PREDICTION OF NURSING STUDENT PERFORMANCE

IN FIRST YEAR COURSEWORK

Except where reference is made to the work of others, the work described in this dissertation is my own or was done in collaboration with my advisory committee. This dissertation does not include proprietary or classified information.

_____

Lynn Purcell Norman

Certificate of Approval:

_____

Maria M. Witte
Associate Professor
Educational Foundations,
Leadership, and Technology

_____

James E. Witte, Chair
Associate Professor
Educational Foundations,
Leadership, and Technology

_____

Margaret E. Ross
Associate Professor
Educational Foundations,
Leadership, and Technology

_____

Stephen L. McFarland
Dean
Graduate School

PREDICTION OF NURSING STUDENT PERFORMANCE

IN FIRST YEAR COURSEWORK

Lynn Purcell Norman

A Dissertation

Submitted to

the Graduate Faculty of

Auburn University

in Partial Fulfillment of the

Requirements for the

Degree of

Doctor of Education

Auburn, Alabama

August 7, 2006

PREDICTION OF NURSING STUDENT PERFORMANCE

IN FIRST YEAR COURSEWORK

_____

Signature of Author

_____

Date of Graduation

VITA

Lynn Norman was born January 11, 1955 in Montgomery, Alabama. She graduated from Robert E. Lee High School in 1973. She attended the University of Alabama and graduated from the University of Alabama at Birmingham with a Bachelor of Science Degree in Nursing in 1977. She received a Master of Science in Nursing Degree from the University of Alabama at Birmingham in 1983. After working as a nurse educator for eight years at Troy State University Associate Degree Nursing Program, an Education Consultant with the Alabama Board of Nursing for twelve years, and a nurse educator at Auburn University Montgomery's Baccalaureate Nursing Program for two years, she entered graduate school at Auburn University in January 2003. She married Jeff Norman on May 24, 1975. They have two daughters, Kay and Karen; one granddaughter, Makenzie; one grandson, Braxton; and two grandsons on the way, Brewer and Braylen.

DISSERTATION ABSTRACT

PREDICTION OF NURSING STUDENT PERFORMANCE

IN FIRST YEAR COURSEWORK

Lynn Purcell Norman

Doctor of Education, Auburn University, August 7, 2006
(MSN, University of Alabama–Birmingham, 1983)
(BSN, University of Alabama–Birmingham, 1977)

150 Typed Pages

Directed by James E. Witte

Abstract

The nursing shortage affects nurses in clinical practice and those who educate

students in nursing education programs. An influx of students seeking admission into

nursing programs in combination with the shortage of nursing faculty has led to the need

to determine early in the admission process which nursing students will be successful in

the nursing program and which students will not. This study investigated the relationship

between the score on a nursing pre-admission examination, HESI A^2, and cumulative

grades from prerequisite academic support courses as predictors of success in the junior

year of a baccalaureate nursing education program. Demographic characteristics, nursing

theory course grades, and learning style, personality profile, and behavioral factors from the preadmission examination were analyzed as predictors.

This study was designed using a retrospective correlational approach to determine predictors of success in the junior year of a baccalaureate nursing education program. Data from one hundred twenty eight students seeking admission into the program were analyzed. There was a statistically significant correlation between the grade point average of the prerequisite academic support courses and the HESI A^2 cumulative score for the sample. There was a statistically significant relationship with both the admission GPA and the HESI A^2 cumulative score with success in the junior year of the nursing education program. Use of the cumulative GPA of the pre-nursing academic support courses and the HESI A^2 as admission criteria was supported in this study. Demographic data showed too few participants in the sample to provide an analysis or an absence of a statistically significant difference between those who were successful in the junior year and those who were not. A statistically significant difference was noted between analytical and global learning styles in the group that was not successful in the junior year.

ACKNOWLEDGMENTS

The author would like to thank those who made this endeavor possible. The encouragement of my committee members, AUM colleagues, and family led to the completion of the degree.

I thank you Dr. James Witte for your encouragement and personal demonstration of teaching the adult learner. Dr. Maria Witte, thank you for your encouragement and attention to details. Thank you, Dr. Margaret Ross for your encouragement and enthusiasm for statistics.

My AUM colleagues supported and encouraged me throughout the program. Thank you especially to Dr. Barbara Witt for your support and to the AUM School of Nursing faculty and staff.

I am privileged to have family who prayed and encouraged me to complete this journey. This dissertation is dedicated to: my grandmother, Nell Brewer, who has supported me through all my degrees; my husband, Jeff, who was always there to love me and never wanted me to stop until it was finished; my mother, Nell Murphy, who was always delighted with my progress; and my daughters, Kay N. Welch and Karen N. Corley, who are relieved that it is finished. Finally, to Makenzie and Braxton, you now have my undivided attention. Thank you, God, for the doors You opened and the guidance through Your Word.

Style manual or journal used: <u>Publication Manual of the American Psychological</u>

<u>Association, 5th Edition.</u>

Computer software used: <u>SPSS 11.5 for Windows, Windows XP, and Microsoft</u>

<u>Word 2003</u>

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION

A current shortage of practicing nurses has prompted nursing education programs to produce more nursing graduates for the workforce. Continuous publicity of the current job market for nurses and future nursing graduates has increased the number of potential students seeking admission into nursing programs (American Association of Colleges of Nursing [AACN], 2004; AACN, 2005; Johnson & Johnson, 2005). Parallel to the shortage of nurses in practice is the decreasing number of nursing faculty available to teach the increasing numbers of students (Hinshaw, 2001). Meeting the need for more nursing graduates in conjunction with the decreased number of faculty is a dilemma for nursing education program administration and members of the faculty. One strategy is to limit enrollment. However, limiting enrollment further adds to the shortage of nurses in practice. Faculty must seek ways to select students from the large pool of applicants who represent a reasonable prospect of success in the nursing education program and including successful completion of the national licensure examination for registered nurses. A method is needed for early identification of potentially successful students in the application process or early in the nursing education program.

The shortage of practicing nurses and nursing faculty has resulted from various factors affecting the workforce. Buerhaus, Staiger, and Auerbach (2000) retrospectively analyzed the employment trends from the US Bureau of the Census Current Population

Surveys between 1973 and 1998. The study determined that during the 1960s and 1970s students, mostly female, who entered the nursing profession, were between the ages of fifteen to nineteen years. In the 1980s the group of students increased with age causing older students to enter nursing programs. Based on the age related patterns, Buerhaus, et al. (2000) projected the future trend of the nursing shortage to continue. By the year 2020, the size of the registered nurse workforce will be approximately twenty percent below the forecasted need. While the focus of the Buerhaus, et al. (2000) study was the aging nursing population, women taking other job opportunities or choosing child rearing instead of employment added to the decrease number of nurses in the workforce (AACN, 2003).

Following the publicity and concern over the nursing shortage, nursing student applications to baccalaureate programs began to rise. The American Association of Colleges of Nursing's (AACN) 2002 annual survey of baccalaureate programs showed an eight percent increase in enrollments over the previous year (AACN, 2002). Kathleen Long, president of AACN in 2002, complimented the nursing programs for bringing attention to the shortage and beginning to fill the gap (AACN, 2002).

Factors contributing to the nursing shortage such as the aging workforce and job competition are identical to those affecting faculty positions. Hinshaw (2001) indicated that the decrease in the number faculty further adds to the nursing shortage because of limits placed on nursing enrollments. The report on *2003–2004 Enrollment and Graduations in Baccalaureate and Graduate Programs in Nursing* from AACN (Berlin, Stennett, & Bednash, 2004) identified that 15,944 qualified baccalaureate nursing program applicants were denied admission in 2003 due in part to an insufficient number

of faculty. Furthermore, AACN (2005) reported that 32,797 qualified applicants were not accepted at schools of nursing in 2004 primarily due to a shortage of faculty to teach the students and resource restraints.

Faculty, who teach in programs and prepare nursing students for professional nursing practice, are faced with a dilemma of deciding which students to admit into the nursing program and which to exclude. Identifying students who will be successful in the nursing program and on the National Council Licensure Examination for Registered Nurses (NCLEX-RN) has been the basis of several studies (Alexander & Brophy, 1997; Arathuzik & Aber, 1998; Beeman & Waterhouse, 2001; Beeson & Kissling, 2001; Brisco & Anema, 1999; Crow, Handley, Morrison, & Shelton, 2004; Daley, Kirkpatrick, Frazier, Chung, & Moser, 2003; Endres, 1997; Haas, Nugent, & Rule, 2004; Nibert & Young, 2001; Nibert, Young, & Adamson, 2002; Sayles, Shelton, & Powell, 2003; Schmidt, 2000; Seldomridge & DiBartolo 2004; Washington & Perkel, 2001). Few studies (Gallagher, Bomba, & Crane, 2001; Lewis & Lewis, 2000; Potolsky, Cohen, & Saylor, 2003; Sandiford & Jackson, 2003) have identified factors that predicted success early in the application process or during the education process.

Crow, Handley, Morrison, and Shelton (2004) surveyed 160 baccalaureate nursing programs across the United States to identify what data were used to predict the NCLEX-RN success. Ninety percent of the nursing education programs surveyed required a comprehensive end of program examination prior to graduation to predict those who would be successful on NCLEX-RN. Twenty-nine percent of those nursing programs surveyed used a cumulative grade point average (GPA) of pre-nursing courses plus the nursing theory and clinical courses to predict success on the licensure

3

examination. Approximately 36.3 percent of the programs used specific nursing course grades to predict success on NCLEX-RN. The data for these variables used for prediction were collected during the nursing program or immediately prior to graduation.

Earlier identification of those likely to be successful in the nursing education program or pass the NCLEX-RN would be beneficial to faculty and the students. Crow et al. (2004) identified that baccalaureate nursing programs should contemplate using standardized entrance examinations as admission criteria to improve success in the program and the NCLEX-RN pass rates for their students. Although the NCLEX-RN is the decisive outcome for nursing graduates to become licensed, this examination is taken after graduation from the nursing education program.

Attrition in undergraduate nursing education programs occurs throughout the first year of nursing courses and up to graduation. Astin (1991, 1993) identified factors affecting attrition in general education programs and categorized them into academic, student profile characteristics, environmental, psychological, and professional integration. These same factors relate to nursing education programs (Jeffreys, 2004). Progression policies in nursing programs determine which students continue in the program. Success in the nursing program is measured by nursing course grades. Success or failure in the nursing courses affects the nursing GPA and overall college GPA, which has a major effect on attrition (Jeffreys, 2004). Identification of those who are most likely to be successful early in the nursing education program would be more beneficial to faculty and the students.

Problem Statement

With the overabundance of students seeking admission into nursing programs and a limited number of faculty available to teach the students, early identification of those students who will be successful in the nursing education program is imperative. Identifying students who would be successful early in the education process allows students who may not be candidates for admission into nursing programs to seek alternative career options. Additionally, early identification of at risk students can provide remediation strategies to be used at intervals during the process of completing the nursing program (Haas, Nugent, & Rule, 2004; Morrison, Free, & Newman, 2002; Nibert, Young, & Britt, 2003).

Variables such as GPA on the pre-nursing courses have been used in many programs as the sole method of selecting students for admission. Health Education System, Inc. (HESI) has developed the HESI Admission Assessment[TM] Examination (HESI A^2) as an additional means to assist faculty in identifying students for admission. There is a limited amount of research on the HESI A^2 and predicting success in a nursing program. This study adds to the body of knowledge and validation of the HESI A^2. This study offers insight on screening criteria for pre-nursing students. The study also yields information to better prepare students accepted into the nursing program.

Identifying a predictive pre-screening method for identifying those nursing students who will be successful in the nursing program is imperative for nursing faculty. Early identification of those students who will be successful in the nursing program will assist in meeting the nursing shortage and prevent unnecessary expenditures for the

student, such as tuition, books and supplies and for the nursing education program, such as faculty time spent on extensive remediation for potentially unsuccessful students.

Purpose of the Study

The purpose of this study was to examine the relationship between the prerequisite academic support courses for a nursing program and the HESI A^2 as a predictor of success in the first year of a baccalaureate nursing education program. This study also identified demographic characteristics, nursing theory course grades, and HESI A^2 based factors that can be used to predict first year student success.

Research Questions

Four research questions were addressed in the study:

1.   What is the relationship between the admission GPA and the HESI A^2 for nursing students?

2.   What is the relationship between the admission GPA and success in the first year of the nursing education program?

3.   What is the relationship between the HESI A^2 scores and students who were successful in the first year of the nursing education program and those who were not?

4.   What demographic characteristics, nursing theory course grades, and HESI A^2 based factors are predictive of success in the first year of the nursing education program?

Significance of Study

There is a limited amount of research on the HESI A^2 and predicting success in the first year of a nursing program and this study will add to this body of knowledge. This study will potentially offer insight on criteria used to screen students for admission into a nursing education program or identify students who may be at risk for being unsuccessful. A further potential result for this study is that it may yield information to identify and better prepare students who are enrolled in the nursing program for the rigors of the nursing curriculum.

Theoretical Framework

Astin's (1991) input-environment-outcome (I-E-O) conceptual model for assessment was used as a guide for this study. The I-E-O model "provides a powerful framework for the design of assessment activities and for dealing with even the most complex and sophisticated issues in assessment and evaluation" (p. 16).

As a foundation for the I-E-O model, Astin (1991) discusses assessment as a means of research to assist educational programs in making decisions regarding student learning. The basic purpose of assessment from Astin's perspective is to enhance the student's educational development. According to Astin, assessment is the gathering of information regarding the performance of students. Assessment refers to two different activities: the collecting of information (measurement) and the use of that information for institutional and individual improvement (evaluation).

Evaluation according to Astin (1991) is the rendering of value judgments. Evaluation of the information generated by a measurement incorporates making a value

judgment on the pedagogical methods or decisions for providing feedback to the student on the material presented.

Assessment of students occurs throughout the college experience. Assessment has two purposes: to help select students (immediate purpose) and to enhance the excellence of the institution (underlying value) (Astin, 1991). An immediate purpose in selecting students for admission into a particular educational program would occur when the grade point average (GPA) or admission test scores are used as criteria. Colleges are interested in admitting those students with the best possible GPAs and highest possible test scores. Admission of these students suggests academic excellence and higher quality academic program, which encompasses an underlying value of the institution.

Classroom assessment is another activity in connection with college courses. Compilation of course grades are used to generate each student's GPA. Uses of the GPA vary and may be used for determining eligibility for graduation, honors, probation, or for selecting and screening students for admission or employment. Concerns about the GPA, according to Astin (1991), is that it does not fully represent what the student knows or their competencies. Instead, Astin stated the "GPA is a relativistic or normative measure, i.e., how a student compares to other students at a particular time" (p. 12). Controversy exists over the extent of usefulness of the GPA (Pascarella & Terenzini, 1991; Scanlan & Care, 2004).

Credentialing or certification is another use of assessment in relation to the college experience. In certain professions, such as medicine, law, accounting, and nursing tests are required for entry into practice or licensure (Astin, 1991).

Results of the measurement provide information necessary for making decisions about the learning process. This decision making process incorporates making value judgments or an evaluation. The evaluation leads to decisions regarding which students to select for admission, progression, or graduation. Evaluation also is used when seeking alternative courses of action in pedagogical techniques (Oermann & Gaberson, 1998).

Astin's I-E-O model of assessment focuses on the college students' development using three elements: students' input assessments, the environment, and output assessments. The model has been used to study the impact of college attrition, success, or lack of success in education programs and student involvement (Pascarella & Terenzini, 1991).

The first of the three elements of the Astin (1991, 1993) model is input. Input refers to the personal qualities or characteristics of the student at the time of initial entry into the institution or to the education program. The input is significant for two reasons. The first reason is that it provides information about the students' strengths and weaknesses. The second reason is that it provides a baseline for assessing how much students actually learn and how much their performance improves between the beginning and end of a course. The input can provide an early opportunity to adjust teaching strategies during a particular course of study. Input measures are of two classifications: fixed characteristics and those that can change over time. Fixed type of data includes demographic data such as gender, age, ethnicity, income, and marital status. Cognitive functioning, aspirations, values, behavioral characteristics can change over time however, may be classified as input data. Sources of input data are admission and registration data,

results of placement tests, and any assessment during orientation or admission into an education program.

Inputs can be identified as independent variables. Input data using the I-E-O model, can be used to show the effects of student interaction with the environment. Examples of this type of input data would be student gender, age, ethnicity, ability or socio-economic level. Other institutional purposes of input data may be for admissions and recruitment, curriculum and program evaluation, and public information.

The second element of the model is the environment. Assessment of the environment is the most challenging of the three elements. The broad basis of the environment includes any occurrence that happens to the student during the educational program that might influence the outcomes under consideration. Factors included in the environment include the curriculum; pedagogical techniques; facilities; behavior of classmates and friends; co-curricular activities; and special programs such as orientation, remediation, or honors. .

In assessing the environment, Astin (1991) discusses three issues: unit of observation, self-produced environment, and source of the data. The unit of observation is the entity to which the measurement is being applied. The entity may be the student, the faculty member, or the institution depending on the rationale for the study. A second issue is the student's self-produced environment where the student chooses their own living or study environment. Sources of environmental data include institutional records and student surveys.

The third element of the I-E-O model is outcomes. Outcomes are resulting characteristics educators are attempting to incorporate in an education program or

develop after exposure to the environment (Astin, 1991, 1993). The outcomes reflect the aims and objectives of the educational program.

Outcomes may be cognitive or affective. Cognitive outcomes comprise knowledge and higher order mental processes including specific subject matter knowledge, academic ability, academic achievement, and professional competency. Affective outcomes are feelings, attitudes, and values that may be measured using self-administered questionnaires. Outcomes may be short-term measures such as GPA, receipt of honors, or long term measures that include successful completion of an educational program or subsequent job performance. Outcomes are oftentimes dependent variables such as posttests, standardized tests results, measurements of retention, end of program assessments, or GPA (Astin, 1991).

Astin's (1991) I-E-O model was used as a guide for this study. The elements of the I-E-O model and the relationships in this study were:

a.   The GPA used for admission into the program and the HESI Admission Assessment (HESI A2) are addressed as input in the model.

b.   The environment in the study is one southern public university baccalaureate in nursing program.

c.   The output includes the completion of the nursing courses in the junior year of the nursing education courses.

Limitations of the Study

Several limitations to the study are identified. The first limitation was that the data were archival from one baccalaureate nursing education program at a southern university.

A convenience sample over a three-year time frame was used. A convenience sample is the weakest form of sampling and has the greatest risk of sampling bias (Polit & Beck, 2004). Retrospective data prevents manipulation of any intervening variables. Intervening variables that could occur between administration of the HESI A2 and completion of the first year nursing courses were not identified or studied.

Assumptions

For the purposes of this study, several assumptions were identified. Early identification of students who will not be successful in a nursing education program is more beneficial than waiting until the culminating nursing course. Faculty can provide remedial interventions for those students identified early in the education process as being potentially unsuccessful. Attrition in nursing education programs is expensive to the student, faculty, and administration. Another assumption related to the participants was that the participants were representative of future applicants of the nursing education program. An assumption was made that the students taking the HESI A^2 were motivated to exert their best effort in selecting their answers.

Definition of Terms

The following terms are defined for interpretation of their use in this study:

Admission GPA is the average score calculated from grades received in academic pre-requisite courses taken prior to admission into the nursing education program. Pre-requisite courses include English composition and literature, fine arts elective, history, government, sociology, general psychology, finite math, biology, introduction to

12

chemistry, nutrition, anatomy and physiology I, anatomy and physiology II, microbiology, and developmental psychology. The university is on a four-point scale. Grades in the pre-requisite courses that are below a C are not accepted and must be repeated.

Baccalaureate Nursing Education Program (BSN) is an organized program of study leading to the baccalaureate degree in nursing which requires at least 120 semester credit hours in pre-requisite academic support courses and major nursing theory and concurrent clinical courses.

Grade Point Average (GPA) is the calculated average score based on grades received from courses taken in the academic setting.

Health Education Systems, Inc. Admission Assessment Examination^{TM} (HESI A^2) is a measurement instrument designed to assist faculty in pre-nursing selection and placement decisions and is given to students prior to admission into the nursing education program.

HESI A^2 based factors includes scores in the following components of the examination: Math, Reading Comprehension, Grammar, Vocabulary, Anatomy and Physiology, Chemistry and Behavioral Inventory. Also included is the learning style and personality profile portion of the examination.

National Council Licensure Examination for Registered Nurses (NCLEX-RN) is the national computerized adaptive examination developed to measure the competencies of an entry-level registered nurse necessary to practice safe, effective care. State licensure is based on passing this examination.

Nursing Education Program is a program of study whereby a student upon successful completion will possess an associate degree (two-year), diploma (three-year), or baccalaureate degree (four-year) in nursing and is eligible to apply for nursing licensure in the United States or its territories.

Success in the junior year is defined as completing the following nursing theory courses with a grade of C or better: NURS 3410 (Pathophysiology), NURS 3510 (Nursing Skills), NURS 3610 (Holistic Assessment), NURS 3710 (Professional Nursing Concepts I), NURS 3320 (Pharmacology), NURS 3420 (Nursing Research and Data Management) NURS 3720 (Holistic Nursing: Adults and Geriatrics), and NURS 3740 (Holistic Nursing: Infants and Children).

Upper division of the nursing education program is defined as the nursing theory and concurrent clinical courses taken during the junior and senior academic year.

