2009

Preadmission academic achievement criteria as predictors of nursing program completion and NCLEX -RN success

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Preadmission Academic Achievement Criteria as Predictors of Nursing Program Completion and NCLEX-RN Success

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Dissertation submitted to the
College of Human Resources and Education
at West Virginia University
in partial fulfillment of the requirements
for the degree of

Doctor of Education
In
Educational Leadership Studies

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Morgantown, West Virginia
2009

Keywords: admission policy, student success, higher education, nursing, predictors

ABSTRACT

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Admission policies and practices in higher education, including those in nursing programs, are diverse; yet administrators have traditionally relied upon preadmission academic achievement for selection of qualified students. Higher education administrators have the responsibility to serve the institution and all of its constituents, ensuring that admission policies and regular systematic evaluation of those policies are important aspects of that service.

The nursing shortage and limited resources have pressed nursing schools to implement innovative strategies to increase the number of qualified graduates. State University's School of Nursing has used a score sheet to rank associate degree nursing applicants since 1984. The preadmission score sheet includes cumulative GPA, standardized test scores, prerequisite and support course grades, and LPN (licensed practical nurse) licensure. Students cannot become registered nurses unless they complete the nursing program and pass the National Council Licensure Examination for Registered Nurses (NCLEX-RN).

The purpose of this study was to determine the ability of various preadmission academic achievement-related variables to predict nursing program completion and NCLEX-RN success. The sample consisted of 294 students admitted to the State University associate degree nursing program in the Fall of 2005, 2006, and 2007. Logistic regression models were used to determine which preadmission academic achievement variables were most predictive of program completion and NCLEX-RN success.

TEAS science scores were predictive of both program completion and NCLEX-RN success. TEAS reading scores were predictive of NCLEX-RN success but not program completion. Science GPA was predictive of program completion, and health-related coursework GPA was predictive of NCLEX-RN success. Demographic factors were also evaluated for the ability to predict success, and of those variables, student type (traditional versus nontraditional) was predictive of both outcome variables. Nontraditional students were most likely to succeed.

Specific recommendations were presented for policy and future research. This study suggested greater emphasis on variables predictive of student success in admission policy, caution when using test scores without context for admission decisions, and variety when selecting those measures used to rank applicants. This study also suggested that the largest amount of variance in student success is yet to be explained and presented recommendations for study replication and expansion.

ACKNOWLEDGEMENTS

I dedicate this work to my husband, Mike, my two children, Mikey and Tessa, and my mother, Diana, for their unyielding love and support. I am extremely grateful for the sacrifices that were made so that I could succeed in this endeavor.

I would also like to thank my advisor, Dr. Ernest Goeres, for his guidance and support throughout my program of study. He reminded me of how much I enjoyed learning.

To my department chair, Dr. Richard Hartnett, thank you for inspiring me to be a better student, to dig deeper, and to think harder.

In addition, I extend appreciation to Dr. Reagan Curtis for his extremely helpful feedback and sacrificial dedication to the education of his students.

I have much admiration and appreciation for Dr. Elisabeth Shelton's accomplishments in nursing education, her passion for the success of nursing students, and her contributions to this study.

I owe a great deal to Dr. Mary Meighen. Her advice, support, and friendship kept me centered and grounded throughout my experiences.

To others who crossed and influenced my path, thank you.

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Background

Higher Education Admission Practice

Admission practices in higher education are as diverse as the needs of the institutions, academic units, and applicant pools they are intended to meet. Many of these practices include selection based on a variety of subjective and objective variables, including interviews, surveys, written essays, standardized test scores, grade point averages (GPAs), and completion of pre-requisite courses. At the same time, some higher education institutions have open or nonselective admission plans. In fact, more than 750 colleges and universities do not require standardized test scores for admission (Hoover & Supiano, 2008).

Admission practices are also diverse within regions or within institutions. For example, institutions within a state may lack agreement on the academic achievement variables that are considered most important to continued academic success. Inconsistency may also exist within a single institution when students are admitted via alternate means or by different criteria in various disciplines (Hebel & Hoover, 2002; Holley, 2006; Reisberg, 2000; "University of Georgia," 2003).

