Baccalaureate Education for Professional Nursing Practice, Essential I* recognizes that a strong foundational knowledge in science prepares students for the knowledge that they will use throughout their time in nursing education and within their nursing career

(AACN, 2008). With BSN education, students should be able to identify and integrate reliable evidence from multiple sources and use this knowledge to inform nursing practice and clinical judgments (AACN, 2008; Institute of Medicine, 2003). *Essential III* of *The Essentials for Baccalaureate Education for Professional Nursing Practice* is entirely directed towards evidence-based practice founded in the sciences.

Beyond nursing education, nursing sensitive indicators reflect the structure, process, and outcomes of nursing care. In essence, these indicators are patient outcomes that have been determined to be nursing sensitive, reflecting the skill and education of nursing staff (2016). Nursing sensitive indicators include nursing turnover rates, use of restraints, nosocomial infections, patient falls, fall with injury to the patient, pressure ulcer rates, and pain assessment/reassessment (American Nurses Association, 2007). Nursing application of evidence-based research within science improves nursing sensitive indicator outcomes (Heslop & Lu, 2014). Science knowledge is a key component in improving healthcare outcomes. A baseline knowledge of science prior to nursing school admission provides a favorable foundation upon which students can grow in the field of nursing knowledge.

Test of essential academic skills subscale English language. The smallest domain of the Test of Essential Academic Skills is the subscale of English language, consisting of 16% of the total test content. The English language content area assesses knowledge on the conventions of standard English, knowledge of the language, and vocabulary acquisition (ATI, 2016). The English language domain aids in the identification of students who may struggle, not because of lack of intelligence, but because of a lack of content mastery of the English language. English language learners (ELL) made up 9.4%, or 4.6 million students, of the public high school student population in the 2014-2015 academic year (National Center for Education Statistics, 2017).

Nursing education will continue to see an increase in ELL students as these students obtain their high school degrees.

Bachelor of Science in nursing (BSN) graduates for whom English is an additional or second language have a lower success rate for being successful on the National Council Licensure Examination for Registered Nurses (NCLEX-RN) on their first attempt (Hansen & Beaver, 2012; Sears, Othman, & Mahoney, 2015; Silvestri, Clark, & Moonie, 2013). Bachelor of Science in nursing students are required to pass the NCLEX-RN before they can practice as a licensed registered nurse. The NCLEX-RN assesses a nursing school graduate's nursing knowledge, not proficiency in English, making students who lack English language proficiency at risk for failure (National Council of State Boards of Nursing, 2017; Sears et al., 2015). Since NCLEX-RN preparation begins within the first nursing class within the nursing school curriculum, a baseline knowledge of the English language sets the foundation for understanding the concepts that are presented in nursing education. A lack of proficiency in the English language can set students up for poor academic performance in the classroom and clinical setting, affecting reading speed, reading comprehension, and understanding complex medical concepts (Kaddoura et al., 2017). Lower nursing student literacy levels are associated with lower first attempt NCLEX-RN pass rates (Crow, Handley, Morrison, & Shelton, 2004).

The Institute of Medicine (2010) has directed nursing education to actively recruit a more diverse student population in an effort to meet the requirement to provide culturally relevant care to all populations. As the United States population becomes more diverse, the nursing workforces caring for them should do the same. At the same time nursing education recruits a more diverse student population, proficiency in the English language is needed to ensure that safe patient care is delivered. *Essentials I, II*, and *VI* of *The Essentials for Baccalaureate*

Education for Professional Nursing Practice address the need for English language literacy (American Association of Colleges of Nursing [AACN], 2008). *Essential I* addresses a liberal education for BSN students where responsibility for a global society is established. *Essential II* directs the ability of BSN students to retrieve, appraise, synthesize, and integrate evidence within nursing practice. *Essential VI* addresses inter- and intra-professional communication, where knowledge of the English language is needed (AACN, 2008).

Summary

Placing more registered nurses (RNs) prepared with the Bachelor of Science in nursing (BSN) in the healthcare setting improves patient care outcomes and healthcare costs (Koh et al., 2016; Woo et al., 2017; Yakusheva et al., 2014). Nursing education faces numerous challenges in meeting the ever-growing need for more RNs in the workforce. Limitations in qualified faculty, clinical placements, clinical preceptors, classroom space, and budgetary constraints result in over 64,000 qualified applicants' being rejected from nursing school admission every year (American Association of Colleges of Nursing [AACN], 2017). Of the applicants who are admitted to schools of nursing, attrition can be as high as 50%, leaving unfilled vacancies in programs and lessening the school's ability to graduate students into employment in the nursing workforce (Harris et al., 2014). Using predictive data to select nursing applicants may assist in decreasing attrition within nursing education.

Various requirements of nursing school admissions have shown predictive ability regarding graduating from nursing school and the ability to pass the National Council Licensure Examination for Registered Nurses (NCLEX-RN) on the first attempt. Standardized testing, such as the Scholastic Aptitude Test (SAT) and American College Test (ACT), along with final course grades in nursing prerequisite courses, and pre-nursing school grade point averages

(GPA) show varying degrees of correlation with nursing school and NCLEX-RN success. Nursing school admission tests, such as the Health Education Systems, Incorporated Admission Assessment (HESI A2), Nursing Entrance Test (NET), and Test of Essential Academic Skills (TEAS), are also used in predicting nursing school and NCLEX-RN success. The TEAS consists of four subscale areas, mathematics, reading, science, and English language. Each subscale contains foundational knowledge that positions students for nursing education success and addresses *The Essentials for Baccalaureate Education for Professional Nursing Practice* guidelines of the American Association of Colleges of Nursing (2008).

The fundamentals of nursing course is a part of the lower level curriculum of nursing education. The fundamentals of nursing course learning outcomes contain knowledge and skill acquisition that covers much of the NCLEX-RN content (management of care, pharmacological and parenteral therapies, physiological adaptation, reduction of risk potential, safety and infection control, basic care and comfort, psychosocial integrity, and health promotion and maintenance) and provides a foundation for student success in RN practice (National Council of State Boards of Nursing, 2016). Final course grades in the fundamentals of nursing course can predict NCLEX-RN success for first-time test takers (Kaddoura et al., 2017).

According to Benner's novice to expert theory and Vygotsky's sociocultural theory, the use of foundational knowledge prior to the admission to nursing education can position students for success in the fundamentals of nursing class and into their nursing career. The proposed research study sought to determine if the TEAS subscale testing scores could predict the final course grade in a fundamentals of nursing course. Findings from this study may provide information to aid in the admission of more qualified students in nursing education who will persist and pass the NCLEX-RN on their first exam attempt. Persistence in nursing education

and passing the NCLEX-RN will benefit the national healthcare system through supplying

qualified RNs to fulfill job vacancies in the national nursing shortage.

CHAPTER THREE: METHODS

Overview

The purpose of this non-experimental quantitative study was to determine if Test of Essential Academic Skills (TEAS) subscale testing scores could predict the final course grade in a fundamentals of nursing course for sophomore students in a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university. Chapter three will describe the design of the study, including setting, participants, data collection, and data analysis procedures.

Design

The research design for this study was a predictive, correlational, quantitative study utilizing archived data for sophomore students from the selected residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program in the academic years of 2015-2016, 2016-2017, and 2017-2018 from a private university located in the mid-Atlantic area of the United States. All archived data was obtained from the University's data collection system and the School of Nursing database. Correlational research was the most appropriate design for the research questions of the study because no variables were manipulated by the researcher (Gall et al., 2007). Also, the correlation does not show cause and effect of the relationship, only the magnitude of the relationship (Gall et al., 2007). The correlational design also aligns with the methods utilized by comparable research studies whose focus was admission criteria and predicting student performance (Aguinis, Culpepper, & Pierce, 2016; Poole, Shulruf, Rudland, & Wilkinson, 2012; Wambuguh et al., 2016). A multiple regression was conducted to measure and study the degree of relationship among the predictor variables and the criterion variable (Gall et al., 2007).

The criterion variable was the final grade for the fundamentals of nursing course for sophomore students from a residential, undergraduate, pre-licensure BSN program at a private university. The fundamentals of nursing course focuses on learning how to deliver safe and effective patient care through communication and basic nursing skills while emphasizing the importance of the fundamental needs of humans. The final grade for the fundamentals of nursing course was reported as a number with the highest score possible being 1,000 points and the lowest score possible being 0 points. The final grade for the fundamentals of nursing course was based on a 1,000 point grading scale where an "A" is 900-1,000 points; "B" is 800-899 points; "C" is 700-799 points; "D" is 600-699 points and "F" is less than 600 points. Passing the course with a grade of "A," "B," or "C" is required in order for students to remain in the BSN program.

The predictor variables for this research were the subscales of the Test of Essential Academic Skills (TEAS). The subscales of the TEAS are mathematics, reading, science, and English language. The mathematics subscale assesses basic mathematical skills covering numbers, algebra, measurement, and data. The content of the mathematics subscale is written at a level that does not require the use of a calculator. The reading subscale focuses on the assessment of functional literacy skills covering the sub-content areas of key ideas and details, craft and structure, and the integration of knowledge and ideas. The science subscale assesses content on human anatomy and physiology, life and physical sciences, and scientific reasoning. The subscale of the English language covers content on conventions of standard English, knowledge of language, and vocabulary acquisition (Assessment Technologies Institute, 2016). The TEAS is a nursing school pre-admission test that predicts early nursing program success for students (Ascend Learning, 2012; Wolkowitz & Kelley, 2010).

Research Questions

RQ1: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2015-2016 academic year?

RQ2: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2016-2017 academic year?

RQ3: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2017-2018 academic year?

Hypotheses

H$_0$1: There is no significant predictive relationship between the criterion variable (final grade for a fundamentals of nursing course) and the linear combination of predictor variables (Test of Essential Academic Skills [TEAS] mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2015-2016 academic year.

H$_0$2: There is no significant predictive relationship between the criterion variable (final grade for a fundamentals of nursing course) and the linear combination of predictor variables (Test of Essential Academic Skills [TEAS] mathematics subscale score, TEAS reading subscale

score, TEAS science subscale score, and TEAS English language subscale score) for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2016-2017 academic year.

H₀3: There is no significant predictive relationship between the criterion variable (final grade for a fundamentals of nursing course) and the linear combination of predictor variables (Test of Essential Academic Skills [TEAS] mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2017-2018 academic year.

Participants and Setting

Population

The participants for this study were a convenience sample of sophomore residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) students at a private university. The university is a large, private, non-profit, suburban university that is regionally accredited. The School of Nursing at the university has full state and national accreditation as a BSN program. Non-probability sampling was utilized to select an appropriate population for research as participants were not chosen randomly but rather on the basis of enrollment in a sophomore level fundamentals of nursing course in the residential, pre-licensure BSN program at the university under study.

Participants who were enrolled in the fundamentals of nursing course in either the 2015-2016, 2016-2017, or 2017-2018 academic years were included in the analysis. The fundamentals of nursing course at the university under study is a required course during the sophomore level in the BSN program. The course focuses on learning how to deliver safe and effective patient care

through communication and basic nursing skills while emphasizing the importance of the fundamental needs of humans. The prerequisite for the course is admission to the School of Nursing at the private university under study. The course is a four credit course consisting of two hours of lecture and six hours of clinical. Students must be successful in both components in order to pass the course. A failure in the fundamentals of nursing course results in student dismissal from the School of Nursing. Passing the course with a grade of "A," "B," or "C" is required in order for students to remain in the BSN program. The final grade for the fundamentals of nursing course is recorded as a number based on a 1,000 point grading scale where an "A" is 900-1000 points; "B" is 800-899 points; "C" is 700-799 points; "D" is 600-699 points and "F" is less than 600 points.

Any student who repeated the fundamentals of nursing course during the years under study had only the final course grade for their first attempt in the course included in the data analysis. Students who were accepted to the School of Nursing and began their 200 level nursing courses in the summer semester of the academic year were excluded in the research population. The rationale for this was that students who began their 200 level nursing courses in the summer semester are required to have a higher grade point average (GPA) for admission to the School of Nursing (3.25) and more credit hours completed (55 hours) on the nursing degree completion plan for admission into the School of Nursing. A higher GPA and more completed degree completion plan credits may positively alter the ability of the student to be retained in the program (Kelly & Crellin, 2012). Additionally, the fundamentals of nursing course in the summer semester is a four-week term versus a 15-week term. Students who withdrew from the fundamentals of nursing course prior to receiving a final grade for the course were excluded from the data analysis. The School of Nursing at the university requires all applicants to take the

Test of Essential Academic Skills (TEAS). Only applicants who have a previous bachelor's

degree are not required to take the TEAS for admission to the School of Nursing under study.