Organization of the Study

This study is divided into five chapters. Chapter I introduces the study; identifies the problem, purpose, research questions, and significance of the study; describes the theoretical framework; identifies limitations and assumptions; and defines the significant terms of the study. Chapter II includes a review of literature that focuses on the history of baccalaureate nursing education, and essential functions and attributes required for nursing practice and integral to nursing education. The magnitude of the current shortage of practicing nurses and nursing education faculty will be discussed. Concepts of assessment, measurement and evaluation used in nursing education are included. Prediction is defined and published studies of predictors of success in nursing education

14

are identified. Methods for the study are presented in Chapter III including the

participants and sample, variables of interest, measurements, data collection and methods

used for data analysis. Chapter IV reports the findings of the study. Chapter V concludes

with a summary of the study, conclusions, implications and recommendations for further

research and for nursing program educators.

II. REVIEW OF LITERATURE

Introduction

Today's baccalaureate nursing education programs provide demanding theoretical and clinical experiences to prepare the nurse graduate to practice in a challenging and perpetually changing workplace. Nursing students are required to maintain the rigors of the curriculum and successfully complete each sequential nursing course. Nursing faculty are confronted with the challenge to maintain the integrity of the program and prepare the student following graduation for passing the NCLEX-RN and providing safe, effective nursing care to the public.

A current nursing shortage exists which effects practicing nurses and nursing faculty in education programs. Publicity about the current nursing shortage and sponsorships of nursing education such as Johnson & Johnson's Campaign for Nursing's Future (AACN, 2004; AACN, 2005; Johnson & Johnson, 2005) and the Nurse Reinvestment Act (2002) has created a surge of students seeking application to nursing programs. The influx of nursing student applications along with a shortage of nursing faculty has caused nursing education programs to turn away qualified applicants (Berlin, Bednash, & Stennett, 2001; Berlin, Stennett, & Bednash, 2003; Berlin, Stennett, & Bednash, 2004; Berlin, Wilsey, & Bednash, 2005; Hinshaw, 2001; National League for Nursing [NLN], 2005). Establishing criteria for the selection of those applicants who will

be admitted into the nursing program is a difficult yet necessary role for faculty and nursing program admission committees.

Studies in the nursing literature have attempted to identify criteria that could be used for admission selection. However, most of these studies focused on the prediction of success or failure on the NCLEX-RN (Alexander & Brophy, 1997; Arathuzik & Aber, 1998; Beeman & Waterhouse, 2001; Beeson & Kissling, 2001; Brisco & Anema, 1999; Campbell & Dickson, 1996; Crow, Handley, Morrison, & Shelton, 2004; Daley, Kirkpatrick, Frazier, Chung, & Moser, 2003; Haas, Nugent, & Rule, 2004; Nibert & Young, 2001; Nibert, Young, & Adamson, 2002; Sayles, Shelton, & Powell, 2003; Schmidt, 2000; Seldomridge & DiBartolo 2004; Washington & Perkel, 2001). The NCLEX-RN is taken following graduation from a nursing education program. By this time, attrition has occurred and some students have either been academically unsuccessful in the nursing courses or have withdrawn from the program due to personal reasons. Student attrition leaves unfilled cohort positions that could have been filled by other qualified students. If these potentially unsuccessful students had been identified earlier, perhaps remediation could have prevented the exodus from the nursing education program or more qualified students could have been selected. Earlier identification of those students who might have been academically successful or unsuccessful needs to occur.

The purpose of this study was to examine if a pre-assessment nursing review could identify or predict which students would have been successful in the first year of the nursing education program at one public baccalaureate nursing program in the southeastern region of the United States. The GPA calculated from the pre-requisite

17

academic support courses for nursing and the results from the Health Education System, Inc. Admission Assessment (HESI A^2) examination were two selected variables used to predict success in the first year in the nursing program. Success is determined by completing the junior nursing courses with a C or better. Criteria that can be used for admission selection or the identification of potentially successful or unsuccessful students early in the nursing program will assist nurse educators in directing those students.

The review of literature for this study will provide an understanding of nursing education and practice. The review begins by focusing on the history of baccalaureate nursing education. The core competencies required for the practice of nursing will be identified in addition to how baccalaureate nursing education programs focus to prepare graduates to possess those competencies. The magnitude of the nursing shortage and its effect on nursing education will be discussed. The review also elaborates on the role of assessment, measurement, and evaluation in nursing education. Finally, a discussion of prediction and predicting success in nursing education programs is addressed.

History of Baccalaureate Nursing Education

Florence Nightingale's desire to help the infirm of the British army in the Crimean War around 1856 established a pattern of behaviors known as the modern secular profession of nursing (Reverby, 1984). Her desire to eliminate the deplorable conditions of the hospital treating the British army soldiers became a reality with her leadership ability. Her efforts succeeded in overcoming longstanding prejudices about nursing from physicians and the public and led to an elevation in the status of all nurses.

Dolan (1963) recognized Nightingale as raising the status of nursing, improving the quality of nursing care, and as the founder of modern nursing education.

Following international recognition for her courage and perseverance in changing the conditions at the military hospital, Nightingale pursued two goals: reform of army sanitary practices and the establishment of a school for nurses (Kalisch & Kalisch, 2004). Using the practices she began with the British military hospital, she originated a nurse training school as an experiment at St. Thomas' Hospital in London in 1860, which later served as the basic foundation for the education of nurses in the United States (Chitty, 2005). Most of the physicians in London at this time opposed the project. It was considered that nurses needed little training because their roles were similar to house maids.

Nightingale desired to share her thoughts on the caring for the health of others. She published her *Notes on Nursing: What It Is, and What It Is Not* which for decades served as the standard text for nursing practice. In her notes, Nightingale (1859) wrote that the most essential part of nurses' training was:

> … to teach them what to observe—how to observe—what symptoms indicate improvement—what the reverse—which are of importance—which are of none— which are the evidence of neglect—and of what kind of neglect. (p. 59)

This observation, Nightingale believes, is for the sake of saving life and increasing health and comfort.

She further stipulated that nurses must use one's own senses to make impressions of the patient. This ability, according to Nightingale, is essential to nursing. In her writings, she also warned against non-trained personnel (Kalisch & Kalisch, 2004).

During the Civil War, conditions in United States' military hospitals were similar to those found in the British military hospital during the Crimean War (Chitty, 2005). In America, there were similar prejudices regarding the inappropriateness of a woman taking on the roles of a nurse especially in military hospitals since it was a male dominated society (Kalisch & Kalisch, 2004). Nightingale's influence crossed the ocean to the United States.

In 1862, Dr. Marie Zakrzewska opened the New England Hospital for Women and Children in Boston with the expressly stated purpose for the training of nurses. This program included six months of training in the practice of maternity and childcare (Kalisch & Kalisch, 2004). The program was expanded ten years later into the first general training school for nurses under the auspices of female physician-instructors. The training program located in the hospital offered lectures on medical, surgical and obstetric nursing. Students in the program, or trainees as they were called, resided at the hospital. Apprenticeships, which were the accepted method of instruction for the practicing of nursing skills, comprised 98 to 99% of the program teaching methods (Reverby, 1984).

Modeling after the Nightingale system, several other training schools began operation in New England in the late 1800s (Chitty, 2005). At times, applications for admission were exceedingly high until the trainees realized the amount of time and effort necessary for completion of the program. Strict rules placed on the student nurses and women's role in society often dictated the number of applications and admissions. Curricular theory content included anatomy and physiology, surgical and medical emergencies, obstetric and gynecological nursing, nursing of children, nervous diseases,

dietetics, hygiene and *materia medica* currently known as pharmacology. Lectures were provided by male physicians (Kalisch & Kalisch, 2004).

By 1900, there were 1006 nurse training schools in the United States. Admission criteria included two years of high school and home education with knowledge of housekeeping duties. Nursing theory, ethics, bacteriology, and massage were added to the now three-year program of training. While physicians taught the core medical and surgical content, registered nurses were beginning to teach as well. Practical training was under the supervision of registered nurses and continued to consist of long strenuous hours (Kalisch & Kalisch, 2004).

World War I demanded a greater number of nurses appropriately educated. In 1918, Vassar College experimented with a training program to demonstrate that college graduates and those with a longer period of academic education would be a special asset in the training of nurses. A 3-month preparatory course added pre-nursing courses in chemistry, economics, history, and psychology to the curriculum. The program, which sent students to cooperating hospitals for the remainder of the program, was successful and spread to five universities throughout the United States. The program showed how cooperating higher educational institutions could include training of nurses. The standard of teaching was higher at the university than most nursing schools (Kalisch & Kalisch, 2004).

Another arrangement for nurse training in university settings occurred between the years of 1916–1920. A combination of academic and professional courses for four to five years led to a diploma in nursing and bachelor's degree in nursing or science. Following high school, preliminary course work was completed at the university

followed by two years of nursing training at the hospital with a year of clinical specialization (Kalisch & Kalisch, 2004; Reverby, 1984). The numbers of interested students and results of this type of training were disappointing. The hospital continued to be dependent on the students for patient care and the course of study was long and tedious (Kalisch & Kalisch, 2004).

Yale University received a grant from the Rockefeller Foundation in 1924 to initiate a nursing program as a separate department with its own budget and dean. The stipulation was to establish the shortest feasible curriculum, which consolidated nursing theory and practice into a curative and preventive framework. Pre-nursing courses included chemistry, psychology and biologic sciences. This program led to a Bachelor of Nursing degree and included public health, community work and hospital service. The program was deemed successful by the Rockefeller Foundation. The success of the program promoted "attainment of a high degree of technical skill and an understanding of the underlying principles" (Kalisch & Kalisch, 2004, p. 230) with an insight into the social and economic forces that affect the patient.

The movement to the university setting continued to be plagued with financial difficulties and opposition from physicians and university administration. The physicians fostered the belief that nurses were over-trained and that brief training in bedside routines would be sufficient. Laws for the registration of nurses did not mandate the higher standards for nursing education. Additionally, standards for curricula in nursing education programs were non-existent. Practical experiences for nursing students were limited to the type of hospital in which the education program was located. The education program was a working department where the students were responsible for furnishing its

nursing service as apprentices (Kalisch & Kalisch, 2004). Administrations of universities were reluctant to accept nursing as a discipline in academics (Chitty, 2005).

In the late 1920s, most nursing education continued to be at an apprenticeship level in the hospital issuing a diploma upon graduation. Hospitals exploited student nurses in an attempt to save money in caring for the patients (Kalisch & Kalisch, 2004) and to staff the hospitals (Chitty, 2005). Financial burdens and difficulty in locating faculty with scholastic qualifications created an additional deficiency in nursing education and graduations of nurses for the workforce (Kalisch & Kalisch, 2004).

A shortage of nurses continued throughout World War II. In 1952, nursing education programs proliferated in community and junior colleges. The purpose of this movement was to prepare bedside nurses for beginning general-duty positions at a faster rate to help reduce the critical shortage of nurses. This plan would add some academic experiences to nursing education thus offering a two-year associate degree in nursing. The three-year hospital diploma programs began having financial difficulty maintaining enrollments (Kalisch & Kalisch, 2004).

In the 1950s, baccalaureate nursing programs were seen as standard diploma programs offered in a collegiate setting. The quality of the baccalaureate graduate could not be differentiated from the diploma graduate. In 1957, a paper published by the National League for Nursing (NLN) described the need for increasing the number of baccalaureate nursing graduates in preparation for graduate study for teaching, administration, and supervision (Kalisch & Kalisch, 2004). Universities needed to provide educational resources for the nursing programs at the same quality as other professional programs.

23

In addition, in the 1950s Margaret Bridgman from Skidmore College first referred to a separation of courses in baccalaureate nursing education programs (Keating, 2006). The lower division included general education courses and pre-requisite courses necessary for the support of the theory and practice of nursing. The lower division courses include physical, biological, and social sciences. The upper division courses were specific nursing theory and clinical practice courses, which included fundamental nursing skills and nursing skills for adults, children, mothers, and newborns.

Funding for nursing education through the federal government by means of the Nurse Training Act of 1964 and Professional Nurse Traineeships assisted in the recruitment of nursing students and graduates in the 1960s (Kalisch & Kalisch, 2004). At this time, there were three levels of nursing education programs. The two-year associate degree in nursing, the three-year diploma of nursing, and the four-year baccalaureate degree in nursing existed. A lack of consistency in length of study and curriculum caused internal and public confusion of the profession of nursing. Employers of nurses had difficulty differentiating the levels of nursing graduates in practice (Nelson, 2002).

In 1965, the American Nurses Association (ANA) proposed a position, whereby, nursing education would develop into two levels: technical and professional. This group recommended that in the future, all nursing education be based in colleges or universities. Students interested in technical nursing practice would consider junior or community colleges and earn an associate degree in a two-year program. Those students interested in professional nursing would attend four-year programs in a college or university setting. The basic preparation for entry level practice for a professional nurse would be the baccalaureate degree education in nursing (American Nurses Association Committee on

Nursing Education, 1965). This proposal by ANA sparked controversy from nursing educators and graduates from associate degree and diploma programs. This issue continues to be debated in nursing practice and education today. Additionally, the three levels of nursing education continue to exist today.

<p align="center">Nursing Practice and Nursing Education</p>

Nursing practice focuses on health promotion, disease prevention, and management of client care in any type of setting. The knowledge and application of principles of growth and development, anatomy and physiology, disease pathophysiology, and the psychological and spiritual responses of the patient are imperative to being a safe, effective nurse. Baccalaureate education for nursing ensures a broad knowledge base and the ability to apply knowledge in making complex, critical decisions.

National Council of State Boards of Nursing, Inc. (NCSBN, 1996) describes nursing practice as the implementation of strategies used to assist individuals or groups to attain or maintain optimal health by achieving defined goals and evaluating those responses to the care and treatment provided. More specifically, NCSBN (2003) in the NCLEX-RN Test Plan document defines nursing as:

> … both an art and a science, founded on a professional body of knowledge that integrates concepts from the liberal arts and the biological, physical, psychological and social sciences. It is a learned profession based on an understanding of the human condition across the life span and the relationships of an individual with others and within the environment. Nursing is a dynamic,

continually evolving discipline that employs critical thinking to integrate

increasingly complex knowledge, skills, technologies and client care activities

into nursing practice. The goal of nursing for client care in any setting is

preventing illness; alleviating suffering; and protecting, promoting and restoring

health.

The registered nurse provides a unique, comprehensive assessment of the

health status of the client (individual, family or group), and then develops and

implements an explicit plan of care. The nurse assists clients in the promotion of

health, in coping with health problems, in adapting to and/or recovering from the

effects of disease or injury, and supporting the right to a dignified death. (p. 2)

Caring for human beings in a vulnerable state as with illness or loss of a loved one

requires a nurse to possess certain high-level specialized knowledge, skills, and abilities

to succeed in carrying out the goal of nursing practice. Yocum (2003) reported on a 1996

NCSBN study where categories of functional abilities necessary for the practice of

registered nurses were identified. These categories represent mostly higher cognitive

functioning and psychosocial skills. Among these categories were the ability for reading,

competence in arithmetic skills, emotional stability, analytical thinking, critical thinking,

interpersonal skills and communication skills.

The American Association of Colleges of Nursing (AACN) published *The*

Essentials of Baccalaureate Education for Professional Nursing Practice (AACN, 1998).

The document articulates that professional nursing requires "critical thinking,

communication, assessment skills, and a balance of intelligence, confidence,

understanding and compassion …" (p. 6) in order to fulfill the diverse roles of nursing

practice. The domain of nursing practice is derived from knowledge of a variety of other fields and disciplines such as chemistry, mathematics, and social and behavioral sciences. Benner (1984) reiterates the basis for safe nursing care and the discretionary judgment needed for providing safe care comes from a strong educational background in biological and psychosocial sciences and in nursing arts and sciences.

Critical thinking, identified by both NCSBN and AACN as a major component of nursing practice, involves decision making (Keating, 2006). Critical thinking is a process, which involves making a judgment based on cognition and taking a planned action. Critical thinking, as in nursing practice, requires the application of conceptual knowledge, the ability to analyze the situation and to evaluate different perspectives and formulate a final activity (Anderson & Krathwohl, 2001). Brookfield (2004) describes critical thinking as a process of recognizing and researching one's beliefs that support their thoughts and actions.

The development of the competencies required for nursing practice begins in the nursing education program. Nursing educators have the monumental task to prepare graduates for the skills and roles in the practice of nursing. In baccalaureate nursing education programs, AACN (1998) depicts several components essential for preparing baccalaureate students to practice nursing. These components include liberal education, professional values, core nursing competencies, core nursing knowledge, and nursing role development. AACN describes liberal education as providing a knowledge base in the arts, sciences and humanities, which promotes analytical and critical thinking and is the basis for clinical nursing judgment. Liberal education enables students to assimilate different perspectives and experiences when making choices for patient care and to

27

communicate effectively orally and in writing. Iwasiw, Goldenberg, and Andrusyszyn (2005) identified psychosocial and health science courses as:

> … integral to the development of open-minded, educated and informed practitioners. Students' interaction with an array of concepts, processes, and world-views expands the depth and scope of their learning, and helps them to think critically from a broader, more comprehensive knowledge base. (p. 182)

Pre-requisite academic courses in the arts, sciences, and humanities are required early in the curriculum or may be integrated strategically with the nursing courses (Boland & Finke, 2005).

Core competencies of nursing according to AACN (1998) include skills in critical thinking, communication, assessment, and basic technical skills. In a nursing education program, the competencies are applied through clinical laboratory experiences under the auspices of a faculty member to the care of patients in a variety of settings including the community health care facilities or primary care settings, hospitals or acute care settings, and in the home. Students learn how to care for adults and children with medical, surgical, and mental health needs. Additionally, care of the maternity patient and newborn is taught. Students in baccalaureate nursing programs learn skills essential for nursing practice with the scientific basis of the application of the skills.

Teaching nursing theory and skills necessary for the care of patients in the health care settings is a role of the faculty in the nursing education programs. Nursing educators facilitate learning by creating a positive learning environment (DeYoung, 2003). Educators provide cognitive, psychomotor, and affective learning activities in a simple to

complex sequence to assist the learner to integrate concepts and recognize relationships in nursing theory and skills (Jeffries & Norton, 2005).

Furthermore, nursing educators provide a variety of learning activities to meet the different learning and information processing styles, which maximizes learning potential (Dunn, 1998; Dunn & Griggs, 2000; James & Maher, 2004, Linares, 1999). Dunn (1998) provides examples of learning activities for different learning and processing styles. Lecture, case study discussions in groups, and audiotapes can assist auditory learners. Charts, videos, computer discs are best for visual learners. Role-playing, games, and experimental activities are provided for kinesthetic learners. Analytical processing learners prefer a sequential explanation of the concept or topic with a checklist or outline. Global processing learners relate holistically to the concept by understanding the concept or topic before concentrating on the details. Providing an overview of the concept followed by details assist the global learner to process the information. Exposing nursing students to a variety of learning styles can assist the student to become adaptive to the complex conditions in the work environment (Colucciello, 1999; Rakoczy & Money, 1995).

A typical baccalaureate nursing education curriculum consists of eight to nine semesters beginning with pre-requisite arts and sciences courses followed by nursing theory courses with concurrent nursing clinical courses. The junior and senior year courses usually are focused on the nursing sciences with emphasis on care of the patient in health care settings (Amos, 2005). The pre-requisite courses are chosen as necessary foundation courses for support of the nursing theory and clinical courses. Table 1 depicts

placement of pre-requisite courses and nursing theory and clinical courses similar to the

Baccalaureate nursing education program used in this study.

Table 1

Typical Course Placement in a Baccalaureate Nursing Program by Semester

Freshman I	English Composition I
	Finite Math
	Biology with Lab
	Psychology
	Fine Arts
Freshman II	English Composition II
	Chemistry with Lab
	Anatomy and Physiology with Lab
	Sociology
	Fine Arts Elective
Sophomore III	Literature I
	Nutrition
	Anatomy and Physiology II with Lab
	History
	Ethics

(table continues)

Table 1 (continued)

Sophomore IV	Literature II
	Developmental Psychology
	Microbiology with Lab
	Political Science
Junior V	Pathophysiology
	Nursing Skills and Lab
	Physical Assessment with Lab
	Professional Nursing Concepts I with Lab
Junior VI	Pharmacology
	Nursing Research and Data Management
	Nursing Care for Adults and Geriatrics and Lab
	Nursing Care for Infants and Children and Lab
Junior or Senior VII	Maternal and Newborn Nursing Care with Lab
	Community Mental Health Nursing Care With Lab
	Nursing Elective

(table continues)

Table 1 (continued)

Senior VIII	Critical Care Nursing and Lab
	Leadership and Management in Nursing
	Community Health Nursing with Lab
Senior IX	Professional Nursing concepts II
	Preceptorship Practicum

Many factors influence the practice of nursing and the education of nursing students. Historically, changes in society and the health care system influence nursing education curriculum (Keating, 2006). AACN (1998) discusses how changes in the complexity of the health care environment in today's society, along with scientific advances, and the changing needs of a diverse population influence nursing practice and health care. New technological discoveries and innovations effect information management and clinical decision making in nursing. Additionally, the age, cultural, and lifestyle diversity of the population requires more critical thinking in order to apply nursing concepts to the care of those populations. This multiplicity of influences on the health care of individuals that requires nursing graduates from today's nursing education programs to be able to master complex information, coordinate a complex system of care, and use technology for providing care delivery (AACN, 1998).