Even though admission practices in higher education are diverse, the use of achievement-related variables in higher education for admission decisions is a common and traditional practice (Mountford, Ehlert, Machell, & Cockrell, 2007; Reisig & DeJong, 2005; Sampson & Boyer, 2001). One could create a relatively consistent list of academic achievement variables used in admission decisions. Standardized tests have been used in admission decisions for over a century (Ahmadi

& Raiszadeh, 1997; Newton & Moore, 2007; Sternberg, 2007), and over 85% of colleges and universities require admission exams (Schneider & Dorans, 1999). Graduate programs often consider GRE (Graduate Record Exam) and MAT (Miller Analogies Test) scores (Leverett-Main, 2004), undergraduate programs often consider ACT (American College Testing) and SAT (Scholastic Assessment Test) scores, and professional schools often use discipline-specific exams. Ahmadi and Raiszadeh (1997) reported the use of undergraduate GPAs and GMAT (Graduate Management Admission Test) scores for admission into schools of business, and Braunstein (2006) cited undergraduate GPAs and GMAT scores as two factors most often relied on for MBA admission decisions. UMAT (Undergraduate Medicine and Health Sciences Admission Test) scores are used along with GPAs to select medical students (Story & Mercer, 2005). Reisig and DeJong (2005) reported that the GRE is widely used in the criminal justice academic area for admission decisions, as well. In addition to the standardized exams, other achievement-related variables, such as GPA and specific course grades, are also considered upon admission.

Even when schools use the same academic achievement variables, the variables may represent different values to different parties (Gordon, 2006; Mountford et al., 2007; Reisig & DeJong, 2005; "What the lawyers'," 1999; Zellner, 2008). For example, Toby (2002) identified a lack of consistency in the meaning of the grade-point average related to grade inflation and an increased emphasis on student evaluations. Undergraduate GPAs can also be misleading. It is possible that students receive low grades in an initial major but are able to improve the GPA

significantly after changing majors (Reisig & DeJong, 2005). At the same time, students may improve GPA by completing non-related coursework (Holley, 2006).

Nursing Education Admission Practice

Diversity and commonalities in admission policies also exist in nursing programs (Seago & Spetz, 2003). The school of nursing featured in this study is located in a state where admission practices differ among private and public institutions and their respective nursing programs. No standardized admission policy exists in nursing education, and schools of nursing struggle to determine the most effective admission plan, just as do other disciplines within higher education institutions.

Although admission practices vary greatly among nursing programs, all entry-level programs are required to comply with similar accreditation standards (National League, 2006), and all nursing graduates are held to the same basic standards for licensure. First, the student must complete the program of study and meet the institution's and the program's requirements for graduation. Graduates must then apply to take a national licensing exam through their state boards of nursing. Every graduate nurse seeking licensure as a registered nurse in the United States must pass the National Council Licensing Examination for Registered Nurses (NCLEX-RN) regardless of location, degree type, program type, or curricular design (National Council, "NCLEX statistics," n.d.).

The NCLEX-RN is a national computerized exam that is administered in a controlled and consistent manner in order to measure a nurse's competencies in delivering safe and effective practice. The NCSBN (National Council of State Boards

of Nursing) develops and administers the exam, which focuses on the competencies required in the first six months of practice (Aucoin & Treas, 2005; National Council, "Frequently asked," n.d.). The NCLEX-RN required a passing score of 1600 until 1988, when it became a pass or fail exam. In 1994, the NCSBN changed the exam from a paper and pencil format to a CAT (computer adaptive testing) format (National Council, 2008). The NCSBN determines whether a candidate has passed or failed the licensure exam based on a scale considering the candidate's ability, item difficulty, and a "passing standard." The passing standard is measured in units of probability called *logits* (National Council, "Pass/Fail," n.d.; O'Neill, 2005). Students receive between 75 and 265 questions, depending upon the level of difficulty of the questions answered right or wrong. If students perform significantly above the standard (based on 95% confidence level), the student will pass before all 265 questions are taken. Likewise, if students perform significantly below the standard, the student will fail the exam before 265 questions are taken. If 265 questions are taken without a determination, the answers for the last 60 items are examined. If the student's performance has been consistently above or below the standard, the student will pass or fail, respectively.

A debate rages regarding the appropriate educational entry level for registered nurses. The two-year associate degree serves to introduce a large number of registered nurses to the workforce quickly and has been instrumental in improving access to the nursing profession for nontraditional students with families, financial constraints, and multiple roles and responsibilities. Yet, the fast-paced and intense associate degree program may prove to be overwhelming for students who may have

been out of school for an extended period of time or who are juggling priorities. Community colleges generally serve as a stepping-stone to the four-year institution (Isaacs, 2002), but associate degree nursing programs aim to prepare students at the professional level in the community college setting. The challenges that associate degree nursing students face require the academic preparation that a selective admissions process is intended to appraise, and it is extremely important to ensure that students admitted are prepared for that level of intensity.