These students were omitted from the data analysis. For students who took the TEAS more than

once, only the TEAS subscores from the date of test administration closest to the timeframe that

the individual completed the fundamentals in nursing course were used. Students who are not

required to take the TEAS exam were excluded from the data analysis.

Sample Size

Archival data were used for this study. The minimum requirement for linear regression

states that the sample sizes need to be at least 10 times as many cases as the predictor variables

(Warner, 2013). In this study, four predictor variables (TEAS mathematics subscale score, TEAS

reading subscale score, TEAS science subscale score, and TEAS English language subscale

score) required at least $N = 40$ samples. Accounting for incomplete student information and

effect size, more than 40 samples were required per sample group.

Sample 2015-2016. The 2015-2016 sample group consisted of 138 students who met the

inclusion criteria of the study. The 2015-2016 sample group contained 122 female and 16 male

students. Of this sample, 94 identified as Caucasian, 3 identified as African American, 3

identified as Hispanic, 2 identified as American Indian, 4 identified as Asian, and 32 did not

report ethnicity. The ages of the 2015-2016 sample group ranged from 18 to 35 years old. Two

participants were removed prior to data analysis due to exclusion criteria. For this study, the

number of participants in the 2015-2016 sample size was 138 students which according to Gall et

al. (2007, p. 145) exceeded the required minimum for a medium effect size with the statistical

power of .7 at the .05 alpha level.

Sample 2016-2017. The 2016-2017 sample group consisted of 160 students who met the inclusion criteria of the study. The 2016-2017 sample group contained 142 female and 18 male students. Of this sample, 110 identified as Caucasian, 1 identified as African American, 3 identified as Hispanic, 1 identified as American Indian, 3 identified as Asian, and 42 did not report ethnicity or reported ethnicity as other. The ages of the 2016-2017 sample group ranged from 18 to 29 years old. Five participants were removed prior to data analysis due to exclusion criteria. For this study, the number of participants in the 2016-2017 sample size was 160 students which according to Gall et al. (2007, p. 145) exceeded the required minimum for a medium effect size with the statistical power of .7 at the .05 alpha level.

Sample 2017-2018. The 2017-2018 sample group consisted of 188 students who met the inclusion criteria of the study. The 2017-2018 sample group contained 169 female and 19 male students. Of this sample, 125 identified as Caucasian, 4 identified as African American, 2 identified as Hispanic, 1 identified as American Indian, 7 identified as Asian, and 49 did not report ethnicity or reported ethnicity as other. The ages of the 2017-2018 sample group ranged from 18 to 28 years old. Two participants were removed prior to data analysis due to exclusion criteria. For this study, the number of participants in the 2017-2018 sample size was 188 students which according to Gall et al. (2007, p. 145) exceeded the required minimum for a medium effect size with the statistical power of .7 at the .05 alpha level.

Instrumentation

Archival data were used to measure the relationship between the predictor and criterion variables. The use of digital record keeping has made broad student characteristic data more available for analysis. Using these data, post-secondary institutions have utilized correlational research, including predictive analytics and at-risk inquiry, for improving undergraduate

retention and satisfaction (Freitas et al., 2015; Pike & Graunke, 2015). The analysis of these student population characteristics has also been noted as stable in relation to institutional retention of students (Pike & Graunke, 2015).

The purpose of this non-experimental quantitative study was to determine if Test of Essential Academic Skill (TEAS) subscale scores could predict the final course grade in a fundamentals of nursing course for sophomore students in a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university. The predictor variables were TEAS subscale scores. The predictor variables (TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) were housed in School of Nursing database. The criterion variable was the numerical final grade for fundamentals of nursing course for students from a residential, undergraduate, pre-licensure BSN program at a private university. The criterion variable information was housed within the Office of the Registrar from the university's data collection system, Banner, eliminating the need for additional data collection. Because all criterion and predictor variables were housed in two secure student databases within the university, consistency could be assured for this research and for the university's ongoing at-risk prediction practices.

Predictor Variables (TEAS Mathematics Subscale Score, TEAS Reading Subscale Score, TEAS Science Subscale Score, and TEAS English Language Subscale Score)

The Test of Essential Academic Skills (TEAS) is a standardized admissions test for schools of nursing. The TEAS was developed by Ascend Learning as a means of predicting student success in nursing education (Ascend Learning, 2012). The TEAS is commonly administered by schools of nursing as an admission examination to assess the academic

preparedness of prospective nursing students as a means of predicting early nursing academic

success (Wolkowitz & Kelley, 2010). The TEAS consists of 170 multiple choice questions that

must be completed within 209 minutes. Of these questions, 150 questions test on the content

domains of mathematics, reading, science, and the English language. Twenty of the TEAS

questions are unscored pretest questions that are evenly distributed across each of the content

domains. Each question has four options (a, b, c, d) for answers, one of which is the correct

answer. The test content is 22% mathematics, 31% reading, 31% science, and 16% English

language. Each content area score is reported in a percentage ranging from the lowest (0%) to the

highest (100%).

Test development consisted of content analysis and a blueprint survey according to the

American Psychological Association, American Educational Research Association, and National

Council on Measurement in Education *Standards for Educational and Psychological Testing*

(Assessment Technologies Institute, 2016). The composite score for the TEAS is reported in a

percentage ranging from the lowest (0%) to the highest (100%). These scores are then interpreted

in levels of academic preparedness that institutions use to assist in selecting applicants for

admission to schools of nursing. Table 2 provides an interpretation of TEAS scores and levels of

student academic preparedness.

Table 2

ATI Academic Preparedness Levels

Academic Preparedness Level	Academic Preparedness Level Definition	Score Range
Developmental	Developmental scores generally indicate a very low level of overall academic preparedness necessary to support learning of health sciences-related content. Students at this level will require additional preparation for most objectives assessed on ATI TEAS. (See Topics to Review on this score report.)	0% to 40.7%
Basic	Basic scores generally indicate a low level of overall academic preparedness necessary to support learning of health sciences-related content. Students at this level are likely to require additional preparation for many objectives assessed on ATI TEAS. (See Topics to Review on this score report.)	41.3% to 58%
Proficient	Proficient scores generally indicate a moderate level of overall academic preparedness necessary to support learning of health sciences-related content. Students at this level can require additional preparation for some objectives assessed on ATI TEAS. (See Topics to Review on this score report.)	58.7% to 77.3%
Advanced	Advanced scores generally indicate a high level of overall academic preparedness necessary to support learning of health sciences-related content. Students at this level are not likely to require additional preparation for the objectives assessed on ATI TEAS.	78% to 90%
Exemplary	Exemplary scores generally indicate a very high level of overall academic preparedness necessary to support learning of health sciences-related content. Students at this level are not likely to require additional preparation for the objectives assessed on ATI TEAS.	90.7% to 100%

The TEAS contains four subscales: mathematics, reading, science, and English language.

The test content is 22% mathematics, 31% reading, 31% science, and 16% English language.

The mathematics content area contains questions on numbers, algebra, measurement, and data. The reading content area contains questions on key ideas and details, craft and structure, and integration of knowledge and ideas. The science content area contains questions on human anatomy and physiology, life science, physical science, and scientific reasoning. The English language content area contains questions pertaining to conventions of standard English, knowledge of language, and vocabulary acquisition (Assessment Technologies Institute, 2016). Each content area score is reported in a percentage ranging from the lowest (0%) to the highest (100%).

The validity of the TEAS is acceptable at $R^2 = .02$; $p < .001$, indicating that the survey is valid (Wolkowitz & Kelley, 2010). The TEAS is administered on a computer. For students to register to take the TEAS, each individual must access the school of nursing application website. A URL link on this page directs students on how to register and complete the TEAS. When students register for the test, the application will prompt students to select the school(s) of nursing to which the individual would like TEAS scores to be sent. The TEAS scores for applicants are housed in the school of nursing database.

Criterion Variable (Final Grade for Fundamentals of Nursing Course)

For this study, the final grade for the fundamentals of nursing course was assigned at the end of the semester. Fundamentals of nursing is a required course for all residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) students at the university under study. The course is offered in the fall, spring, and summer semester of the student's sophomore year in the school of nursing under study and is required in the second semester after the student is admitted to nursing. The purpose of the course is to serve as an introduction to clinical skills and clinical critical thinking skills. Coursework includes a classroom component

worth 600 points and clinical component worth 400 points for a total of 1,000 possible points for the course. Both components must be successfully passed in order to meet the requirements to pass the fundamentals of nursing course. The classroom component consists of lecture, tests, and a final exam. The clinical component consists of students' learning, practicing, and being evaluated on nursing clinical skills in a simulation environment and in the hospital setting. The final grade for the course was based on a 1,000 point grading scale where an "A" is 900-1,000 points; "B" is 800-899 points; "C" is 700-799 points; "D" is 600-699 points and "F" is less than 600 points. For this study, the grade was reported as a number from 0 to 1,000 based on the 1,000 point grading scale. The final grade for the course was entered into Blackboard by the course primary professor at the end of each term. These data were housed in the university database, Banner. The grade was available to students two days after being placed in Banner. A grade of "A," "B," or "C" was required to satisfy the requirement for passing the fundamentals of nursing course. Numerous studies have used the fundamentals of nursing course to evaluate student outcomes in nursing education (Roller & Zori, 2017; Underwood et al., 2013; Wolkowitz & Kelley, 2010).

Procedures

Before obtaining any student data, informal written permission was requested from the Dean of the School of Nursing to obtain the predictor variables (Test of Essential Academic Skills [TEAS] mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) and the criterion variable (final grades for fundamentals in nursing from the academic years of 2015–2016, 2016–2017, and 2017-2018) (see Appendix A). Once permission was obtained from the School of Nursing Dean, formal permission was obtained from the institution's institutional review board (IRB) (see

Appendix B). Following all approvals for the study, a formal request for the data was submitted

to the Analytics and Decision Support (ADS) Department by the Residential BSN Practicum

Coordinator. This was done to comply with the Family Educational Rights and Privacy Act

(FERPA) to protect student identities. The predictor variables (TEAS mathematics subscale

score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language

subscale score) data were obtained from the School of Nursing database that the Residential BSN

Practicum Coordinator manages. The Residential BSN Practicum Coordinator sent the ADS

Department an Excel spreadsheet with the student name, university identification number, and

the predictor variables (TEAS mathematics subscale score, TEAS reading subscale score, TEAS

science subscale score, and TEAS English language subscale score) data for each student from

each sample group (2015–2016, 2016–2017, and 2017–2018). The data request was made

through the submission of a formal data inquiry in accordance with the institutional procedures.

This request was submitted with a requested turnaround time of two weeks per policies of the

university.

The request for data from ADS was submitted for final numerical grades for students who

took fundamentals of nursing in the fall or spring semesters of the 2015–2016, 2016–2017, and

2017–2018 academic years; identification of students who repeated the fundamentals of nursing

course and the final course grade for each attempt; the age of all participants at the time of

completion of the fundamentals of nursing course; the ethnicity of participants; and the gender of

participants. The criterion variable (final grade for fundamentals of nursing course for students

from a residential, undergraduate, pre-licensure Bachelor of Science in nursing [BSN] program

at a private university) data and demographic data were obtained from the university student

database, Banner. The ADS department then matched the data to the student name, university

identification number, and predictor variable data that were provided by the Residential BSN

Practicum Coordinator. All nursing database and Banner data were combined in one Excel

spreadsheet by the ADS department. Once the ADS department matched the criterion variable

data, predictor variable data, exclusionary data, and demographic data, all information was sent

back to the Residential BSN Practicum Coordinator, who then removed all student identifiers

(student name and university identification number) prior to providing the data to the primary

investigator. Accuracy of data was verified by the ADS department.