Nursing Shortage

Buerhaus, Staiger, and Auerbach (2000) retrospectively analyzed the employment

trends from the U.S. Bureau of the Census Current Population Surveys between 1973 and

1998. The study determined that during the 1960s and 1970s students who entered the

nursing profession were mostly female between the ages of fifteen to nineteen years. In

the 1980s, the group of students increased with age whereby older students were entering

nursing programs. Based on these documented trends, Buerhaus, et al. (2000) projected

the future pattern of the nursing shortage to continue on the same path. By the year 2020,

the size of the RN workforce will be approximately twenty percent below what is needed.

Additional job opportunities for women and women choosing child rearing instead of

employment added to the decrease number of nurses in the work force (AACN, 2003).

Basically, the nursing shortage is a case of supply and demand (Shoichet, 2002).

The factors contributing to the nursing shortage such as the aging workforce and

job competition are identical to those affecting faculty positions. Hinshaw (2001) stated

that the decrease in the number of faculty further adds to the nursing shortage because of

limits placed on nursing enrollments. The current number of faculty is insufficient to

meet the demands. Future replacements for the older generation of faculty are also

lacking (Hinshaw, 2001).

A shortage of registered nurses in the workforce is a complex societal concern

due to various causes and issues. The Tri-Council for Nursing (NLN, 2004) comprised of

the American Association of Colleges of Nursing (AACN), the American Nurses

Association (ANA), the American Organization of Nurse Executives (AONE) and the

National League for Nursing (NLN) issued a policy statement on the shortage. This

alliance of the four nursing organizations critically assessed the shortage by looking at the issue from the education, healthcare delivery system, and work environment perspective. The aging nursing work force in health care agencies and schools of nursing along with the decreasing numbers of nursing students enrolled and graduating negatively impacts the future of the shortage.

Following the publicity and concern over the nursing shortage, nursing student applications to baccalaureate programs began to rise (Berlin, Bednash, & Stennett, 2001; Berlin, Stennett, & Bednash, 2003; Berlin, Stennett, & Bednash, 2004; Berlin, Wilsey, & Bednash, 2005). AACN annually surveys baccalaureate and graduate programs in nursing and reports the most current statistics on student enrollment and applications. Table 2 depicts generic baccalaureate nursing student application data for a five year period, 2000–2001 (Berlin, Bednash, & Stennett, 2001), 2002–2003 (Berlin, Stennett, & Bednash, 2003), 2003–2004 (Berlin, Stennett, & Bednash, 2004), and 2004–2005 (Berlin, Wilsey, & Bednash, 2005). The enrollment data for 2001–2002 (Berlin, Stennett, & Bednash, 2002) were reported without the application data. During this five-year time span, the number of applications received at baccalaureate nursing education programs steadily increased.

Table 2

Enrollments, Applications Received and Accepted in Generic Baccalaureate Programs by Year

Year	Total Enrollment	Completed Applications Received	Qualified Applications Accepted
2000-2001[a]	72,986	42,150	26,762
2001-2002[b]	77,958	NA	NA
2002-2003[c]	85,415	54,194	35,542
2003-2004[d]	95,766	86,671	43,721
2004-2005[e]	112,180	122,194	54,577
Total	444,305	305,209	160,602

[a]Berlin, Bednash, & Stennett, 2001; [b]Berlin, Stennett, & Bednash, 2002; [c]Berlin, Stennett, & Bednash, 2003; [4]Berlin, Stennett, & Bednash, 2004; [5]Berlin, Wilsey, & Bednash, 2005

The increase in applications identified in the findings from AACN surveys poses a dilemma to the administration of the nursing program. A lack of faculty and resources prohibits nursing programs from admitting all the potential students (Berlin, Bednash, & Stennett, 2001; Berlin, Stennett, & Bednash, 2003; Berlin, Stennett, & Bednash, 2004; Berlin, Wilsey, & Bednash, 2005), thus further adding to the nursing shortage. Table 2 also shows that generic baccalaureate nursing programs received a total of 305,209 completed applications, even without the 2001–2002 data. The nursing program faculty

has to identify and select those students who will be most successful in the nursing

program and this decision may not be an easy one. Admission criteria must be established

to identify those students who will be most successful (Astin, 1991). From this data, fifty-

three percent of the applications were accepted.

The National League for Nursing (NLN) further documents the significant

increase in qualified applicants not accepted into nursing education programs (NLN,

2005). The NLN's 2005 National Nursing Education Database Survey of all nursing

education programs in the United States and its territories reported that an estimated

147,465 qualified applications were rejected by nursing programs in 2004–2005.

Assessment, Measurement, and Evaluation in Nursing Education

Nursing education programs investigate various means of assessment to assist in

decision making. Assessment, according to Astin (1991), refers to two different activities:

the collecting of information termed measurement and the use of that information for

institutional and individual improvement or for evaluation. Linn and Gronlund (2000) use

the term assessment to include a wide range of quantitative methods of obtaining

information or measurements about students and the formation of value judgments

concerning the progress of learning.

Assessment of students occurs throughout the college experience. Assessment has

two purposes. The immediate purpose is to help select students for admission. The

second purpose is to augment the underlying value such as to enhance the excellence of

the institution (Astin, 1991). Assessment involves the collection of data over time

(Oermann & Gaberson, 1998). Astin (1991) suggests that an immediate purpose in

selecting students for admission into a particular education program would occur when the GPA or admission test scores are used as criteria. Higher education institutions are interested in admitting those students with the best possible GPAs and highest possible test scores. Admission of these students suggests academic excellence and higher quality academic program, which encompasses an underlying value of the institution (Astin, 1991).

The term 'measurement' is the process of assigning numbers to represent student achievement according to certain rules or a reference point (Linn & Gronlund, 2000; Oermann & Gaberson, 1998). Tests are one form of measurement and test scores are usually represented by a number. However, Oermann and Gaberson (1998), surmise that meaning must be applied to the number so that the score can be interpreted.

Three factors are important when interpreting test scores: reliability, validity and absence of bias (Woolfolk, 2004). Reliability refers to the stability, internal consistency or precision of the results of a test and is statistically measured by means of a correlation coefficient (Linn & Gronland, 2000). To improve the reliability of a test, Woolfolk (2004) suggests adding more test items to the test. The validity of a test includes the appropriateness of the interpretation of the results and is specific to the individual purpose of the instrument (Linn & Gronland, 2000; Woolfolk, 2004).

Validity is the degree to which the instrument measures what it is designed to measure (Wiersma, 2000). The types of validity are based on the evidence used for establishing the validity. Wiersma (2000) depicts the different types of evidence as related to content, concurrent criterion, predictive criterion and construct. Criterion and

construct validity can be measured through empirical analysis. Content and, to an extent, construct validity can be analyzed logically.

Classroom assessment is another activity connected with college courses. Outcomes from course requirements are measured in grades for the course. A compilation of course grades generate into the GPA for each student. Uses of the GPA vary. They may be used for determining eligibility for graduation, honors or probation or for selecting and screening students for admission or employment. There are concerns about the GPA because it tells very little about what the student knows or their competencies (Astin, 1991). Instead, Astin reiterates the GPA is a relativistic or normative measure, which is used to show how a student compares to other students at a specific point in time. In contrast, Pascarella and Terenzini (1991) stated that a student's grades are the most revealing indicator of his or her successful adjustment to the intellectual demands of a particular course of study.

Nursing course grades determine success or failure in the nursing program. Established school of nursing policies dictate the criteria for student progression into the next nursing course or level. Policies may identify individual nursing course grades or overall nursing course GPA as a criterion for attrition (Jeffreys, 2004). Nursing programs are prone to high attrition rates because of the demanding curriculum of a nursing education program. Students who fail a nursing course or withdraw from a nursing course are at risk for attrition from the nursing education program. Jeffreys emphasizes that progression policies further add to the risk for attrition.

Caution is advised about grades because of personal influences such as motivation, study habits, and effort (Pascarella & Terenzini, 1991). Scanlan and Care

(2004) further add external factors such as rising consumerism, faculty's concern over promotion and tenure decisions, and institutional policies to the list of effects on grades.

Credentialing or certification is another use of assessment. In certain professions, such as medicine, law, accounting, and nursing, tests are required for entry into practice or licensure (Astin, 1991). For nursing licensure, the NCLEX-RN is a computer adaptive test developed by the National Council of State Boards of Nursing, Inc. designed to measure the competencies necessary to practice safe, effective nursing care. The examination assesses the knowledge, skills, and abilities that are essential to the safe, effective practice of professional nursing at the entry level (NCSBN, 2005). The test plan of the NCLEX-RN examination incorporates client needs across the lifespan and in various clinical settings. The test plan categories for the registered nurse examination include client needs according to the following areas: safe, effective care environment, health promotion and maintenance, psychological integrity, and physiological integrity (NCSBN, 2003). Nursing process, caring, communication, and teaching/learning are essential concepts of nursing that are integrated throughout the examination. The majority of the test items are written at application level or above of Bloom's Taxonomy for the cognitive domain (Anderson & Krathwohl, 2001; Bloom, 1956). The application level or higher "requires more complex thought processing" (NCSBN, 2003, p. 3). The NCLEX-RN was developed using criteria established after the completion of a job analysis of entry-level registered nurses (Chornick & Wendt, 1997).

Evaluation according to Astin (1991) is the rendering of value judgments. Measurement alone does not imply value judgments. Results of the measurement provide information necessary for making decisions about the learning process. Evaluation of the

information generated by an assessment incorporates making a value judgment on the pedagogical methods or decisions for providing feedback to the student on the material.

Evaluation is a complex and difficult process using professional judgment to interpret the information as a basis for decisions about the learner (Oermann & Gaberson, 1998). The evaluation leads to decisions regarding which students to select for admission, progression or graduation. Evaluation is used when seeking alternative courses of action in pedagogical techniques and the overall program and curriculum.

Information from measurements enables nursing faculty to make decisions about students concerning nursing education programs. According to Kubiszyn and Borich (2003), in addition to assessing content areas learned effectively and overall program evaluation, faculty use measurements to diagnose strengths and weaknesses of the student, and make decisions for the selection of applicants into nursing programs, and for counseling to recommend appropriate programs of study or remediation.

In the nursing profession, results from the NCLEX-RN are used by state and territorial boards of nursing and nursing education program accrediting agencies to make decisions on licensure, continued approval of the nursing education program, or accreditation status of the nursing education program (NCSBN, 1999; NCSBN, 2003; NCSBN, 2004). Nursing graduates, deans, and faculty have an investment in the success on NCLEX-RN. Passing the NCLEX-RN means the graduate of the nursing education program is minimally competent to practice nursing (NCSBN, 2005). Results of the examination are sent to the state boards of nursing for a determination of licensure. Nursing graduates who do not pass this high stakes NCLEX-RN examination are not allowed to work as a registered nurse even if they have graduated from a nursing

program. National acceptance of the results by other state and territorial boards of nursing allows licensed registered nurses to apply for licensure in all states and territories (NCSBN, 2003; NCSBN, 2004).

Board of nursing approval of the nursing education program allows the graduates to take the NCLEX-RN or apply for endorsement of the license into or from another state (Alabama Board of Nursing, n.d.; NCSBN, 2004). Nursing education program approval is contingent on the NCLEX-RN passing rate of the graduates. NCLEX-RN passing rates are reviewed by the board of nursing on a yearly basis. Some state boards of nursing withdraw approval of the nursing education program or place the program on probation if an established percentage pass rate for the graduates on the NCLEX-RN is not met (Alabama Board of Nursing, n.d.).

Using the results of the NCLEX-RN for program approval or accreditation depicts the value or excellence of the institution. School of nursing and university accrediting agencies review pass rates as a criterion for continued accreditation (Commission on Collegiate Nursing Education [CCNE], 2003). Faculty members are cognizant of this outcome and identify their role in graduating successful nursing students. Programs that fail to maintain a specified passing rate may lose their approval or accreditation status. Faculties teaching in nursing programs have a vested interest in maintaining high passing rates and ensuring those who complete the program pass the licensure exam.

Prediction of Academic Success

One of the roles of faculty in nursing education programs is to determine criteria for the selection of students who will be accepted into the nursing program. Selection of

students is based on admission criteria or standards (Iwasiw, Goldenberg, & Andrusyszyn, 2005). With the faculty shortage and increased numbers of student applicants, not all students who apply will be selected. Identifying the potentially successful students presents a dilemma for faculty. The faculty desires to select students who will be successful in the rigorous nursing program and on the NCLEX-RN. Faculty must balance the rigors of the nursing program with sufficient applicants. If students are admitted to the program without adequate preparation, according to Engelmann (2004), the faculty must be willing to provide strategies to help the student achieve success.

Establishing criteria by making predictions on academic achievement is one method to assist with the selection of an over abundance of applicants seeking admission into nursing education programs. Prediction, according to Wiersma (2000), is the "estimation of scores on one variable from information about one or more other variables" (p. 459). Prediction is the forecasting of how variables will perform in a new setting or with different individuals (Polit & Beck, 2004). Pedhazur (1997) identifies the use of predictive research for practical applications as having the goal to optimize the prediction of certain criteria. Prediction studies, according to Gay and Airasian (2003), facilitate decisions about individuals, aid in the selection process, to test variables believed to be good predictors, and to determine the predictability of measurements.

Two types of variables are used in prediction. The predictor is the variable from which one predicts and the criterion variable, which is the variable being predicted (Wiersma, 2000). In some predictive research, the predictor and criterion variables may be interchangeable.

Admission decisions are based on solid empirical data. Perfetto (2002) identified four principles to guide the selection of objective predictors. The attribute must: (1) be reliable and reproducible, (2) be consistent for several consecutive classes, (3) demonstrate the ability to predict over the student's undergraduate career, and (4) have academic relevance.

The pursuit for predictive factors of academic performance has focused primarily on student characteristics, aptitude, and personality traits (Lavin, 1965). Most often, GPA is used as the quantitative method of expressing the student's scholastic achievement. As discussed by Lavin, often the correlational relationships between such predictors and performance criteria are not very strong. He offers two reasons for these low correlations: (1) failure to isolate enough of the right variables and or measurement error in the variables and (2) uncontrolled sources of the variation in the grades.

Lavin (1965) studied the prediction of academic performance using GPA. The precision of using grades to predict academic performance is difficult. The subjectivity of grades cannot be controlled. Grade inflation, which is the increase in grade point average without an associated increase in overall student ability, is prevalent in higher education although empirical data is lacking (Scanlan & Care, 2004). Scanlan and Care identified several reasons for grade inflation. One reasons for grade inflation is due to the use of collaborative pedagogical strategies that enables weaker students to achieve higher grades. Student pressure on faculty to give higher grades is a result of changing student demographics where there are more adult learners who are more mature and assertive in the classroom. Additionally, the faculty's inexperience in evaluation of student learning leans more toward grade inflation. From a nursing education perspective, Scanlan and

Care add that the nursing shortage itself has urged faculty to graduate more students. The faculty shortage brings the use of teaching assistants and new inexperienced faculty into the classroom. Finally, the grading in the clinical nursing practice courses is subjective and possibly inflated by clinical faculty, preceptors, clinical associates, or teaching assistants.

Lavin (1965) suggested the use of standardized tests as the index for academic performance to overcome the error associated with the use of grades. Uniform test scores as supplementary criteria of performance assists with the control of the subjectivity of grading.

Determining predictors of success throughout the nursing education program has been a challenge for faculty. Campbell and Dickson (1996) completed a review of forty-seven studies published between 1984 and 1990 on predictors of NCLEX-RN. The meta-analysis showed the best predictors of graduation and NCLEX-RN success were nursing GPA, chemistry GPA, and American Achievement Scores (ACT) scores. The NLN pre-nursing examination also showed the ability to predict success on NCLEX-RN. The least predictive variables were college cumulative GPA, liberal arts GPA, scores on the Scholastic Achievement Test (SAT), and examination scores in the nursing courses.

Predicting success on NCLEX-RN has been the subject of many recent studies in the nursing literature (Alexander & Brophy, 1997; Arathuzik & Aber, 1998; Barkley, Rhodes, & DuFour, 1998; Beeman & Waterhouse, 2001; Beeson & Kissling, 2001; Brisco & Anema, 1999; Crow, Handley, Morrison, & Shelton, 2004; Daley, Kirkpatrick, Frazier, Chung, & Moser, 2003; Endres, 1997; Haas, Nugent, & Rule, 2004; Lauchner, Newman, & Britt, 1999; Newman, Britt, & Lauchner, 2000; Nibert & Young, 2001;

Nibert, Young, & Adamson, 2002; Nibert, Young & Britt, 2003; Sayles, Shelton, &

Powell, 2003; Schmidt, 2000; Seldomridge & DiBartolo, 2004; Washington & Perkel,

2001). Academic and non-academic variables have been studied as predictors of success

on NCLEX-RN. Crow, Handley, Morrison, and Shelton (2004) completed a

comprehensive survey of baccalaureate nursing education programs throughout the

United States to identify what data were used to predict NCLEX-RN success. Ninety

percent of the programs surveyed required a comprehensive examination that is given to

the students during the later portion of the curriculum. Twenty-nine percent used a

cumulative GPA of pre-nursing courses and nursing courses. Thirty-six percent of the

programs reporting used specific nursing course grades to predict NCLEX-RN.

The use of a standardized entrance examination and the SAT scores were the only

reported admission criteria significantly correlated with passing NCLEX-RN. Although

the specific standardized entrance examination was not described, Crow et al. (2004)

identified one of the implications of this study as, "BSN programs should consider using

standardized entrance examinations as admission criteria to enhance the NCLEX success

rates for their students and the program" (p. 183).

Grade point average is an academic variable that has been studied to determine its

predictability for success on NCLEX-RN (Brisco & Anema, 1999; Haas, Nugent, &

Rule, 2004; Washington & Perkel, 2001). Grade point averages have been combined into

three separate groups for analysis: GPA for pre-nursing courses only, GPA for nursing

courses only, and cumulative GPA. Haas, et al. (2004) studied all three groups and

determined the GPA of nursing courses only was found to be most predictive with

baccalaureate students. Several studies compared the GPA from pre-nursing courses to

45

NCLEX-RN success but did not find a significant difference (Brisco & Anema, 1999; Haas, et. al, 2004; Washington & Perkel, 2001). Cumulative GPA from pre-nursing courses and nursing courses combined was determined to be a predictor in three studies (Beeson & Kissling, 2001; Daley, Kirkpatrick, Frazier, Chung, & Moser, 2003; Sayles, Shelton, & Powell, 2003).

Pre-admission tests for nursing have been used in studies as potential predictors for passing NCLEX-RN (Sayles, Shelton, & Powell, 2003; Schmidt, 2000). These tests are administered early in the nursing education process and usually prior to admission into the program. Sayles, et al. (2003) studied the Nurse Entrance Test (NET) published by Educational Resources, Inc. (ERI) and identified that the NET composite score was statistically significant in predicting NCLEX-RN. Schmidt (2000) considered the National League for Nursing (NLN) Pre-Admissions Test as a predictor but did not find a significant correlation with NCLEX-RN. There are no published studies of the HESI A^2 as a predictor of NCLEX-RN since it is a recently developed instrument (Nibert, 2005).

Barkley, Rhodes, and DuFour (1998) studied mid-curricular measurements to predict success on the NCLEX-RN. Mid-curricular tests are specialty content examinations such as those testing basic nursing knowledge for the care of children, adults, mental- health patients or maternal-newborn patients. These tests are given throughout the curriculum in conjunction with the specific nursing content course. Barkley, et al (1998) specifically studied the National League for Nursing (NLN) Achievement Tests as predictors for NCLEX-RN. The Psychiatric, Obstetrical, Adult Health, and Pediatric NLN tests showed a statistically significant correlation with NCLEX-RN. No studies have been published on the HESI Specialty Examinations.

46

Standardized comprehensive nursing achievement tests, which are administered immediately prior to graduation from the nursing program, have also been studied as a predictor of NCLEX-RN success. Recent studies have shown statistically significant correlations with passing NCLEX-RN. The Mosby Assess Test was found to be statistically significant for prediction of passing NCLEX-RN (Beeson & Kissling, 2001). Daley, Kirkpatrick, Frazier, Chung, and Moser (2003) did not find a relationship between NCLEX-RN and the Mosby Assess Test. Sayles, Shelton, and Powell (2003) determined that the PreRN Assessment published by Educational Resources Inc. was statistically significant in their study of associate degree nursing graduates. The Arnett Pre-RN Readiness Examination showed a significant relationship for prediction of the NCLEX-RN in a baccalaureate nursing program (Washington & Perkel, 2001). The Diagnostic Readiness Test (DRT) by NLN was studied by Schmidt (2000) in all types of nursing education programs. The correlation of the DRT with the NCLEX-RN especially in the baccalaureate nursing programs was statistically significant. Seldomridge and DiBartolo (2004) studied the National League for Nursing Comprehensive Achievement Test for Baccalaureate Students and determined that it was a predictor of success and failure on NCLEX-RN. The HESI Exit Examination published by the developers of the HESI A^2 has been shown to be a statistically significant predictor of success on NCLEX-RN in a variety of nursing education programs (Lauchner, Newman, & Britt, 1999; Newman, Britt, & Lauchner, 2000; Nibert & Young, 2001; Nibert, Young, & Adamson, 2002; Nibert, Young & Britt, 2003). Daley et al. (2003) found that the scores on the HESI Exit Examination were significantly different in students who were successful in the NCLEX-RN and those who were not.