State University Admission Practice

State University's School of Nursing (a pseudonym), the setting for this study, began using an admission score sheet to guide admission decisions for the associate degree program in 1984. Considering the competitive nature of the admission process in nursing education, administrators saw the tool's value in establishing clear guidelines using objective achievement-related variables. Often, the admissions process in competitive professional degree programs is contested by students and parents (Holley, 2006). The dean of nursing that created the score sheet stated that she "didn't want the public to guess how decisions were made or to make assumptions [about why students were or were not chosen]." A copy of the most current score sheet can be found in Appendix A.

In order to be eligible for admission, students must meet minimum GPA, ACT and TEAS (Test of Essential Academic Skills) requirements. The TEAS exam is a basic skills (reading, math, science, English and language usage) entrance exam specific to nursing applicant pools. The minimum cumulative GPA required is 2.0 on a 4-point scale. ACT English and math scores must be at least 18 and 19,

respectively, and students must score at least 50 on each section of the TEAS exam. They also must have successfully completed (with a "C" grade or better) algebra, biology, and chemistry in either high school or college. Students, who meet minimum requirements, are ranked according to scores on the score sheet.

Students receive points for ACT or TEAS scores, cumulative GPAs, support course (non-nursing courses required in the program) GPAs, the number of support course credits taken, and pre-requisite course grades (biology, algebra, and chemistry). Five additional points are awarded to licensed practical nurses (LPNs), based on the assumption that their prior education and experience is directly related to success in associate degree nursing programs. In order to become an LPN, they must have completed a practical nursing program and passed the NCLEX for practical nurses. They must also meet the requirements of their respective state boards of nursing.

State University's School of Nursing awarded points for ACT scores until 2007, when they were replaced by TEAS scores on the admission score sheet. The score sheet reflecting the use of ACT scores can be found in Appendix B. This change was made because faculty and university administrators raised concerns about the inappropriateness of using the ACT for nontraditional students, who apply for the nursing program.

The TEAS test is a multiple choice exam marketed by Assessment Technologies Institute (ATI) that tests skills in reading, math, science, English, and language usage. The exam was developed in 1999 for use with more nontraditional student populations (Assessment Technologies, 2007). The exam is said to be more

applicable to nursing programs than the ACT, because nursing program curriculum experts are involved in development and review of TEAS exam questions. For each subsection, students are given composite (raw) scores, national percentile ranks, and program percentile ranks (based on type of nursing program). The School of Nursing at State University uses the composite (raw) scores for admission decisions.

The final selection of students for admission is based on score sheet totals. Those scoring the highest percentages, based on the numbers of seats available, are admitted to the program. In 2000, a former dean of nursing established a minimum score of 80% to uphold the academic standard of the program (Personal communication, September 8, 2008). Students receive points for their performance regarding the variables listed above, and the coding of these variables weights each differently. For example, support course credits and support course GPA are both scored, adding additional weight to performance in support courses. Points from each category are summed and divided by the total number of points possible (38 points) to arrive at the percentage used to rank applicants. Because support course performance is heavily weighted, and high school students generally do not have the opportunity to complete college support courses, the score sheet created a bias against their admission as freshman into the nursing program. To adjust for this bias, the score totals of those applying while in high school are divided by 33 points, instead of the 38 points used to calculate percentages for all other applicants.

The score sheet has been used for over 20 years with only minor changes but without a comprehensive quantitative review of its effectiveness (Personal communication, September 8, 2008). Regular review of the admission process has

consisted of brief discussions of the face validity of the score sheet, general faculty observations of its usefulness or deficiencies, and the efforts to maintain the objectivity of the tool. There has been no formal evaluation of the ability of the TEAS test to predict success, as defined by program completion or NCLEX-RN results, in State University's nursing program.

Statement of the Problem

There is a lack of consistent empirical guidance regarding best admission practices, especially in nursing education. For over 20 years, State University's School of Nursing has used a score sheet consisting of achievement-related variables to identify students who will be most likely to succeed. Traditionally, these same variables have been used in admission policy decisions in other higher education programs and in nursing programs throughout the country. However, no formal evaluation of these variables has been undertaken at State University School of Nursing to determine their relationship to student success as measured by graduation rates or passing rates on the NCLEX-RN examination. Thus, there is a need to identify whether or not these variables are truly predictive of student success.

Purpose of the Study

The purpose of this study was to determine the ability of various preadmission achievement-related variables to predict student success, as measured by program completion and NCLEX-RN results. Academic achievement variables in this study included ACT and TEAS exam scores, preadmission cumulative GPA, prerequisite course GPA, support course GPA, high school GPA, LPN licensure, and the number

of support course credits completed prior to admission. The following research questions were answered in this study.