  Once data were received, subjects who withdrew from the fundamentals of nursing

course prior to receiving a final grade for the course were removed. For students who repeated

the fundamentals of nursing course, only the final grade for the first time the student took the

course was used. Students who were accepted to the School of Nursing and began their 200 level

nursing courses in the summer semester of the academic year were removed. Students who did

not take the TEAS were removed. For students who took the TEAS more than once, the TEAS

subscore results from the TEAS administration that is closest in proximity to the date that the

student completed the fundamentals in nursing course were used. Once the data were considered

correct and complete, they were coded for analysis using IBM's Statistical Package for Social

Sciences (SPSS) version 24 software. For the purpose of this study, the criterion variable was the

final grade for fundamentals of nursing course for students from a residential, undergraduate,

pre-licensure BSN program. The final grade as a number from 0 to 1,000 was used in SPSS. For

the predictor variables (TEAS mathematics subscale score, TEAS reading subscale score, TEAS

science subscale score, and TEAS English language subscale score), the subscale score of 0 to

100% was used in SPSS. Once the data were considered correct and complete, they were

uploaded into SPSS and evaluated to test the null hypotheses.

Data Analysis

For this correlational study, a linear multiple regression was a suitable form of data analysis to investigate the possibility of significant predictive relationships between the predictor variables (Test of Essential Academic Skills [TEAS] mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) and the criterion variable (final grade for fundamentals of nursing course for students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing [BSN] program at a private university). Multiple regression is appropriate when research seeks to determine the relationships between predictor variables and a criterion variable (Gall et al., 2007). For this study, multiple regression was a more appropriate statistical analysis than simple regression because it allowed for more than one predictor variable to be examined at a time, aiding in the explanation of the relationships between each variable at one time or as a group (Howell, 2011).

The assumptions for multiple regression are that variables should be measured on an interval and be independent observations. The assumption of bivariate outliers was assessed using scatter plots, looking for extreme bivariate outliers. The assumption of multivariate normal distribution was assessed by looking for the classic "cigar shape" design on the scatter plots. The assumption of the absence of multicollinearity among predictor variables was assessed with the variance inflation factor (VIF), looking for an acceptable value between one and five (Warner, 2013).

The analysis was run at a 95% confidence interval. An *F*-stat was used to determine the significance of the model. Effect size was reported using Pearson's *r* because both variables being correlated were expressed as a continuous score (Gall et al., 2007). A coefficient of

determination (R^2) was used to show how much each predictor variable influences the variance

in the criterion variable (Gall et al., 2007).

CHAPTER FOUR: FINDINGS

Overview

The purpose of this study was to determine if Test of Essential Academic Skills (TEAS) subscale testing scores could predict the final course grade in a fundamentals of nursing course for sophomore students in a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university. Chapter four includes the research questions, hypotheses, descriptive statistics, data screening, assumption testing, and analysis of the results of the multiple linear regression for this predictive correlational study.

Research Questions

RQ1: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2015–2016 academic year?

RQ2: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2016–2017 academic year?

RQ3: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2017–2018 academic year?

Hypotheses

H₀1: There is no significant predictive relationship between the criterion variable (final grade for a fundamentals of nursing course) and the linear combination of predictor variables (Test of Essential Academic Skills [TEAS] mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2015–2016 academic year.

H₀2: There is no significant predictive relationship between the criterion variable (final grade for a fundamentals of nursing course) and the linear combination of predictor variables (Test of Essential Academic Skills [TEAS] mathematics subscale score, TEAS reading subscale score, TEAS Science subscale score, and TEAS English language subscale score) for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2016–2017 academic year.

H03: There is no significant predictive relationship between the criterion variable (final grade for a fundamentals of nursing course) and the linear combination of predictor variables (Test of Essential Academic Skills [TEAS] mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2017–2018 academic year.

Descriptive Statistics

The archival data used for this study were obtained from the nursing database and the university data collection system for the institution under study. The combined total number of participants for the 2015–2016 sample group, 2016–2017 sample group, and 2017–2018 sample

group was 486.

Descriptive Statistics for 2015–2016 Sample

The 2015–2016 sample size was $N = 138$. The mean and standard deviation for each of the predictor variables of Test of Essential Academic Skills (TEAS) mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score are displayed in Table 3. Table 3 also displays the mean and standard deviation of the criterion variable of the final grade for fundamentals of nursing course for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university.

Table 3

Descriptive Statistics 2015–2016 Sample

Descriptive Statistics

	Mean	Std. Deviation	N
NURS 221 Final Grade (numerical out of 1000) for Spring 2016	914.7153262	29.85399344	138
Math TEAS subscore x2	74.0283	14.73861	138
Reading TEAS subscore x1	80.0594	9.40477	138
Science TEAS subscore x3	66.5226	10.97249	138
English TEAS subscore x4	77.8858	12.25448	138

Descriptive Statistics for 2016–2017 Sample

The 2016–2017 sample size was $N = 160$. The mean and standard deviation for each of the predictor variables of Test of Essential Academic Skills (TEAS) mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language

subscale score are displayed in Table 4. Table 4 also displays the mean and standard deviation of

the criterion variable of the final grade for fundamentals of nursing course for sophomore

students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN)

program at a private university.

Table 4

Descriptive Statistics for 2016–2017 Sample

Descriptive Statistics

	Mean	Std. Deviation	N
fundamentals of nursing final grade 2016_2017	896.0219794	39.93474573	160
Math TEAS subscore x2	75.8998	12.96849	160
Science TEAS subscore x3	66.23013	11.182992	160
English TEAS subscore x4	80.2938	10.91009	160
Reading TEAS subscore x1	80.53369	9.005042	160

Descriptive Statistics for 2017–2018 Sample

The 2017–2018 sample size was $N = 188$. The mean and standard deviation for each of

the predictor variables of Test of Essential Academic Skills (TEAS) mathematics subscale score,

TEAS reading subscale score, TEAS science subscale score, and TEAS English language

subscale score are displayed in Table 5. Table 5 also displays the mean and standard deviation of

the criterion variable of the final grade for fundamentals of nursing course for sophomore

students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN)

program at a private university.

Table 5

Descriptive Statistics for 2017–2018 Sample

Descriptive Statistics

	Mean	Std. Deviation	N
fundamentals of nursing final grade 2017_2018	907.3053	40.30538	188
Reading TEAS subscore x1	80.695479	9.1144865	188
Math TEAS subscore x2	86.5900	10.67474	188
Science TEAS subscore x3	63.623032	9.7290686	188
English TEAS subscore x4	77.9073	12.72067	188

## Results

Data Screening

Prior to conducting the data analysis, the data were screened for missing data and data inconsistencies using the sort function in IBM's Statistical Package for Social Sciences (SPSS) version 24 software. Data screening was conducted on each predictor variable (TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) and criterion variable (final grade for a fundamentals of nursing course).

Hypothesis One

Hypothesis One Assumption Testing

A scatterplot was used to examine the assumption of bivariate outliers and multivariate normal distribution between the criterion variable (final grade for a fundamentals of nursing course) and the predictor variables (TEAS mathematics subscale score, TEAS reading subscale

score, TEAS science subscale score, and TEAS English language subscale score). No extreme

bivariate outliers were detected. The assumption of multivariate normal distribution was tenable

for all variables. See Figure 1 for the scatter plots for the assumption of bivariate outliers and the

assumption of multivariate normal distribution.
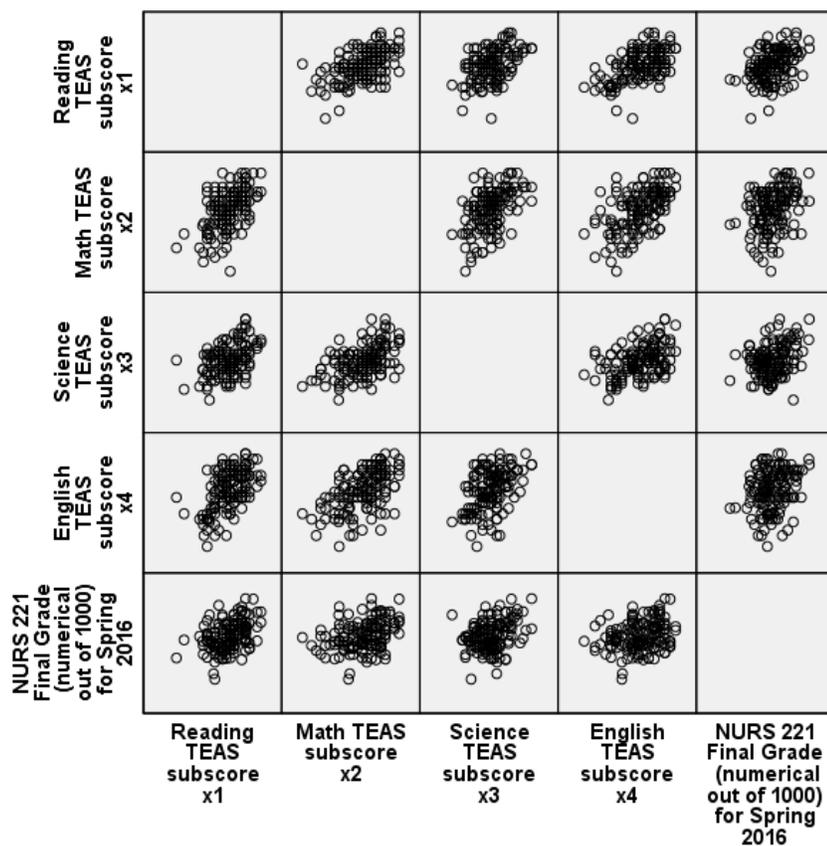
Figure 1. Matrix Scatter Plot of All Criterion and Predictor Variables in the Regression Model 2015–2016 Sample.

The assumption of the absence of multicollinearity among predictor variables was

assessed with the variance inflation factor (VIF), looking for an acceptable value between one

and five (Warner, 2013). All predictor variables fell within the normal range of one to five

indicating the predictor variables were not strongly correlated. See Table 6 for the assumption of

the absence of multicollinearity.

Table 6

Coefficients and Absence of Multicollinearity 2015 – 2016 Sample

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	803.283	21.064		38.135	.000	761.619	844.948		
	Math TEAS subscore x2	.267	.206	.132	1.298	.197	-.140	.675	.584	1.711
	Reading TEAS subscore x1	.946	.319	.298	2.962	.004	.314	1.578	.598	1.673
	Science TEAS subscore x3	.379	.254	.139	1.494	.138	-.123	.881	.696	1.436
	English TEAS subscore x4	-.120	.247	-.049	-.484	.629	-.609	.370	.587	1.705

a. Dependent Variable: NURS 221 Final Grade
(numerical out of 1000) for Spring 2016

Hypothesis One Results

After data screening was conducted and assumptions were met, the multiple linear

regression analysis was conducted at the 95% confidence level. The first research question

examined how accurately the final grade for a fundamentals of nursing course could be

predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore

students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN)

program at a private university for the 2015–2016 academic year. The hypothesis for this

research question was as follows: There is no significant predictive relationship between the

criterion variable (final grade for a fundamentals of nursing course) and the linear combination

of predictor variables (TEAS mathematics subscale score, TEAS reading subscale score, TEAS

science subscale score, and TEAS English language subscale score) for sophomore students

from a residential, undergraduate, pre-licensure BSN program at a private university for the

2015–2016 academic year.

The multiple linear regression, with all four predictors (TEAS mathematics subscale

score, TEAS reading subscale score, TEAS science subscale score, and TEAS English

language subscale score), was statistically significant at the 95% confidence level where $R =$ .441, $R^2 = .195$, adjusted $R^2 = .171$, $F(4, 133) = 8.048$, $p < .001$. Meaning, approximately 17% of the variance of the final grade for a fundamentals of nursing course could be predicted from the linear regression of the predictor variables (TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score). The null hypothesis was rejected. See Table 7 for the ANOVA results of the multiple linear regression analysis.

Table 7

ANOVA Results 2015–2016 Sample

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23793.844	4	5948.461	8.048	.000[b]
	Residual	98308.903	133	739.165		
	Total	122102.747	137			

a. Dependent Variable: NURS 221 Final Grade (numerical out of 1000) for Spring 2016

b. Predictors: (Constant), English TEAS subscore x4, Science TEAS subscore x3, Reading TEAS subscore x1, Math TEAS subscore x2

The TEAS Reading subscale scores were the best predictor of the final grade for a fundamentals of nursing course ($p = .004$). The effect size was large ($r = .402$) (Warner, 2013). See Table 6 for coefficients for the 2015–2016 sample.