47

Few studies have been published on early identification of those students who will be successful in the first year of nursing education programs (Gallagher, Bomba, & Crane, 2001; Lewis & Lewis, 2000; Potolsky, Cohen, & Saylor, 2003; Sandiford & Jackson, 2003). Gallagher et al. (2001) studied two pre-nursing examinations to determine if one examination was a better predictor of success in one nursing program. The Entrance Examination for Schools for Nursing (RNEE) published by The Psychological Corporation was compared to the Nurse Entrance Test (NET) published by Educational Resources, Inc. The NET was of interest because it provided scores on non-academic areas such as stress levels and test taking skills. The two tests were compared to the course grade in the first nursing course and later to the course grade in the last nursing course. The RNEE was found to be the better predictor of the two examinations in the first nursing course and further analyzed using logistic regression. The reading comprehensive subtest score proved to be statistically significant ($R = 0.23$, $p < 0.05$) and determined to be useful for establishing a minimum score for entrance into the nursing education program. Neither examination proved to be a good predictor of success in the final nursing course.

Lewis and Lewis (2000) studied the success of nursing students who transferred the pre-requisite support courses from other schools or universities. The dependent variable was academic success defined as the cumulative GPA of 2.5 or greater at the end of the junior year. Using logistic regression, the results showed that successful transfer students were more than twice as likely to transfer from 4-year institutions (odds ratio (OR) = 2.10, 95% confidence interval (CI): 1.10, 4.03) and more than five times as likely

have taken two or more anatomy and physiology courses (OR = 5.51, 95% CI: 2.76, 11.02) than unsuccessful transfer students.

Potolsky, Cohen, and Saylor (2003) studied the effects of tutoring services on the academic performance of first semester nursing students using the prerequisite science course grade and the nursing pathophysiology and pharmacology grades. Results showed a high correlation with the pathophysiology grade ($r = .77$, $p = .01$) and the pharmacology grade ($r = .60$, $p = .01$). There was not a control group in this study.

Sandiford and Jackson (2003) studied the relationship of academic, socioeconomic, and motivational variables to attrition in the first semester of an associate degree nursing program. The results showed a statistically significant relationship with lower attrition rates and a score at college level in language on the Test of Adult Basic Education ($p \leq .001$) and a pre-semester GPA of 2.5 or above ($p \leq .001$). Three non-academic variables, which included hours planned to work, financial difficulty, and achievement tendency were not significant.

Types of statistical analyses used in studies for predicting success in nursing programs are documented into three categories: correlation coefficient (Barkley, Rhodes, & DuFour, 1998; Brisco & Anema, 1999; Sayles, Shelton, & Powell, 2003), logistic regression (Gallagher, Bomba, & Crane, 2001; Lewis & Lewis, 2000; Schmidt, 2000; Washington & Perkel, 2001), and discriminate analysis (Beeman & Waterhouse, 2001; Endres, 1997; Haas, Nugent, & Rule, 2004). Depending on the variables and reason for the study, logistic regression is more robust than discriminate analysis (Pedhazur, 1997).

Summary

Nursing has a long evolving history. In the 1850s, Florence Nightingale identified tasks, skills, and an environment necessary for the healing of individuals. As a female-dominated profession, the early years of nursing were masked with negative reactions from males and physicians. The perseverance of Nightingale and others led to the development of diploma, associate and baccalaureate degree nursing education programs. Nursing in the 21st century requires core competencies that specify the knowledge, skills, and abilities needed to practice safe, effective nursing care in a variety of settings. The arduous demands of the nursing education program often prevents all selected students from being successful in the first year of the nursing curriculum. Attrition persists in undergraduate nursing education programs throughout the first year of nursing courses and up to graduation (Jefferys, 2004). Identification of those who are most likely to be successful early in the nursing education program is more beneficial to faculty and the students. Prediction of success in the nursing education program through assessment of the student early in the nursing education program or prior to admission into the program may help to recognize students who may encounter difficulty early in the program and allow nurse educators to identify strategies to help those students be successful or seek other careers.

III. METHODS

Introduction

The purpose of this study was to examine the relationship between the prerequisite academic support courses for a nursing program and the HESI A^2 as a predictor of success in the first year of a baccalaureate nursing education program. This study also identified demographic characteristics, nursing theory course grades, and HESI A^2 based factors that can be used to predict first year student success. This chapter will describe the participants of the study, the variables that were studied, the research design, sampling methods used, the instrument, procedures used for the study, and the type of analyses used.

Research Questions

Four research questions were addressed in the study:

1.   What is the relationship between the admission GPA and the HESI A^2 for nursing students?

2.   What is the relationship between the admission GPA and success in the first year of the nursing education program?

3.   What is the relationship between the HESI A^2 scores and students who were successful in the first year of the nursing education program and those who were not?

4.   What demographic characteristics, nursing theory course grades, and HESI A^2 based factors are predictive of success in the first year of the nursing education program?

Participants

The target population for this study was drawn from nursing students applying for admission into the upper division of a baccalaureate nursing program at one public southeastern university. The participants included three cohorts of students seeking admission in the fall of 2001, 2002, and concluding with the fall 2003. Two hundred fifty eight applicants met the minimum requirements of 2.5 GPA and were sent letters of conditional acceptance for the nursing education program for the three years combined. One hundred seventy applicants were sent final acceptance letters. This number was partially based on the number of faculty and clinical site availability. One hundred sixty three applicants began the nursing program.

A total of 128 students met the criteria for inclusion in the sample. Included in the sample for this study were those students who completed the pre-requisite academic support courses with a 2.5 or higher, took the HESI A^2 examination, were accepted into the upper division of the nursing program, and completed the junior nursing theory and clinical courses. Those who withdrew from the courses for academic or personal reasons prior to completion were removed from the sample.

52

The participants were predominately female (91.4 %). The majority of the

participants were Caucasian (79.7%). African Americans represented the largest number

of ethnic minorities with 16.4%. Other ethnic groups represented were American Indian,

Asian American, and Hispanic. The mean age of the students in the sample was 24.9 (*SD*

= 6.23) with a range of 37 years. The range in years was from 20 to 57.

The university chosen for the study was a public, state supported institution

located on a 500-acre campus seven miles east of a major metropolitan area in the

southeastern United States. Enrollment for undergraduate and graduate students is

approximately 5100 per semester. The university offers undergraduate and graduate

degrees through five schools: Liberal Arts, Sciences, Education, Nursing, and Business.

The university is accredited by the Commission on Colleges of the Southern Association

of Colleges and Schools to award the bachelor's, master's and specialist degrees. The

academic year includes two 15-week semesters and one 10-week summer semester. The

School of Nursing is approved by the state board of nursing and accredited by the

Commission on Collegiate Nursing Education (CCNE).

Variables of Interest

For the purposes of this research study, predictors of success are measured toward

the dependent or criterion variable, which is success at the end of the junior year. Success

at the end of the junior year includes a C or better in each of the nursing theory courses

taught in the junior year. The nursing theory courses consist of NURS 3410

(Pathophysiology), NURS 3510 (Nursing Skills), NURS 3610 (Holistic Assessment),

NURS 3710 (Professional Nursing Concepts I), NURS 3320 (Pharmacology), NURS

3420 (Nursing Research and Data Management), NURS 3720 (Holistic Nursing: Adults and Geriatrics), and NURS 3740 (Holistic Nursing: Infants and Children). Co-requisite clinical components of the theory courses are taught and must be completed but are not included as variables in the study because of the pass or fail grading format. Holistic Pathophysiology, Nursing Skills, Holistic Assessment, and Professional Nursing Concepts I are taught in the fall semester of the junior year. Pharmacology, Nursing Research and Data Management, Holistic Nursing: Adult and Geriatric Populations, and Holistic Nursing: Infants and Children are taught in the spring semester of the junior year.

The independent or predictor variables identified in this study included the admission GPA calculated from the pre-requisite academic support courses for nursing and scores from the HESI A^2. Additional predictor variables recognized in this study included grades from selected nursing theory courses in the junior year, demographic characteristics of the participants, and selected HESI A^2 based factors.

The curriculum of baccalaureate nursing education program used in the study required academic courses as pre-requisites to enter into the upper division of the nursing program. These pre-requisite academic support courses include English composition, English literature, a fine arts elective, history, government, sociology, general psychology, finite math, biology, introduction to chemistry, nutrition, anatomy and physiology I, anatomy and physiology II, microbiology, and developmental psychology. The grades from these pre-requisite courses were calculated as the admission GPA by dividing the total number of grade points for the pre-requisite courses by the total number of the credit hours of the pre-requisite courses. The GPA was used as a criterion for

acceptance into the upper division of the nursing education program. The upper division includes the nursing theory and clinical courses of the junior and senior year. A student must have at least a 2.5 GPA based on a 4.0 scale of the pre-requisite academic support courses in order to apply to the upper division.

The scores from the HESI A^2 comprised another set of independent variables. The HESI A^2 was administered at the School of Nursing via computer under proctored, timed conditions as dictated by Health Education System, Inc. protocol. The HESI A^2 was administered after completion of all the pre-requisite courses and prior to beginning the first nursing theory course. The components of the HESI A^2 used in this study include mathematics, reading comprehension, vocabulary, grammar, chemistry, and anatomy and physiology. A cumulative score from the HESI A^2 includes scores in the above areas. Part of the HESI A^2 included a profile of the student's learning style, personality profile, and behavioral inventory and also was analyzed as independent variables.

The junior year nursing theory course grades comprise another group of independent variables. In the fall semester, the students enroll in Pathophysiology, Nursing Skills, Holistic Assessment, and Professional Nursing Concepts I. Holistic Pathophysiology is a three-hour credit course, which explores the holistic view of pathophysiology and psychoneuroimmunology. Nursing Skills is a one-hour credit course with a separate three hour per week clinical lab component where the theory for the safe practice of nursing skills including sterile technique, medication administration, and assisting with activities of daily living is taught. Holistic Assessment is a three-hour credit course with a six hour per week separate clinical component. Holistic Assessment incorporates concepts and theories of nursing process with an emphasis on performing a

head-to-toe physical assessment. Professional Nursing Concepts I is a two credit hour course with a three hour per week separate clinical lab component. This course teaches foundation concepts and roles for professional nursing practice.

The grades for the nursing courses taught in the spring semester of the junior year and used in the study include Pharmacology, Holistic Nursing: Adults and Geriatrics, and Holistic Nursing: Infants and Children. Pharmacology is a two-hour credit theory course incorporating the principles of pharmacology in professional nursing practice. Holistic Nursing: Adult and Geriatric Populations involves learning and applying the concepts and theory of nursing practice specific to adults and geriatrics patients in a three hour credit course and a separate six hour per week clinical lab component. Holistic Nursing: Infants and Children course includes a two-hour credit theory course containing the application of concepts and theories of professional nursing practice in the care of infant and children populations. A separate six hour per week clinical lab component is a co-requisite to Holistic Nursing: Infants and Children.

Select demographic data were analyzed as independent variables. Data collected at admission to the upper division of the nursing program included age, gender, race, marital status, number of children, employment status, previous degree attainment, and possession of a Licensed Practical Nurse license.

Research Design

This study was designed using a retrospective correlational approach. Correlational studies may be relationship studies or prediction studies. Relationship studies are used to determine if, and to what degree a set of variables are related (Gay &

Airasian, 2003). Predictive studies are used to determine if the relationships can make predictions. The variable used to make the prediction is the predictor variable. The criterion variable is the variable that is predicted (Gay & Airasian, 2003; Wallen & Fraenkel, 2001). Beginning with a basic correlation of the variables, those with high correlations are further studied as possible predictors of the criterion variable.

Wallen and Fraenkel (2001) stressed that correlation studies do not establish cause and effect. The occurrence of a relationship between variables shown with a correlation study does not conclude that one variable caused another (Polit & Beck, 2004). Caution should be taken with a prediction study because often a prediction equation is less accurate when used with a group other than the one on which it was originally developed (Gay & Airasian, 2003).

Determining the qualities of an instrument used for predicting is imperative. Sensitivity and specificity are criteria used in evaluating screening instruments (Polit & Beck (2004). Sensitivity is the ability of the instruments to identify a case correctly. These are called true positives. The specificity of the instruments is the ability to identify those cases that do not possess the criterion. These are true negatives. Determining the cutoff point is necessary. The Receiver Operating Characteristic (ROC) curve illustrates the comparison at every cut off point (Simon, 2005). The comparison is helpful in discriminating between the two groups. There will be some cases that are correctly classified as true positives, some that are false positive. Also, some cases may be correctly true negatives and some are false negative (Schoonjans, 2006). The intent is to find the cut off point where most of the true positives and true negatives are found. The ROC curve is described the using the terms, sensitivity and specificity (Schoonjans,

2006). Sensitivity of the ROC curve is the probability that a test result will be positive (true positive). The specificity is the probability that a test result will be negative (true negative). Both of these terms are expressed as a percentage. Table 3 shows the classification of potential outcomes for the dependent variable used in the study.

Table 3

Classification for Potential Outcomes Using Sensitivity and Specificity

Dependent Variable		n		n
Successful	True positive	a	False Positive	c
Unsuccessful	False Negative	b	True Negative	d
Total		a + b		c + d

The area of the ROC curve is determined by coordinates on the x and y axis. The accuracy of the test is determined by the area under the ROC curve. The larger the area, the more true positives while minimizing the false positives (Walld, 2001). Simon (2005) labels the area under the curve as fair (0.50 to 0.75), good (0.75 to 0.92), very good (0.92 to 0.97), and excellent (0.97 to 1.00).

Sampling

A convenience sample of students seeking admission to the upper division of the nursing program at one public southeastern urban university for the years of 2001, 2002 and 2003 was selected for the study. To be included in the study, the students must have

completed the pre-requisite academic support courses with a 2.5 or higher, taken the

HESI A^2 examination, be accepted into the upper division of the nursing program. Those

who withdrew from the junior nursing theory courses prior to completion of the junior

year were removed from the sample.

Convenience sampling is the most vulnerable form of sampling (Polit & Beck,

2004). For this study, a convenience sample was used because the retrospective data

existed from a group of students already formed (Gay & Airasian, 2003; Wallen &

Fraenkel, 2001).

<div align="center">Instrument</div>

HESI Admission Assessment^{TM} (HESI A^2)

HESI Admission Assessment^{TM} (HESI A^2) is the instrument used in this study.

The HESI A^2 was first developed in 1999 as a measurement instrument to assist faculty

in making pre-nursing student selection or academic course placement decisions (Nibert,

2005). HESI tests are developed under the framework of Crocker and Algina's (1986)

classical test theory (Morrison, Adamson, Nibert, & Hsia, 2004). Students are assessed a

twenty-five dollar fee for taking the HESI A^2 (HESI, n.d.c.)

The instrument is an examination containing two components: various academic

content areas and personality inventory that includes assessments for learning style,

personality style, and behavioral inventory (HESI, n.d.a.; HESI, 2003) (see Appendix A).

The first component is the HESI A^2 Content Examinations, which include mathematics,

reading comprehension, vocabulary and general knowledge, grammar, general sciences

<div align="center">59</div>

such as chemistry, anatomy and physiology (see Appendix B for the HESI A^2 Faculty Scoring Guide).

College and university professors who are considered experts in the basic academic fields, such as English, mathematics, biology, chemistry, anatomy and physiology and reading specialists author the test items for the academic content areas (Nibert, 2005). An item analysis is conducted on every HESI exam item that is returned to the company for a summary analysis (Morrison, Adamson, & Hsia, 2001). Additionally, each item is piloted prior to actual use on the instrument. Piloting the items for approximately one year allows for enhancement of the items based on student responses (Nibert, 2005).

Each content area focuses on different cognitive skills needed to be successful in a nursing education program. The areas include basic math, reading comprehension, vocabulary, grammar, and selected sciences of chemistry and anatomy and physiology. The math component is a 50-item examination that concentrates on mathematics needed for calculating medications and solutions in nursing. Math skills that are assessed include addition, subtraction, multiplication, division, fractions, decimals, ratio and proportion, percentages, household measures and general math facts (Ables, Flick, Morrison, Rohlich, Tollett, Tollett, & Zivley, 2003) and are measured at the eight or ninth grade level (HESI, 2003).

The reading comprehension is a 38-item examination, which includes reading health-related scenarios. The reading comprehension assesses the reading skills of identifying main ideas, finding the contextual meaning of words, identifying the purpose

of the writer, differentiating between fact and opinion, making inferences and ability to summarize (Ables, et al., 2003) at the eighth to ninth grade level (HESI, 2003).

The vocabulary and general knowledge component is a 50-item exam containing basic vocabulary used in health care fields (HESI, 2003). Understanding these terms in appropriate contexts assists in accurate professional communication in the health care setting (Ables et al., 2003).

The grammar examination contains items for basic English grammar and writing skills at the eighth or ninth grade level (HESI, 2003). Application of correct grammar usage and written communication, such as subject-verb agreement, plurality versus singularity, pronoun reference, misplaced modifiers, and punctuation depicts an educated individual, which is an expectation of health care recipients (Ables et al., 2003).

Basic knowledge of the sciences necessary to make decisions regarding nursing care is assessed on the HESI A^2. Chemistry, anatomy, and physiology are three subjects that are considered in the science component. Each of the subjects is comprised of 25 items (HESI, 2003). The chemistry section assesses the basic knowledge of chemistry. Chemical equations, reactions, states of matter, periodic table, atomic structure, molar relationships, and acid/base compounds comprise the knowledge assessed (Ables et al., 2003). The anatomy and physiology component examines the basic knowledge of anatomy and physiology of the human body. Examination items could include basic terminology, and concepts related to the integumentary, skeletal, muscular, nervous, endocrine, circulatory, respiratory, digestive, urinary, and reproductive systems (Ables et al., 2003).

Results of each HESI A^2 content examination are generated in a percentage-based score (Nibert, 2005). Depending on the prerequisite courses for the nursing education program, specific content areas, such as the sciences, may be omitted from assessment of the student by the faculty. For example, if chemistry is not a prerequisite course, the chemistry examination may be omitted (Nibert, 2003). A cumulative score reflects the mean score for all the academic components selected by the faculty and taken by the student (Nibert, 2005). Appendix C is a sample HESI A^2 score report.

Results from the HESI A^2 examinations can assist nursing faculty in making decisions about students seeking admission into nursing education programs. HESI recommends to nursing education programs two different uses for the HESI A^2 Exam (Nibert, 2003). First, the HESI A^2 was developed to assist in the selection of qualified applicants for nursing education programs. Nursing education programs can select to administer, to potential students, the exam components of the HESI A^2 that relate to the prerequisites of the nursing curriculum. Admission criteria may consist of the cumulative score, which would include those content areas selected specifically for that nursing education program or may consist of the individual content scores. HESI's recommendation for student selection is to combine the HESI A^2 with other admission criteria. With this in mind, the cumulative score or individual content scores could be used in combination with GPA or other criteria for selecting students for admission (Nibert, 2003).

The second recommendation for using the HESI A^2 content examinations is for placement of potential students in courses that might enhance learning prior to admission into the rigors of the nursing curriculum (Nibert, 2003). The HESI A^2 could determine

at-risk students. If students scored low on the math component or the reading comprehension portion, for example, remediation courses, tutoring, or study skills would benefit the student prior to admission into the nursing courses where those skills are needed. The HESI A^2 may be able to determine those students who may be at risk for being unsuccessful.

Longitudinal studies using the HESI A^2 for tracking student progress throughout the nursing education program and through post-NCLEX results are limited because the instrument was recently developed (Nibert, 2005). Few cohorts of students have completed the nursing program and taken the NCLEX-RN. However, with the input of the authors of the content examinations and the faculty who first piloted the HESI A^2, the developers of the HESI A^2 determined that a cumulative score of 75% for students entering a registered nursing education program should be expected (Nibert, 2005).

There are few reliability and validity studies on the HESI A^2. The reliability is computed statistically using the *Kuder-Richardson Formula 20* (KR-20) (Nibert, 2003). For each test administered, a KR–20 is calculated and added to estimate the average KR–20.

The formula used by HESI to calculate the KR-20 is

R=N/(N-1) * (F(s)- Sum (PQ))/F (s)

Where:

N = number of test items

P = Correct responses-Number of test takers

Q = 1-P F (s) = Mean of the estimated standard deviations

(Morrison, Adamson, & Hsia, 2001).

Kuder-Richardson formulas estimate the coefficient of equivalence particularly when all the items in a test represent a single general factor (Cronbach, 1949).

KR–20 statistics for the HESI A^2 content examinations are based on unpublished studies in 2002 (Nibert, 2003), in 2003 (Murray & Nibert, 2003) using data from an associate degree nursing (ADN) education program, and in 2004 (Yoho & Young, 2004) using data from an ADN and baccalaureate degree nursing (BSN) education program (HESI, 2005). The KR–20 reliability coefficients are shown in Table 4.

Table 4

KR-20 for HESI A^2 by Examination Component

HESI A2 Examination Component	2002 ADN Program*	2003 ADN Program**	2004 ADN and BSN Program**
Math	0.95	0.93	0.99
Reading Comprehension	0.92	0.90	0.99
Vocabulary/General Knowledge	0.98	0.95	0.99
Grammar	0.97	0.97	0.99
Chemistry	0.94	N/A	0.99
Anatomy and Physiology	0.94	0.96	0.98

* Nibert, 2003

** HESI, 2005

Correlation studies of the HESI A^2 content examinations to nursing course grades are underway or have been recently completed. Murray and Nibert (2003) studied the cumulative score for six of the academically-oriented examinations: math, chemistry, anatomy and physiology, grammar, reading comprehension and vocabulary and general knowledge. The study used 52 students from one associate degree nursing program to compare the HESI A^2 score with all final nursing course grades. The correlations were statistically significant ($p = .05$) for all course grades with the exception of the grade in Therapeutic Communications and Principles of Adult Health (Murray & Nibert, 2003).