Research Questions

1. What preadmission academic achievement variables are most predictive of program completion?
2. What preadmission academic achievement variables are most predictive of NCLEX-RN success?

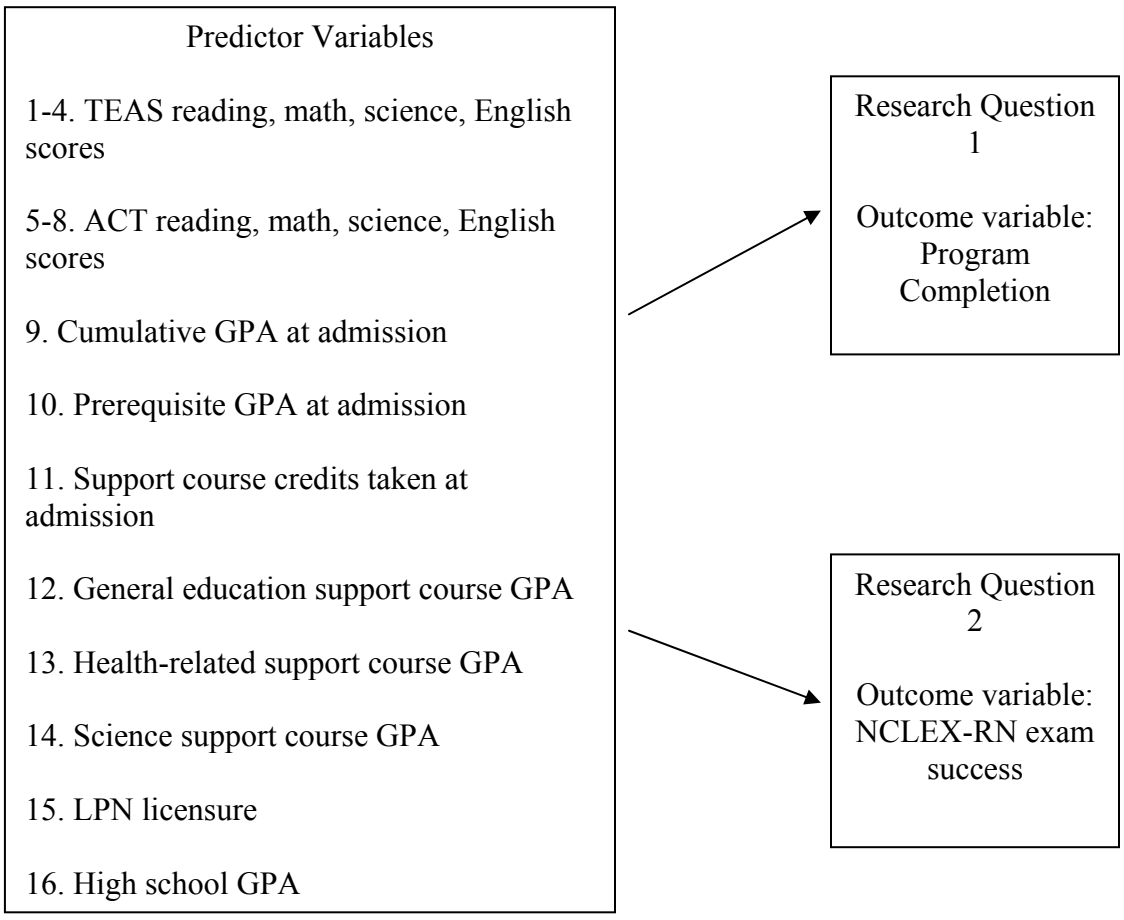

Figure 1. Visual representation of research questions 1-2.

Null Hypotheses

1. Ho1: The independent variables are not predictive of program completion.
2. Ho2: The independent variables are not predictive of NCLEX-RN success.

Significance of the Study

Higher Education

Higher education administrators have the responsibility of serving the institution and all of its constituents (National League, 2006). United States Supreme Court Cases Grutter versus Bollinger and Gratz versus Bollinger established an "institutional responsibility to develop sound policies and practices that can lead to fair and effective selection and admission decisions" (p. 176). Following is a discussion of how admission policies and the evaluation of their effectiveness are important aspects of this service.

Most, if not all, major decisions should reflect the vision, mission, and goals of the institution while serving the needs of the applicant pool. Alignment of institutional policies with the institutional mission is essential (National League, 2006). For example, community colleges traditionally claim to extend the access to education to a greater portion of the population. They attempt to target the underserved or those that may not be eligible for admission into a four-year college or university. The mission of the community college involves an attempt to "remove academic, financial, social, and geographic barriers" (Bissett, 1995, p. 35) to education (Reitano, 2003). Thus, if selective admission policies limit access in a community college setting, the ways in which these policies do accomplish the mission should be examined and disseminated (Roach, 2007; Seago & Spetz, 2003).