Hypothesis Two

Hypothesis Two Assumption Testing

A scatterplot was used to examine the assumption of bivariate outliers and multivariate normal distribution between the criterion variable (final grade for a fundamentals of nursing course) and the predictor variables (TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score). No extreme bivariate outliers were detected. The assumption of multivariate normal distribution was tenable for all variables. See Figure 2 for the scatter plots for the assumption of bivariate outliers and the assumption of multivariate normal distribution.
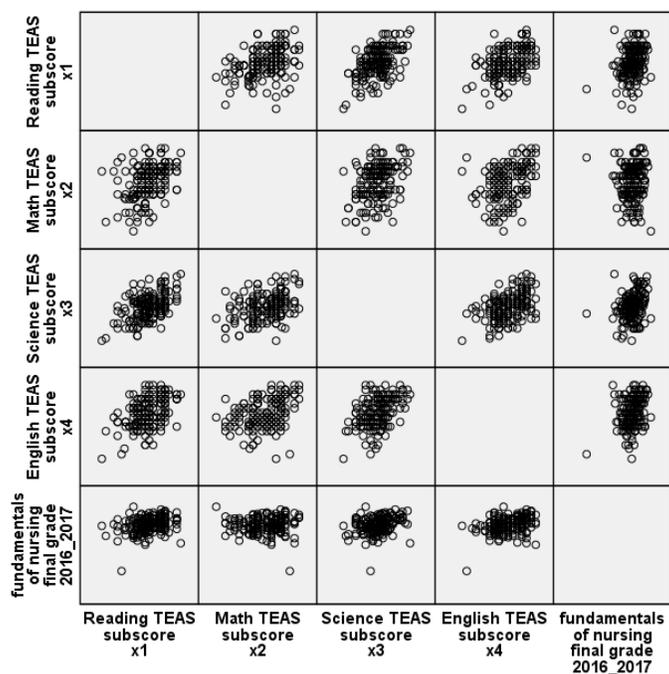
Figure 2. Matrix Scatter Plot of All Criterion and Predictor Variables in the Regression Model 2016–2017 Sample.

The assumption of the absence of multicollinearity among predictor variables was assessed with the variance inflation factor (VIF), looking for an acceptable value between one and five (Warner, 2013). All predictor variables fell within the normal range of one to five

indicating the predictor variables were not strongly correlated. See Table 8 for the assumption of the absence of multicollinearity.

Table 8

Coefficients and Absence of Multicollinearity 2016–2017 Sample

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	769.405	28.535		26.963	.000	713.037	825.774		
	Math TEAS subscore x2	-.656	.255	-.213	-2.573	.011	-1.160	-.152	.773	1.294
	Science TEAS subscore x3	.593	.321	.166	1.844	.067	-.042	1.228	.654	1.528
	English TEAS subscore x4	.855	.322	.234	2.653	.009	.218	1.491	.684	1.462
	Reading TEAS subscore x1	.851	.406	.192	2.095	.038	.049	1.653	.632	1.583

a. Dependent Variable: fundamentals of nursing final grade 2016_2017

Hypothesis Two Results

After data screening was conducted and assumptions were met, the multiple linear regression analysis was conducted at the 95% confidence level. The second research question examined how accurately the final grade for a fundamentals of nursing course could be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2016–2017 academic year. The hypothesis for this research question was as follows: there is no significant predictive relationship between the criterion variable (final grade for a fundamentals of nursing course) and the linear combination of predictor variables (TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) for sophomore students from a residential, undergraduate, pre-licensure BSN program at a private university for the 2016–2017 academic year.

The multiple linear regression, with all four predictors (TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score), was statistically significant at the 95% confidence level where $R = .422$, $R^2 = .178$, adjusted $R^2 = .157$, $F(4, 155) = 8.414$, $p < .001$. Meaning, approximately 16% of the variance of the final grade for a fundamentals of nursing course could be predicted from the linear regression of the predictor variables (TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score). The null hypothesis was rejected. See Table 9 for the ANOVA results of the multiple linear regression analysis.

Table 9

ANOVA Results 2016–2017 Sample

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45237.256	4	11309.314	8.414	.000[b]
	Residual	208333.387	155	1344.086		
	Total	253570.643	159			

a. Dependent Variable: fundamentals of nursing final grade 2016_2017

b. Predictors: (Constant), Reading TEAS subscore x1, Math TEAS subscore x2, English TEAS subscore x4, Science TEAS subscore x3

The TEAS English language subscale scores were the best predictor of the final grade for a fundamentals of nursing course ($p = .009$). The effect size was large ($r = .318$) (Warner, 2013). The TEAS mathematics subscale scores were also significant for predicting the final grade for a fundamentals of nursing course ($p = .011$). The effect size for TEAS mathematics subscale

scores was small ($r = .016$) (Warner, 2013). The TEAS reading subscale scores were also

significant for predicting the final grade for a fundamentals of nursing course ($p = .038$). The

effect size for TEAS reading subscale scores was large ($r = .306$) (Warner, 2013). See Table 8

for coefficients for the 2016– 017 sample.

Hypothesis Three

Hypothesis Three Assumption Testing

A scatterplot was used to examine the assumption of bivariate outliers and multivariate

normal distribution between the criterion variable (final grade for a fundamentals of nursing

course) and the predictor variables (TEAS mathematics subscale score, TEAS reading subscale

score, TEAS science subscale score, and TEAS English language subscale score). No extreme

bivariate outliers were detected. The assumption of multivariate normal distribution was tenable

for all variables. See Figure 3 for the scatter plots for the assumption of bivariate outliers and the

assumption of multivariate normal distribution.
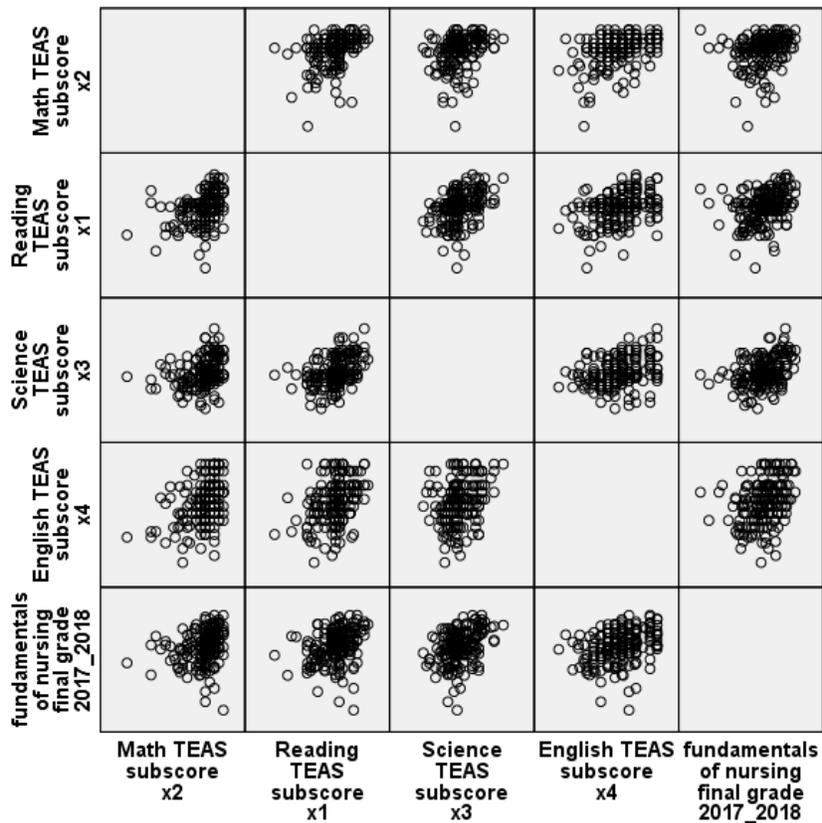
Figure 3. Matrix Scatter Plot of All Criterion and Predictor Variables in the Regression Model 2017–2018 Sample.

The assumption of the absence of multicollinearity among predictor variables was assessed with the variance inflation factor (VIF), looking for an acceptable value between one and five (Warner, 2013). All predictor variables fell within the normal range of one to five indicating the predictor variables were not strongly correlated. See Table 10 for the assumption of the absence of multicollinearity.

Table 10

Coefficients and Absence of Multicollinearity 2017–2018 Sample

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	734.965	27.711		26.522	.000	680.290	789.639		
	Reading TEAS subscore x1	.349	.343	.079	1.017	.310	-.328	1.025	.711	1.407
	Math TEAS subscore x2	.233	.287	.062	.811	.419	-.334	.799	.739	1.354
	Science TEAS subscore x3	1.156	.304	.279	3.803	.000	.556	1.755	.794	1.260
	English TEAS subscore x4	.649	.237	.205	2.733	.007	.180	1.117	.762	1.313

a. Dependent Variable: fundamentals of nursing final grade 2017_2018

Hypothesis Three Results

After data screening was conducted and assumptions were met, the multiple linear regression analysis was conducted at the 95% confidence level. The third research question examined how accurately the final grade for a fundamentals of nursing course could be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2017–2018 academic year. The hypothesis for this research question was as follows: there is no significant predictive relationship between the criterion variable (final grade for a fundamentals of nursing course) and the linear combination of predictor variables (TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) for sophomore students from a residential, undergraduate, pre-licensure BSN program at a private university for the 2017–2018 academic year.

The multiple linear regression, with all four predictors (TEAS mathematics subscale

score, TEAS reading subscale score, TEAS science subscale score, and TEAS English

language subscale score), was statistically significant at the 95% confidence level where $R =$

.467, $R^2 = .218$, adjusted $R^2 = .201$, $F(4, 183) = 12.788$, $p < .001$. Meaning, approximately 20%

of the variance of the final grade for a fundamentals of nursing course could be predicted from

the linear regression of the predictor variables (TEAS mathematics subscale score, TEAS

reading subscale score, TEAS science subscale score, and TEAS English language subscale

score). The null hypothesis was rejected. See Table 11 for the ANOVA results of the multiple

linear regression analysis.

Table 11

ANOVA Results 2017–2018 Sample

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	66364.385	4	16591.096	12.788	.000^b
	Residual	237421.493	183	1297.385		
	Total	303785.878	187			

a. Dependent Variable: fundamentals of nursing final grade 2017_2018

b. Predictors: (Constant), English TEAS subscore x4, Science TEAS subscore x3, Math TEAS subscore x2, Reading TEAS subscore x1

The TEAS science subscale scores were the best predictor of the final grade for a fundamentals

of nursing course ($p < .001$). The effect size for TEAS science subscales scores was large ($r =$

.390) (Warner, 2013). The TEAS English language subscale scores were also a significant

predictor of the final grade for a fundamentals of nursing course ($p = .007$). The effect size for

TEAS English language subscale scores was large (r = .341). See Table 10 for coefficients for

the 2016–2017 sample.

CHAPTER FIVE: CONCLUSIONS

Overview

The purpose of this non-experimental quantitative study was to determine if Test of Essential Academic Skills (TEAS) subscale scores could predict the final course grade in a fundamentals of nursing course for sophomore students in a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university. Chapter five provides a discussion of the research study, implications drawn from the research, limitations of the study, and recommendations for future research based on the data analysis of the current study.

Discussion

The purpose of this quantitative predictive correlational study was to determine if Test of Essential Academic Skills (TEAS) subscale testing scores could predict the final course grade in a fundamentals of nursing course for sophomore students in a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university. Archival data consisting of information related to sophomore residential undergraduate pre-licensure BSN students at a private university during the 2015–2016, 2016–2017, and 2017–2018 academic years were used in this study. The 2015–2016 sample consisted of 138 sophomore nursing students. The 2016–2017 sample consisted of 160 sophomore nursing students. The 2017–2018 sample consisted of 188 sophomore nursing students. Data were analyzed using multiple linear regression.

Hypothesis One

Hypothesis one stated that there is no significant predictive relationship between the criterion variable (final grade for a fundamentals of nursing course) and the linear combination

of predictor variables (Test of Essential Academic Skills [TEAS] mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2015–2016 academic year. The researcher rejected hypothesis one indicating that there is a significant predictive relationship in the criterion variable and the linear combination of predictor variables.

The multiple linear regression results indicated that approximately 17% of the variance of the final grade for a fundamentals of nursing course could be predicted from the linear regression of the predictor variables (TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) (adjusted $R^2 = .171$). Of the predictor variables, the TEAS reading subscale scores were the best predictor of the final grade for a fundamentals of nursing course ($p = .004$) with a large effect size ($r = .402$) indicating a strong association between the criterion and predictor variable (Warner, 2013).