Two correlation studies on the correlation of the HESI A^2 with the HESI Specialty Examinations and the HESI Exit examination have been reported (Nibert, Murray, & Merriman, 2005; Yoho & Young, 2004). Nibert, Murray, and Merriman found that significant correlations ($p < .05$) among all HESI exams administered within the curriculum and final course grades in corresponding courses with the exception of Therapeutic Communications in the associate degree program. The Baccalaureate program showed significant correlations ($p < .05$) with all the HESI exams and final course grades. Results from the Yoho and Young (2004) study have not been published.

The second component of the HESI A^2 is the personal inventory that consists of learning styles, personality styles, and behavioral inventories (HESI, n.d.a.; HESI, 2003). This component offers students awareness about their learning preferences, study habits, and behavioral dispositions as they relate to academic achievement. The developers of the HESI A^2 iterate that this component is not intended as a psychological assessment, or detecting a learning disability, or a referral for such activities (Nibert, 2003). Scoring for the personal inventory component is found in Appendix D.

The learning styles are determined by a 14-item assessment component of the

HESI A^2 (HESI, 2003). Students are assessed as being visual, auditory, kinesthetic,

cognitive, analytical, or global learners. Written explanations of these categories include

a description of the specific type of learner and suggestions for studying that best suits

this type of learner. These explanations are provided to the students with the results of the

HESI A^2 (HESI, n.d.b).

The personality styles component is a 15-item measurement of personality as it

pertains to the preferred learning style (HESI, 2003). The categories for personality types

according to HESI are people person, leader, creative, and calm. Those in the people

person group have a dominant personality type in the talking group. The leader group

have a dominate personality type that is in the working group. The creative person is in

the thinking group. The calm person is in the watching group. Written explanations for

the groups include strengths, weaknesses, strong characteristics, and suggestions for

improving the type of learning style.

The behavioral inventory provides an overall numerical score from a 56-item test

of students' behaviors and values (HESI, 2003). Sub-categories are scored and include

decision making, emotional health, depression and stress. The overall score results

indicate how well a student will handle the rigors of nursing school (HESI, n.d.b).

Procedures

Permission to use archival data and to conduct the study on site was obtained

from the Dean of the selected nursing education program. A proposal for the study was

sent to the Institutional Review Board for the Use of Human Subjects in Research (IRB)

of the University used in the study requesting an exemption status as data already collected would be used. The status of exemption was granted (see Appendix E).

In addition, an appeal for exempt status was requested from the Auburn University Institutional Review Board for Research Involving Human Subjects to meet the requirement for performing research at the University. Approval was granted in May 2005 (see Appendix F).

All data were entered on an Excel spreadsheet by the researcher. Student records were coded to assure anonymity. Identifying data were deleted from the spreadsheet.

Demographic data were collected from student records used for admission to the School of Nursing and entered on the spreadsheet. Specific demographic data included gender, ethnicity, age at admission to the nursing education program, marital status, number of children, previous baccalaureate degree, and if practicing as a Licensed Practical Nurse (LPN). Categorical data such as gender ethnicity, marital status, previous degree, and LPN status were coded.

Course grades and GPA were obtained through the nursing education program Student Advisor. Electronic data from the university record keeping software program located in the registrar's office of the University was used. Results of the HESI A^2 data are generated by Health Education Systems, Inc. and sent to the Dean of the nursing education program. Student records with scores from the HESI A^2 were obtained from the Dean's office at the School of Nursing.

Analysis

Analysis of the data was completed using SPSS, a statistical software package. Descriptive and inferential statistics were used. Descriptive statistics to characterize the sample included the means, standard deviations and ranges for certain data.

Inferential statistical analyses began with Pearson Product Moment Correlation Coefficients to determine the extent of the relationship between the independent variables and the dependent variables. For those relationships that were significant, multivariate procedures were used. The most common type is multiple regression which is used to understand the effects of two or more independent variables on a dependent variable. Regression is used to make predictions about occurrences (Polit & Beck, 2004); the higher the correlation between the variables, the more accurate the prediction. More specifically, logistic regression was used to determine the predictability of the admission GPA, HESI A2 cumulative score, other HESI related factors, and grades for nursing theory courses on success in the junior year of the nursing program. Completion of the junior nursing courses is either yes or no, therefore, the dependent measure is of a categorical measure and suitable for logistic regression (Pedhazur, 1997).

Summary

Chapter III of the study included a description of the participants used in the study and the procedures for obtaining the data from archival records. Success in the junior year of the nursing program, the dependent or criterion variable, was defined and described using the nursing courses included during the junior year. The independent or predictor variables used in the study were described. These variables included the

68

admission GPA for the nursing program and the instrument used in the study, the HESI

A^2 examination. Demographic data and additional components of the HESI A^2 were also

used in the study and described in the chapter. The type of correlation and regression

model used for data analysis was also discussed.

IV. RESULTS

Introduction

The purpose of this study was to examine the relationship between the prerequisite academic support courses for a nursing program and the HESI A^2 as a predictor of success in the first year of a baccalaureate nursing education program. This study also identified demographic characteristics, nursing theory course grades, and HESI A^2 based factors that can be used to predict first year student success.

The results will examine the relationship between the independent variables (admission GPA, HESI A^2 cumulative score, nursing theory course grades, demographic characteristics, and other HESI A^2 based scores) and the dependent variable. The dichotomous dependent variable is described as being successful or not successful in the junior year of a nursing education program. Success in the junior year is completing all nursing theory and clinical courses in the junior year of the nursing program with a C or better.

Participants

One hundred sixty three participants met the initial criteria for admission and were admitted into the nursing education program. For the purposes of the study, data

from one hundred twenty eight participants' records were analyzed. The final number in the sample was limited due to missing or incomplete data.

The demographic characteristics of the sample were retrieved from the records. Data included age, gender, race, marital status, number of children, employment, previous degrees held, and status as a licensed practical nurse (LPN). The mean age of the students in the sample was 24.9 ($SD = 6.23$) with a range of 37 years. The range in years included from 20 to 57. The participants were predominately female (91.4 %, $n = 117$). The majority of the participants were Caucasian (79.7%, $n = 102$). African American represented the largest number of ethnic minorities with 16.4% ($n = 21$). Other ethnic groups represented were American Indian, Asian American, and Hispanic. Sixty-six percent ($n = 85$) of the sample have never been married. Twenty-five and one half percent ($n = 33$) of the participants have at least one child with eight percent having three or more children. Approximately sixty-two percent ($n = 79$) of the sample were employed either full or part time. The data showed that eighteen percent ($n = 23$) hold previous baccalaureate degrees. Seven (5.5%) of the participants are licensed practical nurses seeking the baccalaureate registered nursing degree. Table 5 depicts the demographic characteristics of the sample.

Table 5

Demographic Characteristics of Sample

Characteristic	Total	Percent
	$N = 128$	
Age	$M = 24.9$	
Gender: Male	11	8.6
Female	117	91.4
Race: White	102	79.7
Non-White	26	20.3
Marital Status		
Never Married	85	66.4
Married	39	30.5
Divorced	4	3.1
Number of Children		
None	95	74.2
One	14	10.9
Two	9	7.0
Three	8	6.3
Four	2	1.6
Employment		
Not Employed	49	38.3
Full Time	27	21.1
Part time	52	40.6
Previous Degree		
No	105	82.0
Yes	23	18.0
LPN		
No	121	94.5
Yes	7	5.5

Research Questions

The data were analyzed to address the four research questions focused on the study. The research questions examine the relationship between the independent variables (admission GPA, HESI A^2 cumulative score, nursing theory course grades, demographic characteristics, and other HESI A^2 based scores) and the dependent variable (success in the junior year of the nursing program).

Research Question One

Results of the data analysis addressed Question 1, which is stated, "What is the relationship between the admission GPA and the HESI A^2 for nursing students?" The admission grade point average (GPA) is calculated from the grades in the pre-requisite academic support courses for nursing. These pre-requisite academic support courses include English composition, English literature, a fine arts elective, history, government, sociology, general psychology, finite math, biology, introduction to chemistry, nutrition, anatomy and physiology I, anatomy and physiology II, microbiology, and developmental psychology. The sample mean admission GPA is 3.16 (*SD* .40). The range of the GPA is 2.5 to 4.0.

The HESI A^2 is an examination administered after completion of all the pre-requisite courses and prior to beginning the first nursing theory course. The components of the HESI A^2 used in this study include mathematics, reading comprehension, vocabulary, grammar, chemistry, and anatomy and physiology. A cumulative score from the HESI A^2 includes scores in the above areas. The mean HESI A^2 cumulative score for the sample is 75.6 (*SD* = 7.2). The range of the HESI A^2 cumulative scores is 55.1 to 89.2.

The relationship between the means of the admission GPA and the HESI A^2 was analyzed using a Pearson Product Moment Correlation. The correlation of the admission GPA and the HESI A^2 score were statistically significant ($r = .450, p = .01$). Table 6 identifies the means and standard deviations of the Admission GPA and the cumulative score from the HESI A^2.

Table 6

Comparison of Admission Grade Point Average and Cumulative HESI A^2 Score

Variable	*Total (N = 128)*		*r*
	M	*(SD)*	
Admission GPA	3.16	(.40)	
HESI A^2 Score	75.6	(7.20)	.450*

* p = .01(2-tailed)

To address the last three research questions, the dichotomy of the dependent variable divided the participants into groups. The first group included the participants who successfully completed the junior nursing theory and clinical courses with a grade of C or better, $n = 105$ (82%). The second group consisted of those individuals who were not successful in completing the junior nursing theory and clinical courses with a C or better, $n = 23$ (18%).

Research Question Two

The second research question was, "What is the relationship between the admission GPA and success in the first year of the nursing education program?" An independent samples t-test was performed to determine if there was a statistically significant difference between the mean GPA of those who were successful in the junior year of the nursing program and those who were not. The mean of the admission GPA for those participants who were successful in the junior year of the nursing program was 3.22 (*SD* = .40). The mean of the admission GPA for those participants who were not successful in the junior year was 2.89 (*SD* = .31). An independent samples t-test of the admission GPA for students who were successful in the junior year with those who were not was statistically significant (*t* = 3.8 (126), *p* < .001). Using ANOVA, test of between subjects effects showed a statistically significant difference (*F* (1, 128) = 14.112, *p* < .001). The effect size revealed η^2 = .101 with an observed power of .961.

Further analysis was performed using logistic regression to determine the effect of the independent variable, admission GPA, on success at the end of the junior year. The admission GPA was statistically reliable in distinguishing between those who were successful in the junior year and those who were not (-2 log Likelihood = 105.936; χ^2 (1) = 14.619, *p* = .001). The admission GPA predicted an overall percentage correct of 82.

The Receiver Operating Characteristic (ROC) curve illustrates the sensitivity and specificity of the admission GPA with success in the nursing education program used in the study. Coordinates of the curve are derived from the data analysis. Figure 1 is the graph of the ROC curve for admission GPA. The area under the curve is .739, *p* < .000.
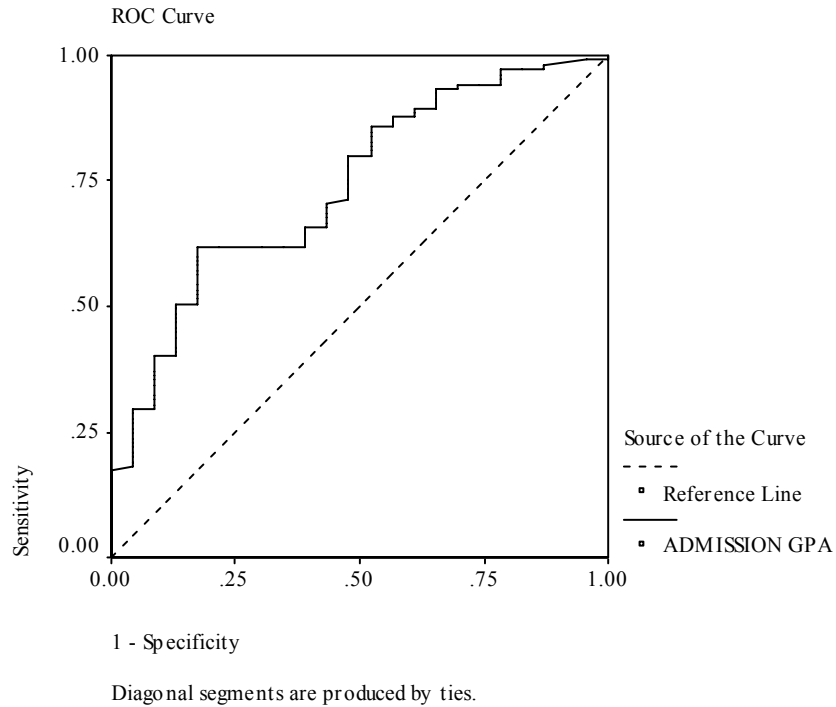
ROC Curve

Figure 1. ROC Curve for Admission GPA

The nursing program selected for the study used admission GPA as criterion for selecting students who will be admitted into the nursing education program. Admission into the program required a 2.5 GPA on the pre-nursing academic support courses. The data were analyzed to determine what GPA cut-off would best delineate those who would be successful in the junior year of the nursing program and those who would not. Table 7 shows the selected GPA cut-off points, sensitivity, specificity, and the percent of predicted probability.

Table 7

Admission GPA and Outcome: Cutting GPA, Sensitivity, Specificity, and Predicted

Probability

Cutting Admission GPA	Successful	Not successful	Sensitivity	1 -Specificity	Predicted Probability
		$N = 128$			
≥ 3.25	50	3	.48	.13	89%
≥ 3.0	68	9	.65	.39	80%
≥ 2.75	94	15	.90	.61	68%
≥ 2.7	98	16	.93	.65	65%
≥ 2.65	99	17	.94	.74	62%
≥ 2.6	102	19	.97	.78	58%
≥ 2.55	102	20	.97	.87	58%
≥ 2.5	105	23	.98	.95	53%

Research Question Three

Research Question 3, "What is the relationship between the HESI A^2 scores and students who were successful in the first year of the nursing education program and those who were not?", is addressed using an independent t test and logistic regression. The binary dependent variable divided the participants into groups. The first group included the participants who successfully completed the junior nursing theory and clinical courses

with a grade of C or better and the second group consisted of those individuals who were not successful in completing the junior nursing theory and clinical courses with a C or better.

The mean for the HESI A^2 cumulative score for the participants who successfully completed the junior year was 76.50 ($SD = 7.18$). The mean HESI A^2 cumulative score for the group that was not successful in completing the junior year course work was 71.4 ($SD = 5.74$). An independent t-test on the means of the two groups was statistically significant ($t = 3.2$ (126) $p = .002$). Using ANOVA, test of between subjects effects showed a statistically significant difference (F (1, 128) = 10.173, $p=.002$). The effect size revealed $\eta^2 = .075$ with an observed power of .886.

Further analysis was performed using logistic regression to determine the effect of the independent variable, HESI A^2 cumulative score, on success at the end of the junior year. The HESI A^2 cumulative score was statistically reliable in distinguishing between those who were successful in the junior year and those who were not (-2 log Likelihood = 111.182; χ^2 (1) = 9.374, $p = .003$). The HESI A^2 cumulative score predicted an overall percentage correct of 79.7.

The ROC curve illustrates the sensitivity and specificity of the HESI A^2 with success in the nursing education program used in the study. Coordinates of the curve are derived from the data analysis. Figure 2 is the graph of the ROC curve for the HESI A^2 cumulative score GPA. The area under the curve is .720, $p = .001$.
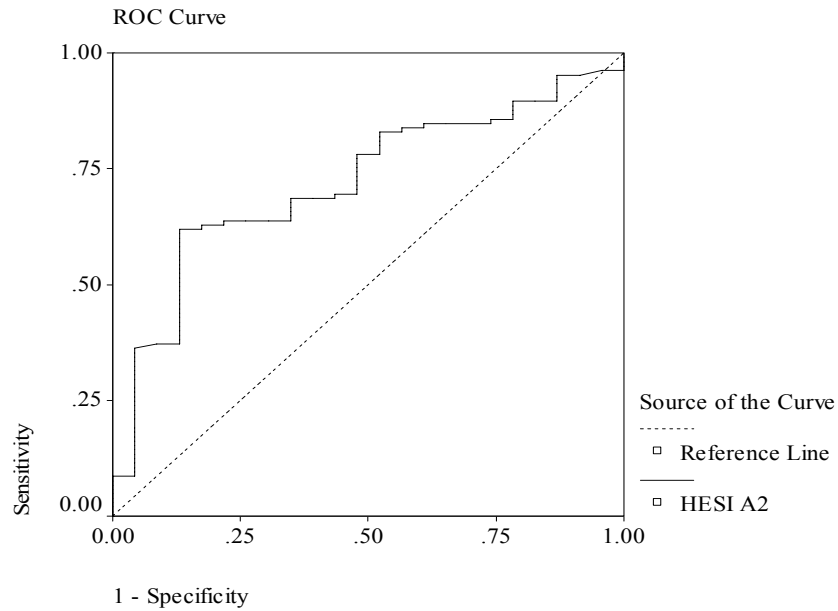
ROC Curve

Figure 2. ROC Curve for HESI A^2 Cumulative Score

The data was analyzed to determine what HESI A^2 cumulative score cut-off would best delineate those who would be successful in the junior year of the nursing program and those who would not. Health Education Systems, Inc. the developers of the HESI A^2 determined that a cumulative score of 75% for students entering a registered nursing education program should be expected (Nibert, 2005). Table 8 shows the selected HESI A^2 cut-off points, sensitivity, specificity, and the percent of predicted probability.

79

Table 8

HESI A^2 Cumulative Score and Outcome: Cutting Score, Sensitivity, Specificity, and Predicted Probability

Cutting HESI A^2 Score	Successful	Not Successful	Sensitivity	1-Specificity	Predicted Probability
		N = 128			
≥ 80	37	1	.35	.04	89%
≥ 75	67	7	.64	.26	83%
≥ 70	87	12	.82	.52	75%
≥ 65	99	20	.94	.87	67%
≥ 60	102	23	.97	1.0	55%
≥ 55	105	23	1.00	1.0	41%

The variables in Research Question Two and Three were further compared using Logistic regression to determine if the admission GPA, the HESI A^2 cumulative score, or a combination of the two would be a better predictor of success in the junior year of the nursing program. When the admission GPA and the HESI A^2 cumulative score were added to the model together a lesser statistically significance occurred (-2 Log Likelihood = 102.625; χ^2 = 17.93). The admission GPA and HESI A^2 cumulative score combined predicted an overall percentage correct of 79.7. Table 9 shows the logistic regression analysis of the two variables. Table 10 depicts the percentage of correct prediction based on each variable and combination of the two variables.

Table 9

Logistic Regression Analysis of Admission GPA and HESI A²

Variable	χ^2	Beta	p value	odds ratio	95% CI	% predicted correctly	-2 log Likelihood
Admission GPA	14.619	2.595	.001	13.397	2.919, 61.495	82	105.936
HESI A²	9.374	.099	.003	1.104	1.034, 1.179	79.7	111.182
Admission GPA and HESI A²	17.930	2.197	.007	8.997	1.820, 44.467	79.7	102.625
		.068	.071	1.070	0.994, 1.152		

Table 10

Percentage of Correct Prediction Based on Admission GPA and HESI A²

	Admission GPA			HESI A²			Admission GPA and HESI A²		
	0*	1**	Percent Correct	0*	1**	Percent Correct	0*	1**	Percent Correct
0*	0	23	0	0	23	0	1	22	4.3
1**	0	105	100	3	102	91.1	4	101	96.2
Overall Percent			82			79.7			79.7

0* = Not Successful

1** = Successful

81

The ROC curve for the admission GPA and HESI A^2 illustrates the overlap of the two variables and close proximity. The difference in the areas equals .019. Figure 3 shows how the two variables coincide.
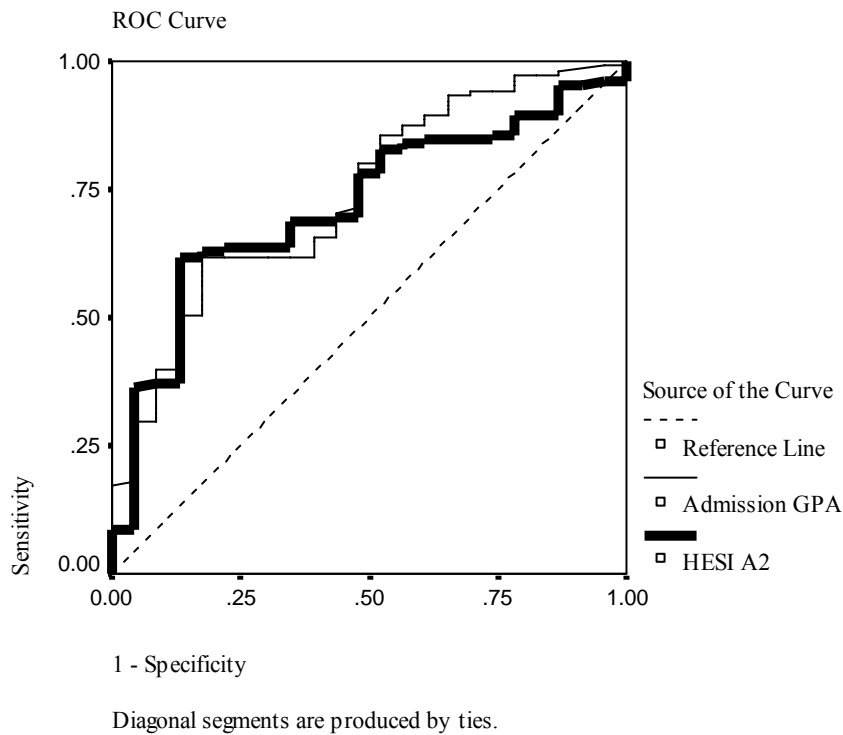
Figure 3. ROC Curve for Admission GPA and HESI A2

Research Question Four

The fourth question, "What demographic characteristics, nursing theory course grades, and HESI A^2 based factors are predictive of success in the first year of the nursing education program?" is addressed. Three sets of variables are discussed and analyzed for significance: demographic characteristics, nursing theory course grades for the junior year, and HESI A^2 based factors that include the separate academic related

components of the cumulative score from the HESI A^2 examination and learning styles, personality profiles and the behavioral score.