This finding supports prior research related to the relationship of literacy proficiency in higher education performance and career success. Literacy proficiency is closely linked to higher education performance and career success (Carnegie Corporation of New York, 2010; Flippo, 2011). Higher literacy levels in higher education have shown to be associated with higher grade point average (GPA) for students obtaining a professional degree (Fulks, 2010). Students who have lower levels of reading literacy may have difficulty reading and comprehending material that is presented in a fundamentals of nursing course.

Hypothesis Two

Hypothesis two stated there is no significant predictive relationship between the criterion variable (final grade for a fundamentals of nursing course) and the linear combination of

predictor variables (Test of Essential Academic Skills [TEAS] mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) for sophomore students from a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university for the 2016–2017 academic year. The researcher rejected hypothesis two indicating that there is a significant predictive relationship in the criterion variable and the linear combination of predictor variables.

The multiple linear regression results indicated that approximately 16% of the variance of the final grade for a fundamentals of nursing course could be predicted from the linear regression of the predictor variables (TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score) (adjusted $R^2 = .157$). Of the predictor variables, the TEAS English language subscale scores were the best predictor of the final grade for a fundamentals of nursing course ($p = .009$) with a large effect size ($r = .318$) indicating a strong association between the criterion and predictor variable (Warner, 2013). The TEAS mathematics subscale scores were also significant for predicting the final grade for a fundamentals of nursing course ($p = .011$) but had a small effect size ($r = .016$) indicating a weak association between the criterion and predictor variable (Warner, 2013). The TEAS reading subscale scores were also significant for predicting the final grade for a fundamentals of nursing course ($p = .038$) with a large effect size ($r = .306$) indicating a strong association between the criterion and predictor variable (Warner, 2013).

The ability of the TEAS English language subscale to predict the final grade for a fundamentals of nursing class supports prior research findings. English language learners (ELL) demonstrated a lower success rate on the National Council Licensure Examination for Registered Nurses (NCLEX-RN) on their first attempt (Hansen & Beaver, 2012; Sears et al., 2015; Silvestri

et al., 2013). Preparation for the NCLEX-RN begins in the first nursing courses, like

fundamentals of nursing, within a school of nursing's curriculum. Students who lack a solid

foundational knowledge of the English language at the start of their nursing education are more

prone to have poor academic performance in the classroom and clinical setting, affecting reading

speed, reading comprehension, and understanding complex medical concepts (Kaddoura et al.,

2017).

The significant predictive ability of the TEAS mathematics subscale scores supports prior

research findings reporting how success in mathematics courses serves as a strong predictor of a

student's ability to achieve academic success in nursing curriculum (Newton, 2008). The effect

size for the TEAS mathematics subscale score was small indicating a weak association between

the TEAS mathematics subscale score and the final grade for a fundamentals of nursing course.

Because of the small effect size, the predictive relationship should be interpreted with caution.

The significant predictive ability of the TEAS reading subscale scores was supported by

prior research on the relationship of literacy proficiency in higher education performance and

career success. Literacy proficiency is closely linked to higher education performance and career

success (Carnegie Corporation of New York, 2010; Flippo, 2011). Higher literacy levels in

higher education have shown to be associated with higher grade point average (GPA) for

students obtaining a professional degree (Fulks, 2010). Students who have lower levels of

reading literacy may have difficulty reading and comprehending material that is presented in a

fundamentals of nursing course.

Hypothesis Three

Hypothesis three stated there is no significant predictive relationship between the

criterion variable (final grade for a fundamentals of nursing course) and the linear combination

of predictor variables (Test of Essential Academic Skills [TEAS] mathematics subscale score,

TEAS reading subscale score, TEAS science subscale score, and TEAS English language

subscale score) for sophomore students from a residential, undergraduate, pre-licensure Bachelor

of Science in nursing (BSN) program at a private university for the 2017-2018 academic year.

The researcher rejected hypothesis three indicating that there is a significant predictive

relationship in the criterion variable and the linear combination of predictor variables.

The multiple linear regression results indicated that approximately 20% of the variance of

the final grade for a fundamentals of nursing course could be predicted from the linear regression

of the predictor variables (TEAS mathematics subscale score, TEAS reading subscale score,

TEAS science subscale score, and TEAS English language subscale score) (adjusted R^2 = .171).

Of the predictor variables, the TEAS science subscale scores were the best predictor of the final

grade for a fundamentals of nursing course ($p < .001$) with a large effect size ($r = .390$)

indicating a strong association between the criterion and predictor variable (Warner, 2013). The

TEAS English language subscale scores were also significant for predicting the final grade for a

fundamentals of nursing course ($p = .007$) with a large effect size ($r = .341$) indicating a strong

association between the criterion and predictor variable (Warner, 2013).

The predictive relationship of TEAS science subscale scores and the final grade for a

fundamentals of nursing course is supported by prior research findings. Higher pre-admission

science grades have demonstrated statistical significance within nursing program completion

(Robert, 2018). Wolkowitz and Kelley (2010) found that the TEAS science subscale scores

correlated with early nursing education success. Fundamentals of nursing is a course that is

standardly found early in nursing education curriculum. A pre-admission baseline knowledge of

science provides a favorable foundation upon which students can build upon for academic

success within nursing education (Elder et al., 2015).

Prior research supports the ability of the TEAS English language subscale to predict the final grade for a fundamentals of nursing class. English language learners (ELL) have a lower success rate on the National Council Licensure Examination for Registered Nurses (NCLEX-RN) on their first attempt (Hansen & Beaver, 2012; Sears et al., 2015; Silvestri et al., 2013). Preparation for the NCLEX-RN begins in the first nursing courses, like fundamentals of nursing, within a school of nursing's curriculum. Students who lack a solid foundational knowledge of the English language at the start of their nursing education are more prone to have poor academic performance in the classroom and clinical setting, affecting reading speed, reading comprehension, and understanding complex medical concepts (Kaddoura et al., 2017).

Implications

The Test of Essential Academic Skills (TEAS) subscale testing scores demonstrated a statistically significant ability to predict the final course grade in a fundamentals of nursing course for sophomore students in a residential, undergraduate, pre-licensure Bachelor of Science in nursing (BSN) program at a private university in the 2015–2016, 2016–2017, and 2017–2018 academic years. These findings support prior research findings that the TEAS has been utilized to demonstrate success in lower levels of nursing education (Wolkowitz & Kelley, 2010). The TEAS mathematics subscale score was found to be statistically significant in the 2016–2017 sample. The TEAS reading subscale score was found to be statistically significant in the 2015-2016 sample and 2016–2017 sample. The TEAS science subscale score was found to be statistically significant in the 2017-2018 sample. The TEAS English language subscale score was found to be statistically significant in the 2016–2017 sample and 2017–2018 sample. While no TEAS subscale demonstrated statistical significance for all sample groups, each subscale was

represented in at least one sample group demonstrating relevance to academic success in a

fundamentals of nursing course. See Table 12 for the significance and effect size of TEAS

subscales scores across all sample groups.

Table 12

Significance/Effect Size of TEAS Subscale Scores Across all Sample Groups

	Academic Year		
Subscale	**2015 – 2016** **Significance/** **Effect Size**	**2016 – 2017** **Significance/** **Effect Size**	**2017 – 2018** **Significance/** **Effect Size**
TEAS Mathematics subscale	$(p = .197)$ Large $(r = .331)$	$(p = .011)$ Small $(r = .016)$	$(p = .419)$ Medium $(r = .268)$
TEAS Reading subscale	$(p = .004)$ Large $(r = .402)$	$(p = .038)$ Large $(r = .306)$	$(p = .310)$ Large $(r = .298)$
TEAS Science subscale	$(p = .138)$ Large $(r = .314)$	$(p = .067)$ Large $(r = .294)$	$(p < .001)$ Large $(r = .390)$
TEAS English language subscale	$(p = .0629)$ Medium $(r = .250)$	$(p = .009)$ Large $(r = .318)$	$(p = .007)$ Large $(r = .341)$

With the exception of the TEAS mathematics subscale score, all predictor variables had a

large effect size when statistical significance was achieved. For the fundamentals of nursing

course, the overarching learning outcome of the course revolves around helping novice student

nurses develop a more solid foundation in critical thinking, evidence-based practice, and nursing

theory while teaching students how to perform medical skills and procedures (Perry et al., 2017).

Given that the fundamentals of nursing course is a lower level nursing class that is typically

taught during the first-year in nursing school, the use of mathematical knowledge for medication

administration is not a primary emphasis of the course, making the association between the

ability of the TEAS mathematics subscale score to determine the final grade in a fundamentals of nursing course less prominent.

The results of this study appear to support the theoretical framework of this study. Benner's novice to expert theory recognizes that learners cannot be responsible for what is beyond their learning and experience (Benner, 2001). Vygotsky's sociocultural theory utilizes the zone of proximal development. The zone of proximal development is the distance between the "actual developmental level as determined by independent problem solving and the level of potential development as determined by problem-solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). The goal of a nursing educator is to provide direction and stimuli for students to move to a higher level of cognitive thinking, scaffolding on the existing knowledge of the learner so students can move along Benner's novice to expert continuum. In applying Benner's novice to expert theory and Vygotsky's sociocultural theory to the current study, the use of foundational knowledge prior to admission to nursing education can position students for success in a fundamentals of nursing course.

The current study demonstrated that the prior knowledge that is assessed in the TEAS subscale scores can position students for success in a fundamentals of nursing course. In particular, TEAS reading and science subscale scores demonstrated a large effect size across all sample groups (see Table 12). This finding supports the need for a large reading and science focus within nursing curriculum prerequisite courses where nurse educators can emphasize metacognition techniques, reading strategies, technical writing skills, anatomy and physiology knowledge, and medical terminology in an effort to improve nursing student success and perseverance throughout the curriculum.

The results of the current study added to the body of knowledge in nursing education.

Improved student retention and success helps ensure financial and institutional stability and sustainability (Levitch & Shaw, 2014). As student attrition and retention rates increase, institutional credibility increases as these are seen as indicators of quality (Angelino et al., 2007; Thompson, 1999). As the national nursing shortage continues to grow, up to 1.1 million nursing graduates are expected to be needed to help alleviate the problem (American Nurses Association, 2017). Each year over 64,000 qualified applicants are rejected from nursing programs in the United States because of budgetary constraints and a lack of qualified faculty, clinical preceptors, clinical sites, and classroom space (AACN, 2017). This makes the need to retain students who are admitted to BSN programs even more imperative. Using the data findings from the current study, schools of nursing can use predictive analytics, like the TEAS subscale scores, to identify at-risk students in a thoughtful way so that more evidence-based intervention strategies can be employed with residential, undergraduate, pre-licensure BSN students to benefit higher education, the field of nursing, and the national economy.

Limitations

Limitations for the current study were related to single-site testing. The single-site testing was necessary to limit curricular nuances for the fundamentals of nursing course. While fundamentals of nursing is a core curricular course in early nursing education, the emphasis on areas of course content and grading policies may vary from one institution to another. An example of this is the emphasis on medication administration within the fundamentals of nursing course. The participant group is also limited to one school of nursing at a large private university. The participants in the study are attending the same school and tend to share in similar worldviews that may influence some of their academic traits.

Participants for the current study were limited to Bachelor of Science in nursing (BSN) students. Diploma and Associate Degree in nursing (ADN) students demonstrate student characteristics that differ from the BSN student population. For example, Diploma programs had 42% of the student population that was over 30 years old. Associate Degree in nursing programs had an over-30-year-old student population that consisted of 30% of the total student body. This percentage dropped to 18% in BSN programs (National League for Nursing, 2014).

Recommendations for Future Research

This study was based on a nursing curriculum constructed around the 2008 *Essentials of Baccalaureate Education for Professional Nursing Practice*, a publication of AACN that is designed to prepare BSN nurses for the 21st century healthcare system (AACN, 2008). The *Essentials of Baccalaureate Education for Professional Nursing Practice* is expected to be revised at the end of 2018. Future research is suggested in looking at the ability of the Test of Essential Academic Skills (TEAS) subscale testing scores to predict the final course grade in a fundamentals of nursing course based on the revised *Essentials of Baccalaureate Education for Professional Nursing Practice*.

The pre-licensure Bachelor of Science in nursing (BSN) School of Nursing used for this research is accredited by the Commission on Collegiate Nursing Education (CCNE). The National League for Nursing's (NLN) Commission for Nursing Education (CNEA) was established in 2013 and accredited its first pre-licensure BSN program in 2017 (NLN, 2018). While the CNEA accreditation is not yet recognized by the U.S. Department of Education, NLN is working towards this recognition. Future research could be expanded to schools of nursing that have CNEA accreditation.

Additionally, this research was conducted in a pre-licensure BSN program. Conducting similar research in Diploma and Associate Degree in nursing (ADN) programs could provide these levels of nursing education with the same predictive analysis benefits that BSN programs may utilize with the research results of the current study. While the Institute of Medicine (2010) has called for an increase in BSN-prepared nurses in the workforce from 50% to 80% by the year 2020 because of findings that healthcare systems with a higher staff percentage of BSN-prepared nurses have been associated with lower patient mortality rates, readmission rates, and lengths-of-stay (Koh et al, 2016; Woo et al., 2017; Yakusheva et al., 2014), the current nursing shortage in any level of nursing education would benefit from the selection of and retention of qualified applicants into nursing education.

REFERENCES

Abele, C., Penprase, B., & Ternes, R. (2013). A closer look at academic probation and attrition: What courses are predictive of nursing student success? *Nursing Education Today, 33*(3), 258-261. doi: 10.1016/j.nedt.2011.11.017

Ackley, B., & Ladwig, G. (2014). *Nursing diagnosis handbook: An evidence-based guide to planning care*. (11th ed.). Maryland Heights, MO: Mosby-Elsevier.

ACT. (2015). *The ACT profile report: National*. Retrieved from http://www.act.org/content/dam/act/unsecured/documents/ACT-National-Profile-Report-2015.pdf

Aguinis, H., Culpepper, S. A., & Pierce, C. A. (2016). Differential prediction generalization in college admissions testing. *Journal of Educational Psychology, 108*(7), 1045-1059. doi: 10.1037/edu0000104.

Ahlstrom, C. (2014). The Dreyfus model of skill acquisition as applied to task development within training programs. *Military Police, 14*(2), 15.

Allen, J., & Sconing, J. (2005*). Using ACT assessment scores to set benchmarks for college readiness* (ACT Research Report Series 2005-3). Retrieved from http://www.act.org/research/ researchers/reports/pdf/ACT_RR2005-3.pdf

American Association of Colleges of Nursing. (1998). *The essentials of baccalaureate education for professional nursing practice.* Retrieved from http://www.nursingworld.org

American Association of Colleges of Nursing. (2008). *The essentials of baccalaureate education for professional nursing practice.* Retrieved from http://www.nursingworld.org/mainmenucategories/anamarketplace/anaperiodicals/ojin/ta

bleofcontents/volume122007/no3sept07/nursingqualityindicators.aspxEvaluatinghttp://w

ww.aacnnursing.org/Portals/42/Publications/BaccEssentials08.pdf

American Association of Colleges of Nursing. (2017). *Nursing faculty shortage fact sheet.*

Retrieved September 6, 2017, from http://www.aacnnursing.org/Portals/42/News

/Factsheets/Faculty-Shortage-Factsheet-2017.pdf

American Association of Colleges of Nursing. (2018). *The impact of education on nursing*

practice. Retrieved from http://www.aacnnursing.org/News-Information/Fact-

Sheets/Impact-of-Education

American Educational Research Association, American Psychological Association, & National

Council on Measurement in Education. (2014). *Standards for educational and*

psychological testing. Washington, DC: Authors.

American Institutes for Research. (2010). *Finishing the first lap: The cost of first year*

student attrition in America's four year colleges and universities. Retrieved from

http://www.air.org/files/AIR_Schneider_Finishing_the_First_Lap_Oct101.pdf

American Institutes for Research. (2011). *Community college dropouts cost taxpayers nearly $4*

billion. Retrieved from http://www.air.org/news/press-release/community-college-

dropouts-cost-taxpayers-nearly-4-billion

American Nurses Association. (2007). *The national database of nursing quality indicators*

(NDNQI). Retrieved from http://www.nursingworld.org/mainmenucategories

/anamarketplace/anaperiodicals/ojin/tableofcontents/volume122007/no3sept07/nursingqu

alityindicators.aspxEvaluating

American Nurses Association. (2010). *Nursing: Scope and standards of practice. (*2nd ed.*).* Silver

Spring, MD: Author.

American Nurses Association. (2017). *Workforce.* Retrieved from

    http://www.nursingworld.org/MainMenuCategories/ThePracticeofProfessionalNursing/w

    orkforce

American Nurses Credentialing Center. (2017). *Magnet.* Retrieved from

    http://www.nursecredentialing.org/

Angelino, L. M., Williams, F. K., & Natvig, D. (2007). Strategies to engage online students and

    reduce attrition rates. *Journal of Educators Online, 4*, 1-14.

Arkell, S., & Rutter, P.M. (2012). Numeracy skills of undergraduate entry level nurse, midwife

    and pharmacy students. *Nurse Education in Practice, 12*, 198-203.

Ascend Learning, LLC. (2012*). Student attrition: Consequences, contributing factors, and

    remedies.* Retrieved from www.atitesting.com

Assessment Technologies Institute. (2016). *ATI TEAS: Technical manual – Phase 1.* Retrieved

    from http://atitesting.com

Bagnasco, A., Galaverna, L., Aleo, G., Grugnetti, A. M., Rosa, F., & Sasso, L. (2016).

    Mathematical calculation skills required for drug administration in undergraduate nursing

    students to ensure patient safety: A descriptive study. *Nurse Education in Practice, 16*(1),

    33-39.

Barra, M. (2013). The effect of medical mathematics retention strategies in decreasing attrition

    rate among African American licensed practical nursing students in a community college.

    Journal of Cultural Diversity, 20(3), 125-133.

Benner, P. (2001). *From novice to expert: Excellence and power in clinical nursing practice*

    (Commemorative ed.). Upper Saddle River, NJ: Prentice Hall.

Benner, P., Sutphen, M., Leonard, V., & Day, L. (2010). *Educating nurses: A call for radical transformation.* San Francisco, CA: Jossey-Bass.

Benner, P., Tanner, C., & Chelsa, C. (2009). *Expertise in nursing practice: Caring, clinical judgment, and ethics* (2nd ed.). New York, NY: Springer Publishing Company, LLC.

Blegen, M. A., Goode, C. J., Park, S. H., Vaughn, T., & Spetz, J. (2013). Baccalaureate education in nursing and patient outcomes. *Journal of Nursing Administration, 43*(2), 89-94.

Bondmass, M., Moonie, S., & Kowalski S. (2008). Comparing NET and ERI standardized exam scores between baccalaureate graduates who pass or fail the NCLEX-RN. *International Journal of Nursing Education Scholarship, 5*, Article 16. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/18384274

Bremner, M. N., Blake, B. J., Long, J. M., & Yanosky, D. J. (2014). Setting a benchmark for the test of essential academic skills (TEAS) V: Striving for first-semester success in nursing school. *Journal of Nursing Education, 53*(9), 537-540. doi: 10.3928/01484834-20140821-12

Bridgeman, B., Pollack, J., & Burton, N. (2008). *Predicting grades in different types of college readiness*. ACT Research Report 2005-3. Iowa City, IA: ACT, Inc.

Cameron, J., Roxburgh, M., Taylor, J., & Lauder, W. (2011). An integrative literature review of student retention in programmes of nursing and midwifery: Why do students stay? *Journal of Clinical Nursing, 20*(9/10). 1372-1382. doi: 10.1111/j.1365-2702.2010.03336.x

Carnegie Corporation of New York. (2010*). Advancing adolescent literacy: The cornerstone of school reform.* New York, NY: Carnegie Corporation of New York. Retrieved from https://www.carnegie.org/media/filer_public/02/08/02089397-554f-4d56-84bb-302a802a6064/ccny_creview_2010_advancing.pdf

Centers for Disease Control. (2017). *National center for health statistics.* Retrieved from https://www.cdc.gov/nchs/fastats/health-expenditures.htm

Clapper, T. C. (2015). Cooperative-based learning and the zone of proximal development. *Simulation & Gaming, 46*(2), 148-158. doi: 10.1177/1046878115569044

College Board. (2016). *Annual AP program participation 1956–2016.* Retrieved from <media.collegeboard.com/digitalServices/pdf/research/2016/2016-Annual-Participation.pdf>.

Committee on Allied Health Education and Accreditation. (1987). *Allied health education directory*, Chicago, IL: American Medical Association.

Crouch, S. J. (2015). Predicting success in nursing programs. *Journal of College Teaching & Learning, 12*(1), 45-54.

Crow, C. S., Handley, M., Morrison, R. S., & Shelton, M. M. (2004). Requirements and interventions used by BSN programs to promote and predict NCLEX-RN success: A national study. *Journal of Professional Nursing, 20*(3), 174-186. doi: 10.1016/j.profnurs.2004.04.004

Elder, B. L., Jacobs, P., & Fast, Y. J. (2015). Identification and support of at-risk students using a case management model. *Journal of Professional Nursing, 31*(3), 247-253. doi: 10.1016/j.profnurs.2014.10.003

Elsevier Education. (2016). *White paper: 2016 scientific evidence for Elsevier HESI exams and products.* Retrieved from https://evolve.elsevier.com/education/pdf/HESI-Scientific-Evidence-White-Paper.pdf

Evans, D. B. (2013). Examining the influence of noncognitive variables on the intention of minority baccalaureate nursing students to complete their program of study. *Journal of Professional Nursing, 29*(3), 148-154. doi: 10.1016/j.profnurs.2012.04.016

Faddis, M. O. (1939). Eliminating errors in medication. *American Journal of Nursing, 39*(1), 1217-1223.

Finkelman, A. (2016). *Leadership and management for nurses: Core competencies for care* (3rd ed.). Upper Saddle Ridge, NJ: Prentice Hall, Inc.

Flippo, R. F. (2011). Transcending the divide: Where college and secondary reading and study research coincide. *Journal of Adolescent & Adult Literacy, 54*(6), 396-401.

Flinders, B. A. (2013). Using the "Baccalaureate Essentials" to create context: Evaluation of an innovative approach. *Contemporary Issues in Education Research, 6*(3), 305-310.

Freitas, S., Gibson, D., Plessis, C. D., Halloran, P., Williams, E., Ambrose, M., . . . Arnab, S. (2015). Foundations of dynamic learning analytics: Using university student data to increase retention. *British Journal of Educational Technology, 46*(6), 1175-1188. doi:10.1111/bjet.12212

Fulks, J. (2010). *Reading may be the key to unlocking basic skills success.* Sacramento, CA: Academic Senate for California Community Colleges. Retrieved from htttp://www.asccc.org/content/reading-may-be-key-unlocking-basic-skills-success

Gall, M. D., Gall, J. P., & Borg, W. R. (2007). *Educational research: An introduction (8th ed.).* Boston, MA: Pearson Education.

Giddens, J., & Gloeckner, G. W. (2005). The relationship of critical thinking to performance on the NCLEX-RN. *Journal of Nursing Education, 44*(2), 85-89.

Giddens, J., & Meyer, D. (2016). Foundational courses for the baccalaureate nursing degree: Enhancing efficiency for academic progression. *Journal of Nursing Education, 55*(7), 373-378.

Gilmore, M. (2008). Predictors of success in associate degree nursing programs. *Teaching and Learning in Nursing, 3*, 121-124.

Gonzales, K. (2010). Medication administration errors and the pediatric population: A systematic search of the literature. *Journal of Pediatric Nursing, 25*(6), 555-565. doi: 10.1016/j.pedn.2010.04.002

Grando, V. T. (1998). Making do with fewer nurses in the United States, 1945-1965. *Journal of Nursing Scholarship, 32*(2), 147-149. doi: 10.1111/j.1547-5069.1998.tb01270.x

Grossbach, A., & Kuncel, N. (2011). The predictive validity of nursing admission measures for performance on the National Council Licensure Examination: A meta-analysis. *Journal of Professional Nursing, 27*(2), 124–128.

Gutl, C., Rizzardini, R. H., Chang, V., & Morales, M. (2014). Attrition in MOOC: Lessons learned from drop-out students. *Learning Technology for Education in Cloud, 446,* 37-48. doi.org/10.1007/978-3-319-10671-7_4

Hagedorn, S. L. (2005). *How to define retention: A new look at an old problem.* Paper sponsored by the Transfer and Retention of Urban Community College Students Project (TRUCCS) funded by the Lumina Foundation (Grant # 1415). Retrieved online: www.chepa.org.