The demographic characteristics consisted of age, gender, race, marital status, number of children, employment, previous degrees held, and status as a licensed practical nurse (LPN). Table 11 shows the frequencies of the characteristics according to those who were successful in the first year of the nursing program and those who were not.

Table 11

Frequencies of Demographic Characteristics by Outcome Group

Demographic Characteristic	Successful ($n = 105$)	Unsuccessful ($n = 23$)
Age	$M = 25$	$M = 24.6$
Gender		
Male	8 (7.6%)	3 (13%)
Female	97 (92.4%)	20 (87%)
Race		
White	88 (83.8%)	14 (60.9%)
Non-White	17 (16.2%)	9 (39.1%)
Marital Status		
Never Married	69 (65.7%)	16 (70%)
Married	32 (30.5%)	7 (30%)
Divorced	4 (3.8%)	0

(table continues)

Table 11 (continued)

Demographic Characteristic	Successful (*n* = 105)	Unsuccessful (*n* = 23)
Number of Children		
None	76 (72.4%)	19 (82.6%)
One or more	29 (27.6%)	4 (17.4%)
Employment		
Not Employed	36 (34.3%)	13 (56.5%)
Full Time or Part time	69 (65.7%)	10 (43.5%)
Previous Degree		
Yes	22 (20.9%)	1 (4.3%)
No	83 (79.1%)	22 (95.7%)
LPN		
Yes	6 (5.7%)	1 (4.3%)
No	99 (94.3%)	22 (95.7%)

Further data analysis on the demographic characteristics revealed information to address Research Question Four. An independent samples t test was used on the age category and yielded no statistically significant difference between those who were successful and those who were not successful (p = .778). A chi-square cross tabs analysis for the categories with dichotomous data was used. The sample size and small number of responses did not allow for an analysis in the categories of gender, race, marital status, previous degree, and LPN status. Work status and number of children were not statistically significant between those who were successful and those who were not.

The junior year nursing theory course grades comprise another group of independent variables. In the fall semester of the junior year, the students enroll in

84

Pathophysiology, Nursing Skills, Holistic Assessment, and Professional Nursing

Concepts I. The grades for the nursing courses taught in the spring semester of the junior

year and used in the study include Pharmacology, Holistic Nursing: Adults and

Geriatrics, and Holistic Nursing: Infants and Children.

An independent samples *t*-test was performed to determine if there was a

difference between those who were successful in the junior year and those who were not

on any of the nursing course grades. Table 12 compares the junior year nursing theory

grades for the group that was successful with the group who were not successful. The

results showed that all of the nursing course grades were statistically significant. The

effect size addresses the strength of relationships among the variables. Cohen's effect

size values of .2, .5, and .8 indicate a small, medium, or large effect size, respectively

(Polit & Beck, 2004). All nursing courses had a large effect size.

Table 12

Comparison of Junior Year Nursing Theory Course Grades by Group

Junior Year Nursing Theory Courses	Successful (n = 105) M (SD)	Unsuccessful (n = 23) M (SD)	t	df	p (2-tailed)	Levene's Test for Equality of Variances F	p	d
Pathophysiology	85.7 (5)[a]	79 (3.6)	6.093	125	.000	3.718	.056	1.54
Nursing Skills	88.6 (4.7)	84.3 (4.6)	3.954	126	.000	.004	.948	0.92
Professional Nursing Concepts I	87.7 (4.5)	82.9 (3.5)	4.765	126	.000	2.041	.156	1.19
Pharmacology	83.8 (5.2)[a]	77 (8.8)	4.916	125	.000	2.794	.097	0.94
Holistic Nursing: Adults and Geriatrics	83.6 (5)	73.8 (7.7)	7.600	126	.000	1.128	.290	1.51
Holistic Nursing: Infants and Children	81.4 (3.8)	72.4 (4)	8.285	126	.000	.207	.630	2.31

[a]*n* = 104

The HESI A^2 examination is comprised of separate academic related components. The HESI A^2 components used in this study include Mathematics, Reading Comprehension, Vocabulary, Grammar, Chemistry, and Anatomy and Physiology. An independent samples *t*-test was computed for the means between those who were successful in the junior year and those who were not on each content area of the HESI A^2. Table 13 shows the results of the comparison of the components for those who were

successful in the junior year and for those who were unsuccessful. The mean was not

statistically significant for the Reading Comprehension component. A statistically

significant difference was found in the Math, Vocabulary, Grammar, Chemistry, and

Anatomy and Physiology components, although the effect size values are small to

medium.

Table 13

Comparison of the HESI A^2 Content Examinations by Group

HESI A^2 Content Examinations	Successful $n = 105$ M (SD)	Unsuccessful $n = 23$ M (SD)	t	df	p (2-tailed)	Levene's Test for Equality of Variances		
						F	p	d
Math	84.7 (12.1)	78.3 (12.4)	2.285	126	.024	0.446	.505	.52
Reading	82.8 (8.5)	80.2 (7.6)	1.338	126	.183	1.118	.292	.32
Vocabulary	76.5 (10.1)	70.1 (10.4)	2.726	126	.007	0.094	.760	.62
Grammar	92.3 (4.5)	88.2 (9.4)	3.140	126	.002	11.301	.001	.55
Chemistry	67.2 (13.6)	58.2 (13.1)	2.899	126	.004	0.304	.582	.67
Anatomy & Physiology	64.2 (13.6)[a]	59.1 (10.6)	2.094	124	.038	0.236	.628	.42

[a] $n = 104$

An additional part of the HESI A^2 is the Personality Profile and included learning

styles, personality styles, and behavioral inventories. The personality styles and learning

styles were categorical and had to be coded for use in the analysis. The score from the

Behavioral Inventory allowed for a statistical analysis without coding.

The developers of the HESI A^2 convey the results of the learning style types in

two groupings. The first grouping consisted of auditory, cognitive, kinesthetic, or visual

type of learners. The second grouping was analytical or global type. Table 14 shows the

frequency of learning style types of the total sample and divided by those who were

successful and those who were not successful in the first year of the nursing program.

Table 14

Frequencies of Learning Style Types by Group and Total

Grouping I	Successful ($n = 103$)	Unsuccessful ($n = 23$)	Total ($n = 126$)
Auditory	26 (25.2%)	5 (21.7%)	31 (24.6%)
Cognitive	16 (15.5%)	1 (4.3%)	17 (13.5%)
Kinesthetic	53 (51.5%)	14 (60.9%)	67 (53.2%)
Visual	8 (7.8%)	3 (13.1%)	11 (8.7%)
Grouping II			
Analytic	51 (49.5%)	5 (21.7%)	56 (45.3%)
Global	52 (50.5%)	18 (78.3%)	70 (54.7%)

The small sample and number of responses in certain cells did not allow for an

analysis of the Group I learning styles. A majority of the sample was kinesthetic style

learners.

A chi square analysis of the second grouping (analytical vs. global) and outcome (successful vs. unsuccessful) showed a statistically significant relationship between the learning style and the outcome ($\chi^2 = 6.3$, $p < .05$). The data analysis further documents that the Odds Ratio is 3.67 (95% CI = 1.3, 10.6) indicating that those who did not succeed were almost 4 times more likely to have a global learning style rather than an analytical learning style.

The Personality Profile of the HESI A^2 included four categories: calm person, creative person, lead person, and people person. The assignment of the category is determined by the dominate personality type. Table 15 shows the frequencies and percentages of the personality style type by the outcome group. A chi square analysis revealed an insufficient number of cases in at least one cell.

Table 15

Frequencies of Personality Types by Outcome Group

Personality Type	Successful ($n = 103$)	Unsuccessful ($n = 21$)	Total ($n = 124$)
Calm	17 (16.5%)	3 (14.3%)	20 (16.1%)
Creative	27 (26.2%)	4 (19.1%)	31 (25.0%)
Lead	36 (35.0%)	7 (33.3%)	43 (34.7%)
People	23 (22.3%)	7 (33.3%)	30 (24.2%)

The third component of the Personality means for the Behavioral Inventory for those who were successful and those who were not successful were 6.8 (*SD* =1.5) and 6.8 (*SD* 1.3), respectively. Results from independent samples t-test for the Behavioral Inventory score showed no statistically significant difference between the means for the two groups (*t* = -.303 (124), *p* = .762). An ANOVA revealed no statistically significant difference between groups (*F* (1, 126) = .092, *p* = .762). The effect size showed η^2 = .001 with an observed power of .06.

Summary

Results of the data analysis for the study to determine if the admission GPA, HESI A^2 cumulative score or demographic characteristics, nursing theory course grades, and HESI A^2 based factors can be used to predict first year student success. Logistic analysis, chi square, and an independent samples t-test were used to analyze the data. An alpha level of .05 was set. From the sample, the correlation of the admission GPA and HESI A^2 cumulative score was found to be statistically significant. As compared with the dependent variables, being successful or not being successful in the junior year of the Baccalaureate nursing program, both independent variables showed a statistically significance difference.

Other variables were analyzed. The demographic factors showed too few participants in one or more categories to provide an analysis of whether or not a statistically significant difference between those who were successful and those who were not. All the nursing course grades were statistically significant. The Holistic Nursing: Infants and Children course had the highest effect sizes (see Table 12). One of

the individual components of the HESI A^2 cumulative score, reading, was not statistically significant. The other components of the HESI A^2 cumulative score were statistically significant with small to medium effect sizes (see Table 13). The learning styles analysis showed too few numbers in at least one of the cells to be valid. However, from the descriptive analysis of the frequencies, the majority of those in the sample were kinesthetic learners. There was not a statistically significant difference between the means of the behavioral inventories. Chapter V includes the purpose of the study, summary of the study, a discussion of the results, recommendations for further study, and recommendations for faculty teaching in nursing education programs.

V. SUMMARY, DISCUSSION, AND RECOMMENDATIONS

Purpose of the Study

The purpose of this study was to examine the relationship between the prerequisite academic support courses for a nursing program and the HESI A^2 as a predictor of success in the first year of a baccalaureate nursing education program. This study also identified demographic characteristics, nursing theory course grades, and HESI A^2 based factors that can be used to predict first year student success.

Summary

The participants included three cohorts of students seeking admission into a baccalaureate nursing education program during the fall of 2001, 2002, and concluding with the fall 2003. A total of 128 students met the criteria for inclusion in the sample. The demographic characteristics of the sample included age, gender, race, marital status, number of children, employment, previous degrees held, and status as a licensed practical nurse (LPN). The mean age of the students in the sample was 24.9 ($SD = 6.23$) with a range of 37 years. The range in years was from 20 to 57. The participants were predominately female (91.4 %, $n = 117$). The majority of the participants were Caucasian (79.7%, $n = 102$). African American represented the largest number of ethnic minorities with 16.4% ($n = 21$). Other ethnic groups represented were American Indian,

92

Asian American, and Hispanic. Sixty-six percent ($n = 85$) of the sample have never been married. Twenty-five and one half percent ($n = 33$) have one or more children with eight percent having three or more. Approximately, sixty-two percent ($n = 79$) of the sample are employed either full or part time. The data showed that eighteen percent ($n = 23$) hold previous baccalaureate degrees. Seven (5.5%) of the participants are licensed practical nurses seeking the baccalaureate registered nursing degree.

The sample was divided into two groups for the study. The first group included the participants who successfully completed the junior nursing theory and clinical courses with a grade of C or better, $n = 105$ (82%). The second group consisted of those individuals who were not successful in completing the junior nursing theory and clinical courses with a C or better, $n = 23$ (18%). Success in the junior year nursing courses was the outcome variable.

The GPA of the pre-requisite academic support courses used for admission into the nursing education program was one of the predictor variables analyzed in the study. The admission GPA is calculated by dividing the total number of grade points for the prerequisite courses by the total number of the credit hours of the pre-requisite courses. The prerequisite academic support courses include English composition, English literature, a fine arts elective, history, government, sociology, general psychology, finite math, biology, introduction to chemistry, nutrition, anatomy and physiology I, anatomy and physiology II, microbiology, and developmental psychology.

The second predictor variable was the cumulative score from the HESI A^2. The HESI A^2 is an examination containing two components: various academic content areas necessary for nursing students and assessments for learning style, personality profile, and

behavioral inventory (HESI, n.d.a.; HESI, 2003). The HESI A^2 cumulative score includes the academic content areas only.

Additional available data were studied to determine factors that can predict first year success in a nursing education program. Data analyzed included demographic characteristics (age, gender, race, marital status, work status, number of children, previous degree, and LPN status), nursing theory course grades (Pathophysiology, Nursing Skills, Holistic Assessment, Professional Nursing Concepts I, Pharmacology, Holistic Nursing: Adults and Geriatrics, and Holistic Nursing: Infants and Children), and HESI A^2 based factors (learning styles, personality styles, and behavioral inventory). Pearson R correlations, logistic regression, and a one-way multivariate analysis of variance were used to determine statistically significant predictors based on the following research questions:

1.   What is the relationship between the admission GPA and the HESI A^2 for nursing students?

2.   What is the relationship between the admission GPA and success in the first year of the nursing education program?

3.   What is the relationship between the HESI A^2 scores and students who were successful in the first year of the nursing education program and those who were not?

4.   What demographic characteristics, nursing theory course grades, and HESI A^2 based factors are predictive of success in the first year of the nursing education program?

94

Discussion

Faculty in nursing education programs are challenged with identifying criteria for admission into the program. The grades from the pre-nursing academic support courses calculated into the cumulative GPA of the pre-nursing courses is readily available for use as admission criteria and used in many nursing education programs. Statistical analysis of the cumulative GPA in this study showed a moderate correlation with the HESI A^2 cumulative score. There was a statistically significant relationship with admission GPA and success in the junior year of the nursing education program. Use of the cumulative GPA of the pre-nursing academic support courses as admission criteria was supported in this study.

The HESI A^2 cumulative score is another variable studied for use as admission criteria. As with the cumulative admission GPA, the HESI A^2 cumulative score showed a statistically significant correlation with success in the junior year of the nursing education program. The HESI A^2 cumulative score for admission criteria into the nursing program was supported in this study.

A determination of which one of the two variables is the best choice for admission criteria should be made based on statistical analysis and practicality. Both the admission GPA and the HESI A^2 cumulative score showed a statistically significant relationship with success in the junior year of the nursing program and could be used as admission criteria. The HESI A^2 requires financial expense on the part of the student and faculty or staff time at the school or university to administer the examination under proctored conditions. Additional statistical analysis of the two variables together with success in the

junior year did not show an increase in the percentage of correct prediction over the admission GPA alone.

The demographic variables showed too few participants in the sample to provide an analysis or an absence of a statistically significant difference between the two groups. In the study, however, the frequencies in the descriptive statistics revealed that the sample contains a variety of adult learners. Long (2004) discusses the variations of adult learners in terms of motives for learning, personalities, experiences, and roles. The demographics of the sample in the study validated these variations that are described by Long. From the learning motivation and experiential aspect, all learning styles are represented in the sample, eighteen percent of the sample hold previous degrees and five percent are already licensed as LPNs. Various roles are integral obligations of the adult learner and depicted in this study's sample. Thirty-one percent of the sample are married; twenty six percent have children; and sixty-two percent work full or part-time. The personality profile from the HESI A^2 showed that the sample represents all four types of personalities.

Grades in the nursing courses of the junior year were analyzed to determine the relationship with success in the junior year of the nursing program. Three of the nursing courses, Pathophysiology, Holistic Nursing: Adult and Geriatrics and Holistic Nursing: Infants and Children showed the highest correlation with success in the junior year. In two of the courses, the average semester grade for the group who was not successful in the junior year was less than 75. Seventy-five is the lowest accepted grade for progression in the program. Both of these courses are taken in the second semester of the junior year and are the first of the medical content courses where test questions for

96

evaluation of student learning are written at the application or higher cognitive level in preparation for the NCLEX-RN. NCLEX-RN questions are mostly written at the application level or higher (NCSBN, 2003). Generally, the other junior level nursing courses are evaluated with more fundamental knowledge and comprehension cognitive level questions.

In addition to the cumulative score, the HESI A^2 assesses other aspects of the student. Learning styles, personality styles, and behavioral inventory of the students are assessed. Each of these components of the HESI A^2 was analyzed. These additional components of the HESI A^2 may be helpful in identifying students at risk for being unsuccessful and out weigh the expense of the administration of the examination.

Health Education Systems, Inc. provides information on the type of learning style of the student. Each student is categorized into two separate groups of learning styles. One group includes auditory, cognitive, kinesthetic, and visual learners. The second group consists of analytical or global learners. There is no statistically significant relationship between the auditory, cognitive, kinesthetic, and visual learning categories of the first group of learning styles and success in the first year of the nursing program. A majority of students in both the successful and unsuccessful group are kinesthetic learners.

The second group of learning styles consisted of analytical or global learners. Analysis of these two groups showed a statistically significant relationship. The students who were successful in the junior year of the nursing program were closely divided between analytical (49.5%) or global learners (50.5%). A high percent (78%) of the students who were not successful in the junior year was global learners.

The behavioral inventory was to identify students' behaviors and values (HESI, 2003). The overall score results indicate how well a student will handle the rigors of nursing school (HESI, n.d.b). The results indicated there was no statistically significant relationship between the behavioral inventory scores for the students who were successful and those who were not successful in the junior year of the nursing program.

Recommendations

The recommendations from this study encompass two areas: the need for further study and suggestions for faculty teaching in nursing education programs. The following recommendations address the two areas.

Recommendations for Further Research

1.   Future research should include the use of additional numbers of participants to study the HESI A^2. Although this study showed a statistically significant relationship between the HESI A^2 cumulative score with the success in the junior year of the nursing program, the ability to generalize the results is limited because of the number of participates in the sample. This study included 128 participants from one baccalaureate school of nursing in the sample. The potential uniqueness of the sample would add to the difficulty of generalizing the findings. Additional data from other schools of nursing, including associate and baccalaureate nursing education programs, will add to the reliability and validity of the instrument.

2.   Studies comparing the HESI A^2 results of associate degree nursing programs with baccalaureate degree nursing programs should follow to determine if the

HESI A^2 would have a higher correlation and predictability with one type of education program from the other.

3.   Learning styles of nursing students need further study. As shown in this study, global learners make up 78% of the group that was not successful in the junior year. Further assessment of the students using additional instruments to determine the learning style would be valuable in focusing on appropriate methods of teaching.

4.   Selection of criteria for admissions into nursing education programs continues to plague faculty. Additional methods of identifying and selecting those students who are likely to be successful in the nursing education program should continue to determine predictors of success in the nursing education program. Studying individual pre-nursing academic support course grades, such as anatomy and physiology or overall science GPA as admission criteria would add to the body of knowledge and determine consistent predictors of success in nursing education programs (Jeffries & Norton, 2005).

If the GPA of the pre-nursing academic courses continues to be used as criteria for admission into the nursing program, data should support that GPA which has the best cut-off point for success. Data from additional classes should be incorporated to further validate the use of a particular cut-off point GPA.

5.   The importance of success on the NCLEX-RN impacts nursing graduates and nursing education programs. A recommendation for study of the HESI A^2 and the NCLEX-RN results would be beneficial. Identifying factors from the HESI A^2 which predict success or failure on NCLEX-RN will assist nursing education programs in identifying students who may be at risk for NCLEX-RN failure. This would determine

early identification of potential NCLEX failures (Beeson & Kissling, 2001; Higgins, 2005).

Recommendations for Nursing Faculty

1.   The GPA of the pre-nursing academic support courses or admission GPA was identified as a predictor of success in the nursing education program used in the study. Faculty should determine if the admission GPA should be used as a determining factor for admission into the nursing education program and what specific GPA makes the best cut point for admission. If it is determined that admission GPA should be a factor, faculty must further decide if the GPA is the sole criterion or to be used in conjunction with other criterion, such as a score on an admission examination.

2.   The HESI A^2 assessed the learning styles of the sample. Faculty should select a variety of teaching methods to accentuate the different learning styles of the student population (Forrest, 2004). Nursing faculty are responsible for identifying teaching and learning strategies and managing environments that foster the development of critical thinking and clinical decisions making skills specific to nursing.

More specifically, results from this study indicate that students who were not successful in the first year of the nursing program were more often global learners. Faculty need to explore teaching methods that will enhance learning and applying nursing theory content for the global learners (Dunn, 1998).