Hannon, B. (2014). Predicting college success: The relative contributions of five

      social/personality factors, five cognitive/learning factors, and SAT scores. *Journal of*

      Education Training Studies, 2(4), 46-58. doi: 10.11114/jets.v2i4.451

Hansen, E., & Beaver, S. (2012). Faculty support for ESL nursing students: Action plan for

      success. *Nursing Education Perspectives, 33*(4), 246-250.

Harris, R. V., & King, S. B. (2016) Use of standardized test scores to predict success in a

      computer applications course. *Community College Journal of Research and Practice,*

      40(1), 75-78. doi: 10.1080/10668926.2014.985404

Harris, R. C., Rosenberg, L., & O'Rourke, M. E. (2014). Addressing the challenges of nursing

      student attrition. *Journal of Nursing Education, 53*(1), 31-37.

Herrera, C., & Blair, J. (2015). Predicting success in nursing programs. *Research in Higher*

      Education Journal, 28, 1-8. Retrieved from

      https://files.eric.ed.gov/fulltext/EJ1062101.pdf

Herrington, A., & Schneidereith, T. (2017). Scaffolding and sequencing core concepts to develop

      a simulation-integrated nursing curriculum. *Nurse Educator, 42*(4), 204-207. doi:

      10.1097/NNE.0000000000000358

Heslop, L., & Lu, S. (2014). Nursing-sensitive indicators: A concept analysis. *Journal of*

      Advanced Nursing, 70(11), 2469-2482. doi: 10.1111/jan.12503

Homard, C. M. (2013). Impact of a standardized test package on exit examination scores and

      NCLEX-RN outcomes. *Journal of Nursing Education, 52*(3), 175-178. doi:

      10.3928/01484834-20130219-01

Howell, D. C. (2011). *Fundamental statistics for the behavioral sciences* (7th ed.). Belmont, CA:

      Wadsworth.

Institute of Medicine. (2003). *Heath professions education: A bridge to quality*. Washington, DC: National Academies Press.

Institute of Medicine. (2010). *The future of nursing: Focus on education*. Retrieved from http://www.nationalacademies.org/hmd/~/media/Files/Report%20Files/2010/The-Future-of-Nursing/Nursing%20Education%202010%20Brief.pdf

Institute of Medicine. (2011). *Committee on the Robert Wood Johnson foundation initiative on the future of nursing.* Washington, DC: National Academies Press.

Jinks, A. M., Richardson, K., Jones, C., & Kirton, J. A. (2014). Issues concerning recruitment, retention, and attrition of student nurses in the 1950/60s: A comparative study. *Nursing Education in Practice, 14*(6), 641-647. doi: 10.1016/j.nepr.2014.07.002

Jun, W.H., Lee, E.J., Park, H.J., Chang, A.K., & Kim, M.J. (2013). Use of 5E learning cycle model combined with problem-based learning for a fundamentals of nursing course. *Journal of Nursing Education, 52*(12), 681-689. doi: 10.3928/01484834-20131121-03

Juraschek, S. P., Zhang, X., Ranganathan, V. K., & Lin, V. W. (2012). United States registered nurse workforce report card and shortage forecast. *American Journal of Medical Quality, 27,* 241-249. doi: 10.1177/1062860611416634

Kaakinen, J., & Arwood, E. (2009). Systematic review of nursing simulation literature for use of learning theory. *International Journal of Nursing Education Scholarship, 6*(1), 16. doi: 10.2202/1548-923X.1688

Kable, A. K., Levett-Jones, T., Arthur, C., Reid-Searl, K., Humphreys, M., Morris, S., Walsh, P., & Witton, N. J. (2018). A cross-national study to objectively evaluate the quality of diverse simulation approaches for undergraduate nursing students. *Nursing Education in Practice, 28,* 248-256. doi: 10.1016/j.nepr.2017.10.010

Kaddoura, M. A., Flint, E. P., Van Dyke, O., Yang, Q., & Chiang, L. (2017). Academic and demographic predictors for NCLEX-RN pass rates in first- and second-degree accelerated BSN programs. *Journal of Professional Nursing, 33*(3), 229-240. doi: 10.1016/j.profnurs.2016.09.005

Kaplan Nursing. (2012). *Kaplan nursing and Lippincott Williams & Wilkins: Integrated testing program faculty manual* (10th ed.). Retrieved from https://www.sonnet.ucla.edu/sites/default/files/son_files/Kaplan%20Nursing%20Integrated%20Testing%20Faculty%20Manual%20update%20November%202012.pdf

Kelly, P. J., & Crellin, M. A. (2012). *Retention and transfer in Colorado's public colleges and universities.* Retrieved from https://highered.colorado.gov/Publications/Studies/2012/20121213_CO_NCHEMS_Retention_Transfer.pdf

Kelsey, C., & Hayes, S. (2015). Frameworks and models: Scaffolding or strait jackets? Problematising reflective practice. *Nurse Education in Practice, 15*(6), 393-396. doi: 10.1016/j.nepr.2015.05.006

Kobrin, J. L., Patterson, B. F., Shaw, E. J., Mattern, K. D., & Barbuti, S. M. (2008). *Validity of the SAT for predicting first-year college grade point average* (Research Report 2008-5). New York: The College Board.

Koh, K. W., Wang, W., Richards, A. M., & Chan, M. Y. (2016). Effectiveness of advanced practice nurse-led telehealth on readmissions and health-related outcomes among patients with post-acute myocardial infarction: ALTRA study protocol. *Journal of Advanced Nursing, 72*(6), 1357-1367. doi:10.1111/jan.12933

Korvick L. M., Wisener, L. K., Loftis, L. A., & Williamson, M. L. (2008). Comparing the academic performance of students in traditional and second-degree baccalaureate

programs. *Journal of Nursing Education, 47*, 139-141. doi: 10.3928/01484834-20080301-10

Kowitlawakul, Y., Brenkus, R., & Dugan, N. (2013). Predictors for success for first semester, second-degree bachelor of science in nursing students. *International Journal of Nursing Practice, 19* (Suppl. 1), 38-43. doi: 10.1111/ijn.12014

Kukkonen, P., Suhonen, R., & Salminen, L. (2016). Discontinued students in nursing education: Who and why? *Nurse Education in Practice, 17*, 67-73. doi: 10.1016/j.nepr.2015.12.007

Kutney-Lee, A., Sloane, D. M., & Aiken, L. (2013). An increase in the number of nurses with baccalaureate degrees is linked to lower rates of postsurgery mortality. *Health Affairs, 32*(3), 579-586.

Kyllonen, P. C. (2012). The importance of higher education and the role of noncognitive attributes in college success. *Latin American Educational Research Journal, 49*(2), 84-100.

Lahue, B. J., Pyenson, B., Iwasaki, K., Blumen, H. E., Forray, S., & Rothschild, J. M. (2012). National burden of preventable adverse drug events associated with inpatient injectable medications: Healthcare and medical professional liability costs. *American Health Drug Benefits, 5*(7), 1-10. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4031698/

Langford, R., & Young, A. (2013). Predicting NCLEX-RN success with the HESI exam: Eighth validity study. *Journal of Professional Nursing, 29*(2), S5-S9. doi: 10.1016/j.profnurs.2012.06.007

Lavandera, R., Whalen, L. K., Perkel, V., Hackett, D., Molnar, C., . . . Harris, J. (2011). Value-added of HESI exam as a predictor of timely first-time RN licensure. *International Journal of Nursing Education Scholarship, 8*, 1-12.

Levitch, D., & Shaw, M. (2014). Factors contributing to satisfaction and retention in an online doctoral program. *Journal of Online Higher Education, 5*(5), 1-19.

Mattern, K. D., & Patterson, B. F. (2014). *Synthesis of recent SAT validity findings: Trend data over time and cohorts* (College Board Research in Review 2014-1). New York, NY: The College Board.

McCarthy, M. A., Harris, D., & Tracz, S. M. (2014). Academic and nursing aptitude and the NCLEX-RN in baccalaureate programs. *Journal of Nursing Education, 53*(3), 151-159.

McNelis, A. M., Fonacier, T., McDonald, J., & Ironside, P. (2011). Optimizing prelicensure students' learning in clinical settings: Addressing the lack of clinical sites. *Nursing Education Perspectives, 32*(1). 64-65.

Miller, P. H. (2011). *Theories of developmental psychology.* New York, NY: Worth Publishers.

Morrison, S., Adamson, C., Nibert, A., & Hsia, S. (2004). HESI exams: An overview of reliability and validity. *CIN: Computers, Informatics, Nursing, 22*(4), 220-226.

Murray, K. T., Merriman, C. S., & Adamson, C. (2008). Use of the HESI Admission Assessment to predict success. *CIN: Computers, Informatics, Nursing, 26*(3), 67-72.

National Advisory Council on Nurse Education and Practice. (1996). *Report to the Secretary of the Department of Health and Human Services on the basic registered nurse workforce.* Washington, DC: United States Department of Health and Human Services, Health Resources and Services Administration.

National Center for Educational Statistics. (2016). *Digest of educational statistics.* Retrieved

from https://nces.ed.gov/programs/digest/index.asp

National Center for Education Statistics. (2017). *English language learners in public schools*.

Retrieved from https://nces.ed.gov/programs/coe/indicator_cgf.asp

National Council of State Boards of Nursing. (2016). *NCLEX-RN examination: Test plan for the*

National Council Licensure Examination for Registered Nurses. Retrieved from

https://www.ncsbn.org/RN_Test_Plan_2016_Final.pdf

National Council of State Boards of Nursing. (2017). *NCLEX and other exams.* Retrieved from

https://www.ncsbn.org/nclex.htm

National League for Nursing. (2014). *Number of basic RN programs, total and by program type:*

2005 to 2014. Retrieved from http://www.nln.org/docs/default-source/newsroom/nursing-

education-statistics/number-of-basic-rn-programs-total-and-by-program-type-2005-to-

2014.pdf?sfvrsn=0

National League for Nursing. (2018). *FAQs: National League for Nursing Commission on*

Education Accreditation (NCEA: General questions. Retrieved from

http://www.nln.org/accreditation-services/news-and-updates/faqs

New York Senate. (2016). *S2145.* Retrieved from

http://legislation.nysenate.gov/pdf/bills/2015/S2145

Newton, S. (2008). The impact of community college transfer on entry-level baccalaureate

nursing student retention. *Nurse Educator, 33*(1), 45-48.

Norris, S. P., & Phillips, L. M. (1987). Explanations of reading comprehension: Schema

theory and critical thinking theory. *Teachers College Record, 89*(2), 281-306.

O'Keeffe, P. (2013). A sense of belonging: Improving student retention. *College Student*

Journal, 47(4), 605.

Perry, P. A., Potter, A. G., Stockert, P., & Hall, A. (2017). *Fundamentals of nursing* (9th ed.).

    St. Louis, MO: Elsevier.

Pike, G. R., & Graunke, S. S. (2015). Examining the effects of institutional and cohort

    characteristics on retention rates. *Research in Higher Education, 56*(2), 146-165.

    doi:10.1007/s11162-014-9360-9

Poole, P. J., Shulruf, B., Rudland, J., & Wilkinson, T. (2012). Comparison of UMAT scores and

    GPA in prediction of performance in medical school: A national study. *Medical*

    Education, 46(2), 163-171. doi: 10.1111/j.1365-2923.2011.04078.x

Raisman, N. (2011). *Customer service and the cost of attrition (Expanded).* Cincinnati, OH:

    Hobsons.

Robert, N. (2018). Predictors of program completion and NCLEX-RN success in an associate

    degree nursing program. *Nursing Education Perspectives. 39*(1), 38-39. doi:

    10.1097/01.NEP.0000000000000237

Roberts, S., & Campbell, A. (2017). Striving for a good standard of maths for potential

    student nurses. *British Journal of Nursing, 26*(1), 32-36. doi:

    10.12968/bjon.2017.26.1.32

Roller, M. C., & Zori, S. (2017). The impact of instituting process-oriented guided inquiry

    learning (POGIL) in a fundamental nursing course. *Nurse Education Today, 50*, 72-76.

    doi: 10.1016/j.nedt.2016.12.003

Romeo, E. M. (2013). The predictive ability of critical thinking, nursing GPA, and SAT scores

    on first-time NCLEX-RN performance. *Nursing Education Perspective, 34*(4), 248-253.