3.   Demographics and personality profile of the sample in the study validated a variety of the characteristics of the adult learner (Long, 2004). Faculty teaching in nursing education programs need to be aware of the varied personality, experiential, and

role characteristics of the adult learner and provide learning strategies in an environment conducive to acquiring the knowledge and applying the skills of nursing.

      4.   Students who are at risk for being unsuccessful in the nursing education program can be assisted and supported by faculty. Faculty should formulate remediation strategies throughout the junior and senior year in the nursing curriculum (Beeson & Kissling, 2001) or develop a retention program for at risk students (Englemann, 2004; Jeffreys, 2004; Lockie & Burke, 1999).

REFERENCES

Ables, L., Flick, J., Morrison, S., Rohlich, B., Tollett, A., Tollett, J., & Zivley, S. (2003). *HESI admission assessment*^{TM} *study guide* (D. Boyd, Ed.). Houston, TX: Health Education Systems, Inc.

Alabama Board of Nursing. (n.d.). *Alabama board of nursing administrative code, chapter 610-X-3 education programs*. Retrieved May 31, 2006 from http://abn.state.al.us/main/downloads/admin-code/chapter%20610-X-3.html

Alexander, J. E., & Brophy, G. H. (1997). A five-year study of graduates' performance on NCLEX-RN. *Journal of Nursing Education, 36*, 443–445.

American Association of Colleges of Nursing (AACN). (1998). *The essentials of baccalaureate education for professional nursing practice.* Washington, DC: Author.

American Association of Colleges of Nursing (AACN). (2002). *Though enrollments rise at U.S. nursing colleges and universities, increase is insufficient to meet the demand for new nurses*. Retrieved June 4, 2006 from http://www.aacn.nche.edu/Media/NewsReleases/archives/2002/enrol02.htm

American Association of Colleges of Nursing (AACN). (2003). *Faculty shortages in baccalaureate and graduate nursing programs: Scope of the problem and*

strategies for expanding the supply. Retrieved June 4, 2006, from

http://www.aacn.nche.edu/ Publications/pdf/TFFFWP.pdf

American Association of Colleges of Nursing (AACN). (2004, December). *Enrollment*

increases at U.S. nursing schools are moderating while thousands of qualified

students are turned away. Retrieved June 4, 2006 from

http://www.aacn.nche.edu/Media/NewsReleases/enrl04.htm

American Association of Colleges of Nursing (AACN). (2005). *New data confirms*

shortage of nursing school faculty hinders efforts to address the nation's nursing

shortage. Retrieved June 4, 2006, from http://www.aacn.nche.edu/Media/

NewsReleases/2005/Enrollments05.htm

American Nurses Association Committee on Nursing Education. (1965). American

Nurses Association's first position on education for nursing. *American Journal of*

Nursing, *65*(12), 106–107.

Amos, L. (2005). Baccalaureate nursing programs. Retrieved January 15, 2006, from the

American Association of Colleges of Nursing (AACN) Web site:

http://www.aacn.nche.edu/Education/nurse_ed/BSNArticle.htm

Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching and*

assessing: A revision of Bloom's taxomony of educational objectives (Abridged

ed.). New York: Longman.

Arathuzik, D., & Aber, C. (1998). Factors associated with national council licensure

examination-registered nurse success. *Journal of Professional Nursing*, *14*(2),

119–126.

Astin, A. W. (1991). *Assessment for excellence: The philosophy and practice of assessment and evaluation in higher education.* New York: Macmillan Publishing Company.

Astin, A. W. (1993). *What matters in college?* San Francisco: Jossey-Bass Publishers.

Barkley, T. W., Rhodes, R. S., & DuFour, C. A. (1998). Predictors of success on the NCLEX-RN among baccalaureate nursing students. *Nursing and Health Care Perspectives*, *19*(3), 132–138.

Beeman, P. B., & Waterhouse, J. K. (2001). NCLEX-RN performance: Predicting success on the Computerized Examination. *Journal of Professional Nursing, 17*(4), 158–165.

Beeson, S. A., & Kissling, G. (2001). Predicting success for baccalaureate graduates on the NCLEX-RN. *Journal of Professional Nursing, 17*(3), 121–127.

Benner, P. (1984). *From novice to expert: Excellence and power in clinical nursing practice*. Menlo Park, CA: Addison-Wesley Publishing Co.

Berlin, L. E., Bednash, G. D., & Stennett, J. (2001). *2000-2001 enrollment and graduations in baccalaureate and graduate programs in nursing*. Washington, DC: American Association of Colleges of Nursing.

Berlin, L. E., Stennett, J., & Bednash, G. D. (2002). *2001-2002 enrollment and graduations in baccalaureate and graduate programs in nursing*. Washington, DC: American Association of Colleges of Nursing.

Berlin, L. E., Stennett, J., & Bednash, G. D. (2003). *2002-2003 enrollment and graduations in baccalaureate and graduate programs in nursing*. Washington, DC: American Association of Colleges of Nursing.

Berlin, L. E., Stennett, J., & Bednash, G. D. (2004). *2003-2004 enrollment and graduations in baccalaureate and graduate programs in nursing*. Washington, DC: American Association of Colleges of Nursing.

Berlin, L. E., Wilsey, S. J., & Bednash, G. D. (2005). *2004-2005 enrollment and graduations in baccalaureate and graduate programs in nursing*. Washington, DC: American Association of Colleges of Nursing.

Bloom, B. S. (Ed.). (1956). *Taxonomy of educational objectives: The classification of educational goals by a committee of college and university examiners.* New York: D. McKay.

Boland, D. L., & Finke, L. M. (2005). Curriculum designs. In D. M. Billings & J. A. Halstead, *Teaching in nursing: A guide for faculty* (pp. 145–166). St. Louis, MO: Elsevier, Inc.

Brisco, V. J., & Anema, M. G. (1999). The relationship of academic variables as predictors of success on the national council licensure examination for registered nurses (NCLEX-RN) in a selected associate degree program. *ABNF Journal, 10*(4), 80–86.

Brookfield, S. D. (2004). Critical thinking techniques. In M.W.Galbraith (Ed.), *Adult learning methods: A guide for effective instruction* (pp. 341–360). Malabar, FL: Krieger Publishing Co.

Buerhaus, P. I., Staiger, D. O., & Auerbach, D. I. (2000). Implications of an aging registered nurse workforce. *JAMA, 283*(22), 2948–2945. Retrieved June 4, 2006 from CINAHL® database.

Campbell, A., & Dickson, C. J. (1996). Predicting student success: A 10-year review using integrative review and meta-analysis. *Journal of Professional Nursing*, *12*(1), 47–59.

Chitty, K. K. (2005). *Professional nursing: Concepts and challenges*. St. Louis: Elsevier.

Chornick, N. L., & Wendt, A. L. (1997). NCLEX-RN: From job analysis study to examination. *Journal of Nursing Education, 36*(8), 378–382.

Colucciello, M. L. (1999). Relationships between critical thinking dispositions and learning styles. *Journal of Professional Nursing*, *15*(5), 294–301.

Commission on Collegiate Nursing Education (CCNE). (2003). Standards for accreditation of baccalaureate and graduate nursing programs. Retrieved June 4, 2006 from http://www.aacn.nche.edu/Accreditation/NewStandards.htm

Crocker, L., & Algina, J. (1986). *Introduction to classical and modern test theory*. New York: Holt, Rinehart, and Winston.

Cronbach, L. J. (1949). *Essentials of psychological testing*. New York: Harper & Brothers.

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.

Daley, L. K., Kirkpatrick, B. L., Frazier, S. K., Chung, M. L., & Moser, D. K. (2003). Predictors of NCLEX-RN success in a baccalaureate nursing program as a foundation for remediation. *Journal of Nursing Education*, *42*(9), 390–398.

DeYoung, S. (2003). *Teaching strategies for nurse educators.* Upper Saddle River, NJ: Pearson Education, Inc.

Dolan, J. A. (1963). *Goodnow's history of nursing* (11th ed.). Philadelphia: Saunders.

Dunn, R. S. (1998). *Learning styles and the nursing profession*. New York: Jones & Bartlett Publishers, Inc.

Dunn, R. S., & Griggs, S. A. (2000). *Practical approaches to using learning styles in higher education.* Westport, CT: Bergin & Garvey.

Endres, D. (1997). A comparison of predictors of success on NCLEX-RN for African American, foreign-born, and white baccalaureate graduates. *Journal of Nursing Education, 36*(8), 365–373.

Engelmann, L. (2004). Interventions for student success. In L. Caputi & L. Engelmann (Eds.), *Teaching nursing: The art and science* (Vol. 1, pp. 406–419). Glen Ellyn, Illinois: College of DuPage Press.

Forrest, S. (2004). Teaching styles. In L. Caputi & L. Engelmann (Eds.), *Teaching nursing: The art and science* (Vol. 1, pp. 345–365). Glen Ellyn, IL: College of DuPage Press.

Gallahger, P. A., Bomba, C., & Crane, L. R. (2001). Using an admissions exam to predict student success in an ADN program. *Nurse Educator*, *26*(3), 132–135.

Gay, L. R., & Airasian, P. (2003). *Education research: Competencies for analysis and applications.* Upper Saddle River, NJ: Pearson Education.

Haas, R. E., Nugent, K. E., & Rule, R. A. (2004). The use of discriminant function analysis to predict student success on the NCLEX-RN. *Journal of Nursing Education, 43*(10), 440–446.

Health Education Systems, Inc. (HESI) (n.d.a). HESI Admission Assessment[TM] (A[2]). Retrieved June 4, 2006 from http://www.hesitest.com/testing/exams/entrance.asp

Health Education Systems, Inc. (HESI) (n.d.b). *Scoring explanations for: Learning styles, behavioral inventory, personality types.* Houston, TX: Author.

Health Education Systems, Inc. (HESI) (n.d.). HESI exams[TM]: Price sheet. Retrieved January 12, 2006 from http://hesitest.com/testing/exams/examlist.asp

Health Education Systems, Inc. (HESI). (2003). *Attention users of the HESI admission assessment exam (A^2) and faculty scoring guide.* Houston, TX: Author.

Health Information Systems, Inc. (HESI). (2005) *Reliability estimates for the HESI admission assessment* [Health Education Systems, Inc. Database]. Houston, TX: Health Information Systems, Inc.

Higgins, B. (2005). Strategies for lowering attritions rates and raising NCLEX-RN pass rates. *Journal of Nursing Education*, *44*(12), 541–547.

Hinshaw, A. (2001). A continuing challenge: The shortage of educationally prepared nursing faculty. *Online Journal of Issues in Nursing, 6*(1), Manuscript 3. Retrieved June 4, 2006, from http://www.nursingworld.org/ojin/ topic14/tpc14_3.htm

Iwasiw, C., Goldenberg, D., & Andrusyszyn, M. (2005). *Curriculum development in nursing education*. Boston: Jones and Bartlett Publishers.

James, W. B., & Maher, P. A. (2004) Understanding and using learning styles. In M. W. Galbraith (Ed.), *Adult learning methods: A guide for effective instruction* (pp. 119–139). Malabar, FL: Krieger Publishing Co.

Jeffreys, M. R. (2004). *Nursing student retention: Understanding the process and making a difference.* New York: Springer Publishing Co.

Jeffries, P., & Norton, B. (2005). Selected learning experiences to achieve curriculum

    outcomes. In D. M. Billings & J. A. Halstead, *Teaching in nursing: A guide for*

    faculty (pp. 187–212). St. Louis, MO: Elsevier, Inc.

Johnson & Johnson Health Care Systems, Inc. (2005). Enrollment increases at nursing

    schools-yet thousands still turned away. Retrieved May 31, 2006 from

    http://www.discovernursing.com/newsletter_view.aspx?id=6

Kalisch, P. A., & Kalisch, B. J. (2004). *American nursing: A history* (4th ed.).

    Philadelphia: Lippincott, Williams, & Wilkins.

Keating, S. B. (2006). *Curriculum development and evaluation in nursing*. Philadelphia:

    Lippincott, Williams, & Wilkins.

Kubiszyn, T., & Borich, G. (2003). *Educational testing and measurement: Classroom*

    application and practice. New York: J. Wiley & Sons.

Lauchner, K. A., Newman, M., & Britt, R. B. (1999). Predicting licensure success with a

    computerized comprehensive nursing exam: The HESI exit exam. *Computers in*

    Nursing, 17(3), 120–128.

Lavin, D. E. (1965). *The prediction of academic performance: A theoretical analysis and*

    review of research. New York: Russell Sage Foundation.

Lewis, C., & Lewis, J. H. (2000). Predicting academic success of transfer nursing

    students. *Journal of Nursing Education, 39*(5), 234–236.

Linares, A. Z. (1999). Learning styles of students and faculty in selected health care

    professions. *Journal of Nursing Education, 38*(9), 407–714.

Linn, R. L., & Gronlund, N. E. (2000). *Measurement and assessment in teaching*. Upper

    Saddle River, NJ: Merrill.

Lockie, N. M., & Burke, L. J. (1999). Partnership in learning for utmost success (PLUS): Evaluation of a retention program for at-risk nursing students. *Journal of Nursing Education, 38*(4), 188–192.

Long, H. B. (2004). Understanding adult learners. In M. W. Galbraith (Ed.), *Adult learning methods: A guide for effective instruction* (pp. 23–37). Malabar, FL: Krieger Publishing Co.

Morrison, S., Adamson, C., & Hsia, S. (2001). Reliability and validity of HESI exams. HESI Newsletter. Houston, TX: Health Education Systems, Inc.

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

Morrison, S., Free, K. W., & Newman, M. (2002). Do progression and remediation policies improve NCLEX-RN pass rates? *Nurse Educator, 27*(2), 94–96.

Murray, K., & Nibert, A. (2003, November). *Evaluating student success & curriculum outcomes with HESI.* Paper presented at meeting of the 8th National Nurse Educator Conference. Indiana University School of Nursing. Indianapolis, IN.

National Council of State Boards of Nursing, Inc. (NCSBN). (1996). *Assuring competence: A regulatory responsibility.* Chicago: Author.

National Council of State Boards of Nursing, Inc. (NCSBN). (1999). *Uniform core licensure requirements: A supporting paper.* Retrieved June 4, 2006, from http://www.ncsbn.org/regulation/nursingpractice_nursing_practice_licensing.asp

National Council of State Boards of Nursing, Inc. (NCSBN). (2003). *NCLEX-RN® Examination: Test plan for the national council licensure examination for*

registered nurses. Retrieved June 4, 2006 from http://www.ncsbn.org/pdfs/

RNTestPlan_Apr04.pdf

National Council of State Boards of Nursing, Inc. (NCSBN). (2004). Model Nursing Act

and Rules. Retrieved January 8, 2006 from http://www.ncsbn.org/regulation/

nursingpractice_nursing_practice_model_act_and_rules.asp

National Council of State Boards of Nursing (NCSBN). (2005). *2005 NCLEX®*

Examination Candidate Bulletin. Retrieved June 4, 2006 from

http://ncsbn.org/pdfs/Web_Bulletin_05.pdf

National League for Nursing (NLN). (2004). *Tri-council for nursing: Policy statement.*

Retrieved June 4, 2006 from http://www.nln.org/aboutnln/ news_tricouncil2.htm

National League for Nursing (NLN). (2005). *News: Despite encouraging trends*

suggested by the NLN's comprehensive survey of all nursing programs, large

number of qualified application continue to be turned down. Retrieved January

12, 2006 from http://www.nln.org/newsreleases/nedsdec05.pdf

Nelson, M. (2002). Education for professional nursing practice: Looking backward into

the future. *Online Journal of Issues in Nursing, 7*(3), Manuscript 3. Retrieved

June 4, 2006, from http://www.nursing_world.org/ojin/topic18/ tpc18_3.htm

Newman, M., Britt, R. B., & Lauchner, K.A. (2000). Predictive accuracy of the HESI exit

exam: A follow-up study. *Computers in Nursing, 18*(3), 132–136.

Nibert, A. (2003). *HESI Admission Assessment (A^2) Exam^{TM} reliability and validity data.*

Houston, TX: Health Education Systems, Inc.

Nibert, A. (2005). *Information about the HESI admission assessment exam:*

Development & scoring. Houston, TX: Health Education Systems, Inc.

Nibert, A., Murray, K., & Merriman, C. (2005, February). *Benchmarking with HESI exams in ADN and BSN programs.* Paper presented at the 19th Annual Southern Nursing Research Society Conference, Atlanta, Georgia. Abstract retrieved June 4, 2006 from http://www.conferenceprogram.com/snrs/PaperAbstract/ 6E_Nibert.pdf

Nibert, A., & Young, A. (2001). A third study on predicting NCLEX success with the HESI exit exam. *Computers in Nursing, 19*(4), 172–178.

Nibert, A., Young, A., & Adamson, C. (2002). Predicting NCLEX success with the HESI exit exam: Fourth annual validity study. *CIN: Computers, Informatics, Nursing, 20*(6), 261–267.

Nibert, A., Young, A., & Britt, R. (2003). The HESI exit exam: Progression benchmark and remediation guide. *Nurse Educator, 28*(3), 141–145.

Nightingale, F. (1859). *Notes on nursing: What it is, and what it is not*. London: Harrison and Sons.

Nurse Reinvestment Act of 2002, Pub. L. No. 107-205, § 1,116 Stat. 811 (2002)

Oermann, M. H., & Gaberson, K. B. (1998). *Evaluation and testing in nursing education*. New York: Springer Publishing Co.

Pascarella, E. T., & Terenzini, P. T. (1991). *How college affects students*. San Francisco: Jossey-Bass Publishers.

Pedhazur, E. J. (1997). *Multiple regression in behavioral research: Explanations and prediction* (3rd ed.). Australia: Thomson Learning.

Perfetto, G. (2002). Predicting academic success in the admissions process: Placing an empirical approach in a larger process. *The College Board Review, 196*, 30–35.

Polit, D. E., & Beck, C. T. (2004). *Nursing research: Principles and methods* (7th ed.). Philadelphia: Lippincott, Williams, & Wilkins.

Potolsky, A., Cohen, J., & Saylor, C. (2003). Academic performance of nursing students: Do prerequisite grades and tutoring make a difference? *Nursing Education Perspectives, 24*(5), 246–251.

Rakoczy, M., & Money, S. (1995). Learning styles of nursing students: A 3-year cohort longitudinal study. *Journal of Professional Nursing*, *11*(3), 170–174.

Reverby, S. (Ed.). (1984). *Nursing and nursing education in the United States: The committee for the study of nursing education*. New York: Garland Publishing, Inc.

Sandiford, J. R., & Jackson, D. K. (2003, April). *Predictors of first semester attrition and their relation to retention of generic associate degree nursing students.* Paper presented at the Annual Meeting of the Council for the Study of Community Colleges, Dallas, TX.

Sayles, S., Shelton, D., & Powell, H. (2003). Predictors of success in nursing education. *ABNF Journal, 14*(6), 116–126.

Scanlan, J. M., & Care, W. D. (2004). Grade inflation: Should we be concerned? *Journal of Nursing Education, 43*(10), 475–479. Retrieved June 4, 2006, from ProQuest® database.

Schmidt, A. E. (2000). An approximation of a hierarchical logistic regression model used to establish the predictive validity of scores on a nursing licensure exam. *Educational and Psychological Measurement, 60*(3), 463–478.

Schoonjans, F. (2006). ROC curve analysis: Introduction. Retrieved March 9, 2006 from http://www.medcalc.be/manual/mpag06-13a.php

Seldomridge, L. A., & DiBartolo, M. C. (2004). Can success and failure be predicted for

    baccalaureate graduates on the computerized NCLEX-RN? *Journal of*

    Professional Nursing, 6(20), 361-368.

Shoichet, C. E. (2002). Nurses needed, stat: Shortage leads colleges to expand programs

    and recruitment. *The Chronicle of Higher Education*, *48*(47), 30–31.

Simon, S. (2005). Stats: ROC curve. Retrieved March 11, 2006 from Children's Mercy

    Hospitals & Clinics Web site: http://www.childrens-mercy.org/stats/ask.asp

Walld, R. (2001). Using the ROC Curve to Measure Sensitivity & Specificity. Retrieved

    March 11, 2006 from http://www.umanitoba.ca/centres/mchp/concept/dict/

    Statistics/ROC.html

Wallen, N. E., & Fraenkel, J. R. (2001). *Educational research: A guide to the process*.

    Mahwah, NJ: Lawrence Erlbaum Associates.

Washington, L. J. & Perkel, L. (2001). NCLEX-RN strategies for success: A private

    university's experience. *ABNF Journal, 12*(1), 12–20.

Wiersma, W. (2000). *Research methods in education*. Boston: Allyn and Bacon.

Woolfolk, A. (2004). *Educational psychology* (9th ed.). Boston: Pearson Education, Inc.

Yocum, C. J. (2003). Regulations, licensure, and policy: The functional abilities essential

    for competent nursing practice. In K. A. Pischke-Winn, K. G. Andreoli, & L. S.

    Halstead (Eds.), *Students with disabilities: Nursing education and practice:*

    Proceedings manual (pp. 100–109). Chicago: Rush University Medical Center.

Yoho, M., & Young, A. (2004, July). *The predictive accuracy of standardized nursing*

    exam scores in an associate degree nursing program. Paper presented at the 15th

    International Nursing Research Congress of Sigma Theta Tau, Int., Dublin,

Ireland. Abstract retrieved June 4, 2006, from http://stti.confex.com/stti/

inrc15/techprogram/paper_18654.htm

APPENDICES

APPENDIX A

HESI ADMISSION ASSESSMENT$^{\text{TM}}$ (A^2)

HESI *Admission Assessment*™ (A²)

Diskettes contain the following Exams. You may choose to administer the entire A²™ or administer only certain exams contained in the A²™.