Sanders, D., & Welk, D. S. (2005). Strategies to scaffold student learning: Applying Vygotsky's zone of proximal development. *Nurse Educator, 30*(5), 203-207.

Sawyer, R. (2010). *Usefulness of high school average and ACT scores in making college admission decisions.* ACT Research Report 2010-2. Iowa City, IA: ACT, Inc.

Schneider, M., & Yin, L. (2011). *The hidden costs of community colleges.* Retrieved from http://www.air.org/resource/hidden-costs-community-colleges

Shapiro, D., Dundar, A., Chen, J., Ziskin, M., Park, E., Torres, V., & Chiang, Y. (2012). Completing college: A national view of student attainment rates. *National Student Clearinghouse Research Center*. Retrieved from http://nscresearchcenter.org/signaturereport4/#ExecutiveSummary

Schooley, A., & Kuhn, J. R. (2013). Early indicators of NCLEX-RN performance. *Journal of Nursing Education, 52*(9), 539-542. doi: 10.3928/01484834-20130819-08

Sears, N. A., Othman, M., & Mahoney, K. (2015). Examining the relationships between NCLEX-RN performance and nursing student factors, including undergraduate nursing program performance: A systematic review. *Journal of Nursing Education & Practice, 5,* 10-15.

Shelton, C. (2016). Students who developed logical reasoning skills reported improved confidence in drug dose calculation: Feedback from remedial maths classes. *Nurse Education Today, 41*, 6-11. doi: 10.1016/j.nedt.2016.03.007

Silvestri, L. A., Clark, M. C., & Moonie, S. A. (2013). Using logistic regression to investigate self-efficacy and the predictors for National Council Licensure Examination success for baccalaureate nursing students. *Journal of Nursing Education & Practice, 3*, 21-34.

Stalpers, D., De Brouwer, B., Kalijouw, M. J., & Schuurmans, M. J. (2015). Associations between characteristics of the nurse work environment and five nurse-sensitive patient outcomes in hospitals: A systematic review of literature. *International Journal of Nursing Studies, 52*(4), 817-835.

Taylor, H., Loftin, C., & Reyes, H. (2014). First-time NCLEX-RN pass rate: Measure of program quality or something else? *Journal of Nursing Education, 53*(6), 336-341. doi: 10.3928/01484834-20140520-02

Thompson, E. (1999). Can the distance education student progress (DESP) inventory be used as a tool to predict attrition in distance education? *Higher Education Research & Development, 18*, 77-84.

Tubbs-Cooley, H., Cimiotti, J. P., Silber, J. H., Sloane, D. M., & Aiken, L. H. (2013). An observational study of nurse staffing ratios and hospital readmission among children admitted for common conditions. *BMJ Quality & Safety, 22*, 1-8. doi:10.1136/bmjqs-2012-001610

Twigg, D. E., Gelder, L., & Myers, H. (2015). The impact of understaffed shifts on nurse-sensitive outcomes. *Journal of Anatomy, 71*(7), 1564-1572. doi:10.1111/jan.12616

Underwood, L. M., Williams, L. L., Lee, M. B., & Brunnert, K. A. (2013). Predicting baccalaureate nursing students' first-semester outcomes: HESI admission assessment. *Journal of Professional Nursing, 29*(2), S38-S42. doi: 10.1016/j.profnurs.2012.07.003

United States Department of Education. (2015). *Federal student aid*. Retrieved from https://studentaid.ed.gov/sa/

United States Department of Labor. (2017). *How to become a registered nurse*. Retrieved from https://www.bls.gov/ooh/healthcare/registered-nurses.htm#tab-4

University of Kentucky. (n.d.). *Med math practice test.* Retrieved from

http://www.uky.edu/Classes/NUR/863/practicetest.htm

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.*

Cambridge, MA: Harvard University Press.

Wambuguh, O., Eckfield, M., & Hofwegen, L. V. (2016). Examining the importance of

admissions criteria in predicting nursing program success. *International Journal of*

Nursing Education, 13(1), 87-96. doi: 10.1515/ijnes-2015-0088

, R. M. (2013). *Applied statistics: From bivariate through multivariate techniques* (2nd ed.).

Thousand Oaks, CA: SAGE Publications.

Westrick, P. A., Le, H., Robbins, S. B., Radunzel, J. M., & Frank, S. (2015). College

performance and retention: A meta-analysis of the predictive validities of ACT scores,

high school grades, and SES. *Educational Assessment, 20*(1), 23-45. doi:

10.1080/10627197.2015.997614

Wolkowitz, A. A., & Kelley, J. A. (2010). Academic predictors of success in a nursing program.

Journal of Nursing Education, 49(9), 498-503. doi: 10.3928/01484834-20100524-09

Woo, B. F., Lee, J. X., & Tam, W. S. (2017). The impact of the advanced practice nursing role

on quality of care, clinical outcomes, patient satisfaction, and cost in the emergency and

critical care settings: A systematic review. *Human Resources for Health, 15*(1), 1-22.

doi:10.1186/s12960-017-0237-9

Wright, K. (2012). The assessment of drug calculation skills: Time to rethink the whole process.

Nurse Education Today, 32, 341-344.

Wu, M., Tam H. P., & Jen T. H. (2017). *Classical test theory.* In *Educational measurement for*

applied researchers (pp. 73-90). Singapore: Springer.

Yakusheva, O., Lindrooth, R., & Weiss, M. (2014). Economic evaluation of the 80%

    baccalaureate nurse workforce recommendation. *Medical Care, 52*(10), 864-869.

Yin, T., & Burger, C. (2003). Predictors of NCLEX-RN success of associate degree nursing

    graduates. *Nurse Educator, 28*(5), 232-236. doi: 10.1097/00006223-200309000-00011

Appendix A: Permission from School of Nursing Dean to Conduct Study

Yes. I approve.

Dean, Liberty University School of Nursing
Administrative Dean, Provost Office

From: Turner, Tracey Milton (Nursing)
Sent: Sunday, May 27, 2018 5:20:35 PM
To: Dean, Liberty University School of Nursing
Subject: Updated Permission to conduct study on LUSON data

Dean, School of Nursing,

The IRB is requesting additional information and an updated permission from you. I have highlighted the changes from your initial permission to conduct the study. Thank you for this consideration.

I would like to request permission to conduct a quantitative research study for my dissertation based on data involving your undergraduate BSN students. Please see information on my study below.

Purpose: The purpose of this non-experimental quantitative study is to determine if Test of Essential Academic Skills (TEAS) subscale testing scores can predict the final course grade in a fundamentals of nursing course for sophomore students in a residential, undergraduate, pre-licensure bachelor of science in nursing (BSN) program at a private university.

Predictor Variables: TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score.

Criterion Variable: The criterion variable is the final grade for fundamentals of nursing course for students from a residential, undergraduate, pre-licensure BSN program at a private university. Fundamentals of nursing is a required course during the sophomore year at the school of nursing under study.

Significance of the Study: This study is important to the topic of nursing student retention in relation to school of nursing admission Test of Essential Academic Skills (TEAS) subscale scores predictive value on final course grades for a fundamentals of nursing course a residential, undergraduate, pre-licensure BSN program at a private university.

Research Questions:
RQ1: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure bachelor of

science in nursing (BSN) program at a private university for the 2015–2016 academic year?

RQ2: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure bachelor of science in nursing (BSN) program at a private university for the 2016–2017 academic year?

RQ3: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure bachelor of science in nursing (BSN) program at a private university for the 2017–2018 academic year?

Data that I am requesting from Liberty University School of Nursing: TEAS subscale scores from student application

Data that I will be requesting from the Liberty University Registrar's Office: Numerical final grade of students in the fundamentals of nursing course (NURS 221) from Spring 2016, Spring 2017, and Spring 2018; Demographic data (Age at time of completion of Fundamentals of Nursing course, gender, ethnicity.

To comply with FERPA law, the following actions will be taken to protect student identities: The Residential BSN Practicum Coordinator will request a report from the registrar's office for each sample group year (2015–2016; 2016–2017; 2017–2018). The Coordinator will send in an Excel sheet with the student name, University ID number, and TEAS subscale scores to the registrar's office. The report received back from the registrar's office will match the student name, University ID number, TEAS subscale scores with the student's numerical final grade in the fundamentals of nursing course (NURS 221) and demographic data (age at time of completion of fundamentals of nursing course, gender, and ethnicity). The report will be sent back to the Residential BSN Practicum Coordinator who will then remove all student identifiers (student name and University ID number) prior to giving data to the primary investigator.

May I be granted permission to conduct this research study? I am happy to provide more information if you desire.

Tracey Milton Turner, EdS, MSN, RNC-OB
Chair of the Residential BSN Program
Assistant Professor of Nursing
School of Nursing

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From: Turner, Tracey Milton (Nursing)
Sent: Tuesday, March 20, 2018 7:07 PM
To: Dean, Liberty University School of Nursing
Subject: RE: Permission to conduct study on LUSON data

Thank you very much.

Tracey Milton Turner, EdS, MSN, RNC-OB
Chair of the Residential BSN Program
Assistant Professor of Nursing
School of Nursing

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From: Dean, Liberty University School of Nursing
Sent: Saturday, March 17, 2018 10:21 PM
To: Turner, Tracey Milton (Nursing) <tturner5@liberty.edu>
Subject: RE: Permission to conduct study on LUSON data

Mrs. Turner,

I think this is a wonderful research idea. I give my approval.

Thank you

Dean, Liberty University School of Nursing
Administrative Dean for Undergraduate Programs
Office of the Provost & Chief Academic Officer

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From: Turner, Tracey Milton (Nursing)
Sent: Friday, March 16, 2018 2:47 PM
To: Dean, Liberty University School of Nursing
Subject: Permission to conduct study on LUSON data

Dean, School of Nursing,

I would like to request permission to conduct a quantitative research study for my dissertation based on data involving your undergraduate BSN students. Please see information on my study below.

Purpose: The purpose of this non-experimental quantitative study is to determine if Test of Essential Academic Skills (TEAS) subscale testing scores can predict the final course grade in a fundamentals of nursing course for sophomore students in a residential, undergraduate, pre-licensure bachelor of science in nursing (BSN) program at a private university.

Predictor Variables: TEAS mathematics subscale score, TEAS reading subscale score, TEAS science subscale score, and TEAS English language subscale score.

Criterion Variable: The criterion variable is the final grade for fundamentals of nursing course for students from a residential, undergraduate, pre-licensure BSN program at a private university. Fundamentals of nursing is a required course during the sophomore year at the school of nursing under study.

Significance of the Study: This study is important to the topic of nursing student retention in relation to School of Nursing admission Test of Essential Academic Skills (TEAS) subscale scores predictive value on final course grades for a fundamentals of nursing course a residential, undergraduate, pre-licensure BSN program at a private university.

Research Questions:
RQ1: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure bachelor of science in nursing (BSN) program at a private university for the 2015–2016 academic year?
RQ2: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure bachelor of science in nursing (BSN) program at a private university for the 2016–2017 academic year?
RQ3: How accurately can the final grade for a fundamentals of nursing course be predicted from the Test of Essential Academic Skills (TEAS) subscale scores for sophomore students from a residential, undergraduate, pre-licensure bachelor of science in nursing (BSN) program at a private university for the 2017–2018 academic year?

Data that I am requesting from Liberty University School of Nursing: TEAS subscale scores from student application

<u>Data that I will be requesting from the Liberty University Registrar's Office:</u> Numerical final grade of students in the fundamentals of nursing course (NURS 221) from Spring 2016, Spring 2017, and Spring 2018.

May I be granted permission to conduct this research study? I am happy to provide more information if you desire.

Thank you for your consideration.

Tracey Milton Turner, EdS, MSN, RNC-OB
Chair of the Residential BSN Program
Assistant Professor of Nursing
School of Nursing

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Appendix B: IRB Approval

Dear Tracey M Turner,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study does not classify as human subjects research. This means you may begin your research with the data safeguarding methods mentioned in your IRB application.

Your study does not classify as human subjects research because it will not involve the collection of identifiable, private information.

Please note that this decision only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued non-human subjects research status. You may report these changes by submitting a new application to the IRB and referencing the above IRB Application number.

If you have any questions about this determination or need assistance in identifying whether possible changes to your protocol would change your application's status, please email us at irb@liberty.edu

Sincerely,

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
The Graduate School

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