Exams Contained In the A²™ Include:

- **Math:** Test items related to math concepts required when calculating drugs and solution problems. Sub-scoring of the following categories is provided:
  - Addition
  - Subtraction
  - Multiplication
  - Division
  - Fractions
  - Decimals
  - Ratio and Proportion
  - Household Measures
  - General Math Facts (Roman Numerals, Military Time, etc.)

- **Reading Comprehension:** Reading scenarios related to health care topics.

- **Vocabulary and General Knowledge:** Rationales are provided at the completion of this exam.

- **Grammar:** Tests ability to identify correct English writing formats.

- **General Sciences:**
  - Anatomy and Physiology
  - General Chemistry

- **Learning Styles**: Identifies individual learning style and prints test-taking and study tips best suited for the individual's learning style and relates these recommendations to nursing curricula.

- **Personality Style**: Uses concepts related to introversion and extroversion to classify the student's personality style. Explanations are printed at the conclusion of the exam to let the student know how to use his/her personality style to be successful in a nursing education program.

APPENDIX B

HESI ADMISSION ASSESSMENT (A^2) FACULTY SCORING GUIDE

HESI *Admission Assessment Exam* (A^2)
Faculty Scoring Guide

A^2 Content Exams:

1. **Math**: 50-item exam. Focuses on math needed for calculation of Drugs and Solutions. Time allotment: 50 minutes.
2. **Reading Comprehension**: 38-item exam. Reading scenarios that are health related. The reading scenarios pop up on the screen. Students can move around the windows to see the entire scenario. Time allotment: 50 minutes
3. **Vocabulary and General Knowledge**: 50-item exam. Contains basic vocabulary that is often used in health care fields. Time allotment: 50 minutes.
4. **Grammar**: 50-item exam. Contains basic grammar. Time allotment: 50 minutes
5. **Chemistry**: 25-item exam. Depending on whether or not Chemistry is a pre-requisite for your curriculum, you may or may not have students complete this quick assessment of chemistry knowledge. Time allotment: 25 minutes.
6. **Anatomy and Physiology (A&P)**: 25-item exam. Depending on whether or not A&P is a pre-requisite for your curriculum, you may or may not have students complete this quick assessment of A&P knowledge. Time allotment: 25 minutes.
7. **Biology**: 25-item exam. Depending on whether or not Biology is a pre-requisite for your curriculum, you may or may not have students complete this quick assessment of Biology knowledge. Time allotment: 25 minutes.

A^2 Learning Style/Personality Profile:

1. **Learning Styles**: 14-item assessment of preferred learning style. Time allotment: 15 minutes.
2. **Personality Style**: 15-item assessment of personality related to preferred learning style. Students receive a printout with study tips based on their learning style and personality profile. Time allotment: 15 minutes.
3. **Behavioral Inventory**: 56-item assessment of students' behavior-values with sub-scoring on Decision-making, Depression, Stress, and Emotional Health. Time allotment: 45 minutes.

Instructor's Scoring Guide

MATH SCORING SUMMARY	
Description: Math assessment indicates a student's basic math skills at the eighth and ninth grade levels.	
SCORE	SCORE DESCRIPTION
90% and Above	Should be able to calculate all levels of medication administration problems.
80-90%	Should be able to calculate basic medication administration problems, and should seek some additional assistance to increase their math skills in order to be successful in calculating higher level calculations.
79-70%	Will require varying degrees of assistance to be successful with medication calculations.
69% and Below	Should seek additional assistance in a formalized math remediation program, either prior to entering a nursing program or in conjunction with beginning level courses.

READING COMPREHENSION SCORING SUMMARY	
Description: Reading comprehension assessment indicates basic reading and comprehension skills at the eighth to ninth grade reading levels.	
SCORE	**SCORE DESCRIPTION**
90% and Above	Should be able to read and comprehend nursing textbook content.
80-89%	Should be successful in understanding most nursing textbook content though they may need to re-read more difficult material in order to grasp the full meaning of the material.
70-79%	Will have difficulty keeping up with the heavy reading assignments necessary for successful completion of a nursing program.
69% and Below	Should seek additional assistance in a formalized remediation program prior to entering the nursing program.

VOCABULARY AND GENERAL KNOWLEDGE SCORING SUMMARY	
Description: Vocabulary is viewed by some authors as the best measure of adult IQ. These questions are designed to assess vocabulary skills, general knowledge, and critical thinking skills as a means of determining the candidates' ability to succeed in a nursing education program.	
SCORE	**SCORE DESCRIPTION**
90% and Above	A well-read individual whose vocabulary skills are at the tenth to the eleventh grade level. These students should be successful in reading and understanding nursing textbooks.
80-89%	These students can be successful in nursing school but will need to carefully re-read those areas they do not understand and look up words they do not know the meaning of in an effort to increase their vocabulary skills.
79-70%	Keeping up with reading assignments may be more arduous for those scoring at this level and additional tutoring may be indicated.
69% and Below	Should seek additional assistance in a formalized reading and vocabulary enhancement program prior to entering the nursing program or in conjunction with beginning level courses.

GRAMMAR SCORING SUMMARY	
Description: Grammar assessment indicates basic grammar skills eighth to ninth grade reading levels.	
SCORE	**SCORE DESCRIPTION**
90% and Above	Should be able to complete written assignments with no difficulty in terms of writing grammatically correct assignments. Should be able to read and comprehend most nursing textbooks.
80-89%	Should be able to complete written assignments in terms of writing grammatically correct assignments. However, written assignments may need to be reviewed by a knowledgeable person prior to submitting them for grading.
70-79%	Will have difficulty with grammar when completing written assignments and when speaking to clients, teachers, etc. Obtaining outside assistance in English/Grammar will probably be helpful.
69% and Below	Enrolling in an English/Grammar remediation program prior to entering nursing school is likely to be required in order to be successful in a nursing program.

*The importance of success on the Chemistry, Biology and Anatomy and Physiology tests depends on the school's entrance requirements.

APPENDIX C

HESI ADMISSION ASSESSMENT (A^2) SCORING INFORMATION

Name: Date: 10/6/2004
School: HESITest - Main   Duration: 96 Minutes 7 Seconds.
Scoring Information

HESI Exams
Scoring Explanation

HESI Exams

### Admission Assessment Cumulative Report

The chart included in your report describes your particular scores.

Subject Area	HESI Score
(1) Anatomy & Physiology	80.00%
(2) Biology	88.00%
(3) Chemistry	92.00%
(4) Grammar	86.00%
(5) Math	88.00%
(6) Reading	94.74%
(7) Meaning-Word Use	100.00%
(8) Conclusions	100.00%
(9) Implications	80.00%
(10) Reading Comp	100.00%
(11) Vocabulary & General Knowledge	92.00%
(12) General Knowledge	100.00%
(13) General Vocabulary	87.50%
Overall Exam Average	**88.68**

Admission Assessment Category Scores

Delivery ID 35668

124
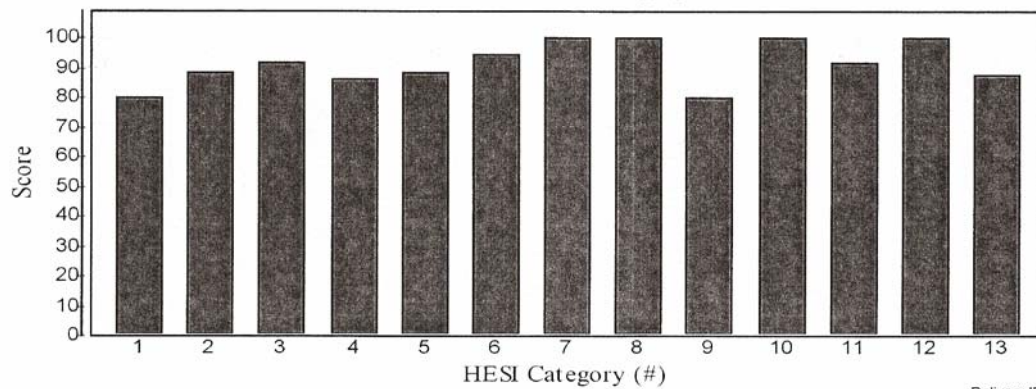
APPENDIX D

SCORING EXPLANATIONS FOR THE HESI ADMISSION ASSESSMENT (A^2)

LEARNING STYLES, BEHAVIORAL INVENTORY, AND PERSONALITY TYPES

Scoring Explanations for:

Learning Styles

Behavioral Inventory

Personality Types

LEARNING STYLE EXPLANATION

Visual

Learn best by seeing. Pictures in textbook and skills book are helpful. Will do well in clinical labs after observation. Associate pictures and skills to concepts in your mind. Write and use flashcards to study. Create pictures when studying. Write information down and take notes. Sit in the front of the class. Visualize the information obtained in lab settings and in clinical and relate this information to theory. Spend time observing others and plan before taking action. Journalizing stimulates thinking.

Auditory

Learn from general concepts to specific content. You like lecture courses. Read books and study materials aloud. Put facts into a song. Recite and repeat information. You will like the step-by-step clinical skills. You like verbal instructions. Help teach others as you learn. Focus on the end of each chapter's summary to help you tie information together.

Kinesthetic

You like to experiment with the knowledge you obtain and you learn best by being involved. You will enjoy and do well in skills labs and clinical. Practice tests are helpful to your learning; develop tests for yourself as a practice for exam. Design movements to remember facts. Study for short periods of time, then move around. Set specific goals. You learn best when you are active.

Cognitive

You like obtaining information that has a personal meaning for you. You need to find ways to make classroom and clinical content meaningful to you. You will enjoy both lecture and clinical and you can identify relevant information well. You need to think concepts through and relate the information into your own words.

Analytical

You like things done in an orderly manner, i.e., step-by-step. You pay attention to details and like to be prepared. You also like to know what to expect and you focus your attention on meeting your goals. You value facts over feelings. You like to finish one thing at a time and you are logical, self-motivated, objective, and consistent. You need to know not only the "how" but also the "why" of content. You enjoy learning and like tests because they break information into parts.

Global

You are sensitive to others and flexible. You have a tendency to "go with the flow". You learn best by discussing and working with others. However you need reassurance and reinforcement because you work hard to please others. You have a tendency to take criticism personally. You see the big picture and can read between the lines. You have a sense of fairness and avoid competition and conflict. You like to give and receive praise. You need to relate knowledge to life. You are sometimes threatened by tests and may need to seek help with test-taking skills.

Behavioral Inventory

The Behavioral Inventory provides only an overall-score, as well as scores on the sub-categories: decision making, emotional health, depression, and stress. These scores range from 1-10. An explanation for the total score and the sub-categories tested are described below.

Overall-Score

9 to 10: Your score indicates a superior rating. However, it might indicate that you are "test wise" and may simply be answering what you believe others want to hear.

8 to 8.9: You are within the normal range of emotional health and should be able to handle the rigors of nursing school quite well.

7 to 7.9: You should be able to handle the rigors of nursing school, but will find it stressful and you should seek the support of family and friends to assist you in this endeavor.

6.9 or below: You may find the rigors of nursing school quite stressful. Outside professional counseling may be helpful. Be open to such assistance.

Sub-Categories

Decision-Making

9-10: Your score indicates that your decision-making abilities are superior, and this ability is likely to be helpful when applied to the process of making sound nursing judgements.

8-8.9: Your score indicates that you are able to make sound judgements and have the ability to learn to make sound nursing decisions.

7.0-7.9: Your score indicates that making nursing decisions may be stressful for you, and you should seek the assistance of faculty in developing the ability to make sound nursing judgements.

6.9 or below: Your score indicates that making nursing decisions will be quite stressful for you, and you will require the assistance of faculty as well as extra clinical exposure to develop the ability to make sound nursing judgements.

Emotional Health

9-10: Your score indicates that you are extremely emotionally healthy. However, it might indicate that you are "test wise" and may simply be answering what you believe others want to hear.

8-8.9: Your score indicates that you are emotionally healthy and should not have any significant problems with the rigors of nursing school.

7-7.9: Your score indicates that you will particularly need the support of family and friends to complete the rigors of nursing school.

6.9 or below: Your score indicates that you may need professional counseling to complete the rigors of nursing school. If so, be open to such suggestions.

Depression

9-10: Your score indicates that you are not depressed at all. However, it might indicate that you are "test wise" and may simply be answering what you believe others want to hear.

8-8.9: Your score indicates that you do not have a significant problem with depression at this time. You should be able to complete the rigors of nursing school by using your normal support systems.

7-7.9: Your score indicates that you are slightly depressed and may have difficulty with the rigors of nursing school. You will probably need the support of family and friends particularly while in nursing school.

6.9 or below: Your score indicates that you are depressed and outside professional counseling may be helpful. Be open to such suggestions.

Stress

9-10: Your score indicates that you handle stress extremely well. However, it might indicate that you are "test wise" and may simply be answering what you believe others want to hear.

8-8.9: Your score indicates that you are quite capable of handling the stress of nursing school.

7-7.9: Your score indicates that you may have difficulty handling the stress of nursing school and will particularly need the support of family and friends while in school.

6.9 or below: You score indicates that you are highly stressed. The rigors of nursing school are likely to cause additional stress, which may necessitate professional counseling.

Personality Types

People Person

Your answers indicate that your dominant personality type is in the talking group.

You have many strengths. You have an appealing personality and a good sense of humor. You live in the present, are cheerful, and volunteer to help others. You love people, make friends easily, and enjoy telling stories. You like spontaneous activities and appreciate compliments.

When these characteristics are used in excess, they can become weaknesses. You may dominate conversations and become a compulsive talker. Storytelling can lead to repeating the same stories over and over. You might rather talk than work, making it difficult to complete tasks. Decisions could be made by feelings alone.

Strong characteristics:

Extrovert
Adaptable to change
Concrete thinker
Good memory for colors
Assertive

Because of your personality style, your learning techniques should match your needs.

Suggestions to improve your learning style:

You like to discuss the information being learned. You may have to read the information first, and then discuss it with your instructor and/or friends. Use study groups, but be careful – the group must have standard rules of practice or it will not be useful. Keep on track. Rote learning with memory work will be a good tool. You and your friends may need some prompting to practice drilling each other, but it will pay off. It might be good to use review questions, some textbooks have study guides. Different colored Flashcards would be very helpful because you remember colors better than names. Use your sense of humor to your advantage – make up rhymes and riddles for your questions and answers. Use different colored highlighter to mark your textbook. You like to ask, "why". It is a good question, but do not get overwhelmed on trivia. Keep your priorities in order.

Lead Person

Your answers indicate that your dominant personality type is in the working group.

You have many strengths. You are a born leader with a dynamic and confident style. You are independent and can be self-sufficient. You are goal-oriented, you feel the need to correct wrongs, and seek practical solutions to problems. Decisions are usually based on the facts. You can see the entire picture and are not easily discouraged. You excel in emergencies and jump into action when something needs to be done.

When these characteristics are used in excess, they can become weaknesses. You can be very strong-willed and compulsive in nature. Because of your intolerance of mistakes and impatience, you can come across as being rude. You may be a workaholic, unable to relax, and dominate others with your competitive nature. Others may see you as bossy, a know-it-all, and inflexible.

Strong characteristics include:

> Extrovert
> Competitive
> Abstract thinker
> Active
> Fact-finder

Because of your personality style, your learning techniques should match your strengths.

Suggestions to improve your learning style:

You want to understand the entire general concept, and then go toward specific information. You need to know and understand the facts and the details, but you do not like trivia. You need to know what the relevance of the information is and how it relates. Games work well for you. You like the pace of the class to move rapidly. You can use study groups – only after learning the information alone. Wrote learning and memorizing work for you only if you see relevance in the information. Practice drills with friends can be fun for you. You like to ask, "what" questions. Find study friends above your knowledge base. You usually enjoy studying and learning.

Creative Person

Your answers indicate that your dominant personality type is in the thinking group.

You have many strengths. You are very talented and creative with a thoughtful and serious nature. You can be very sensitive to others. You are perfectionist, detail-oriented, and thorough which makes you a very conscientious employee. You can be analytical, orderly, and organized in your job. You are schedule-oriented, and seek to find creative solutions to problems. You make friends very cautiously, but are a faithful and devoted listener.

When these characteristics are used in excess, they can become weaknesses. You may be moody, depressed and have a low self-image, related to the imperfections of the world. You can be self-centered and not people oriented. You may choose the most difficult work. You have high standards and you may be difficult to please. You may be full of contradictions, unforgiving and suspicious.

Strong characteristics include:

Introvert
Industrious
Abstract thinker
Like a supporting role
Self-sacrificing

Because of your personality style, your learning techniques should match your needs.

Suggestions to improve your learning style:

You like to be introduced to an area or subject. You enjoy learning and studying new things. With a little exposure and encouragement, you learn quickly and thoroughly. You are a competent and practical learner. You see the general concept and understand the specific relevance without the trivia. Your perfectionist nature drives your study habits. You will use study groups as a review, only after learning the information alone. You are driven by the 'how" question. You always want to know more. You may develop your own test questions and answer them. You are an eager learner.

Calm Person

Your answers indicate that your dominant personality type is in the "watching" group.

You have many strengths. You have a low-key, relaxed personality. You have a calming affect on others. You are quiet, but have a dry and witty sense of humor. You are compassionate and a good listener. You enjoy watching people and avoid conflicts when possible.

When these characteristics are used in excess, they can become weaknesses. Others may see you as unenthusiastic and lazy. You may not be goal-oriented and avoid responsibilities. Watching rather than working may be a problem. The lack of motivation can cause a resistance to change.

Strong characteristics include:

Introvert
Steady
Amiable
Compromising
Concrete thinker

Because of your personality style, your learning techniques should match your needs.

Suggestions to improve your learning style:

You have a tendency to procrastinate and may need prodding to study. You may like to discuss the information with others before reading the assignment. Study groups may help you, but be careful about becoming a non-contributing member because you prefer to watch others instead of contributing to the studying. You must stay focused. Rote learning with memory work may be a good tool for you. Using demonstrations will keep you from daydreaming. Use your sense of humor to your advantage – make up rhymes and riddles for your answers to questions. Highlighting in your textbook will help you focus. You and your friends can use drills to help you learn and study. Prioritize your tasks for effective time management.

APPENDIX E

INSTITUTIONAL REVIEW BOARD (IRB) SELECTED NURSING EDUCATION

PROGRAM

MEMORANDUM

TO: Ms. Niki L. Johnson, J. D., M. B. A.
               Director, AU Office of Human Research Protections

FROM: Dr. Lola L. McCord, Chair, AUM IRB

DATE: April 27, 2005

RE: Ms. Lynn Norman's proposal for research, *AUM IRB file #2005-11*

I am writing to inform you about the status of protocols submitted by Ms. Lynn Norman. Ms. Norman is a faculty member at AUM who, coincidentally, is also pursuing a doctorate at your campus. She plans to conduct dissertation-related research in the coming months using retrospective data associated with AUM students. She recently submitted a research proposal for our review.

Upon consideration of her protocols, we found her project to be exempt from further review given guidelines set forth in *45 CFR 46* (as well as institutional policy). We have documented her review request and established a file number recording her review status. I suspect that Ms. Norman's dissertation advisor will require that she submit a parallel request to your board. If so, we respectfully request that your board consider this board's examination and decision sufficient to satisfy review requirements associated with this dissertation research project at AU.

Should you require additional information from us, please don't hesitate to contact me. I would be pleased to discuss any concerns or questions you have. I can be reached by phone at 334-244-3359 or via e-mail at lmccord@mail.aum.edu.

Thanks for your assistance!

Cc: Dr. Peter Grandjean, Chair, AU IRB

P.O. Box 244023   Montgomery, Alabama 36124-4023
Located at I-85 and Taylor Road
(334) 244-3548 ATTNet 240-3548 fax (334) 244-3472

135

APPENDIX F

INSTITUTIONAL REVIEW BOARD (IRB) DEGREE GRANTING INSTITUTION

Auburn University

Auburn University, Alabama 36849

June 8, 2005

MEMORANDUM TO: Lynn Norman
                                       Nursing

PROTOCOL TITLE: "Prediction of Nursing Student Performance in First Year Coursework"

IRB File: #05-119 EX 0505

APPROVAL DATE: May 26, 2005
EXPIRATION DATE: May 25, 2006

The referenced protocol was approved "Exempt" from further review under 45 CFR 46.101 (b)(4) by IRB procedure on May 26, 2005. You should retain this letter in your files, along with a copy of the revised protocol and other pertinent information concerning your study. If you should anticipate a change in any of the procedures authorized in protocol #05-119 EX 0505, you must request and receive IRB approval prior to implementation of any revision. Please reference the above IRB File in any correspondence regarding this project.

If you will be unable to file a Final Report on your project before May 25, 2006, you must submit a request for an extension of approval to the IRB no later than May 10, 2006. If your IRB authorization expires and/or you have not received written notice that a request for an extension has been approved prior to May 25, 2006, you must suspend the project immediately and contact the Office of Human Subjects Research for assistance.

A Final Report will be required to close your IRB project file.

If you have any questions concerning this Board action, please contact the Office of Human Subjects Research at 844-5966.

Sincerely,

Niki L. Johnson, JD, MBA, Director
Office of Human Subjects Research
Research Compliance Auburn University

cc: William Spencer
           James Witte