A balance must exist between offering equal educational opportunity and maintaining the standards and quality demanded by the profession and its constituents (Bissett, 1995). When shaping, evaluating and revising admission policy, administrators must evaluate congruence with the mission and identify ways to choose those who will further the philosophical goals of the institution, profession, and society (Hoover, 2008, "At admissions conference").

Implementing the mission through admission policies affects students at many different levels and in many different ways (Hebel, 2007). The relationship between a student and the institution is reciprocal, and higher education administrators must guide decisions regarding admissions with a careful analysis of how the admission policy affects the students, the institution, and the relationship between them in the terms of desired outcomes (Hiss, 2001). Oliver (1985) used the General Systems Model to describe this relationship. She described the way in which the students, institutions, and the environment "continuously exchange matter, energy, and information" (p. 197). Therefore, it is extremely important that admission policies reflect and nurture this relationship.

Either the existence or perceived existence of inequality or injustice can greatly influence students and communities and their relationships with the institution (Burdman, 2004). The institution has an ethical responsibility to identify admission policies that accurately determine qualification (Bore, Munro, Kerridge, & Powis, 2005; Gosie, 2005); serve to create opportunities, not barriers, for success (Bissett, 1995; Sjogren, 2003); and select students with consistency and without discrimination (National League, 2006; Story & Mercer, 2005). Departments should also strive to

implement admission policies consistent with those of the institution, unless there is sound rationale for exceptions (National League, 2006).

A challenge to equality is the biased nature of many of the tools of objectivity (Downey, Collins, & Browning, 2002; Reisig & DeJong, 2005; Sjogren, 2003). For example, the ACT and SAT exams have been criticized for bias against those of ethnic minorities. Bates College in Maine has used the SAT I exam on an optional basis since 1984, and Hiss (2001) reported that this policy has been responsible for assisting racial minorities in accessing higher education, when SAT scores may have limited that access. George Mason University also adopted a standardized test-optional policy for high school seniors with strong academic records, citing the SAT as a weak predictor of college academic performance, in an attempt to increase diversity (Banerji, 2006). Sternberg (2007) reported that an admission model that focused on assessing critical reasoning and practical thinking predicted program grades better than the SAT or GPA and resulted in significantly reduced differences in scores among ethnic groups.

Standardized tests may present bias in the area of ethnicity, but they may also present other biases. Ahmadi and Raiszadeh (1997) criticized standardized testing and claimed that it tended to favor those of higher socioeconomic status. Story and Mercer (2005) also noted that training courses aimed to increase a student's scores on these exams are more likely to be accessible and affordable to those of more abundant means. In business schools, the GMAT has exhibited gender bias against females who did better in MBA coursework but had lower GMAT scores (Braunstein, 2006), and females have traditionally scored lower on standardized tests (Heumann, 2002;

Wright & Wright & Bachrach, 2003). Standardized tests, such as the SAT or ACT, have also created hurdles for nontraditional students (Muse & Teal, 1993). In the interest of fairness, administrators are charged with crafting an admission policy that will reasonably lead to a decision regarding the student's potential for success without discriminating against underrepresented populations.

One fear is that an admission policy would prevent a qualified student from entering into a program. Even though equality is desired, students with histories of academic achievement also believe that hard work and academic excellence should be rewarded (Sjogren, 2003; Story & Mercer, 2005). If programs, especially nursing programs, desire to expand enrollment and the workforce, failing to admit a qualified student is tragic.

Although it is unfair to reject a qualified student, it would also be an injustice to admit students that are not prepared for a program and set them up for failure (Hebel, 2007). Students and their families sacrifice time, energy, and resources for higher education, and failure leaves that sacrifice unanswered (Lengacher & Keller, 1990; Oliver, 1985). At the same time, the students, families, faculty, and peers lose even more when failure occurs. A loss of self-esteem may influence the student's chances for future success. Families agonize over the student's struggles, and peers experience personal loss and discouragement when they see classmates fail. Some students attend college to improve their financial situation in the midst of economic hardship. A failure further complicates their situation. Those making admission policy decisions should understand the factors that predict success, as well as those that predict risk (Marti, 2001).

Using academic achievement as the only determinant for admission may lack the specificity that programs seek. Many of the standardized exams used for admissions decisions are not directly correlated with specific curricula (Ahmadi & Raiszadeh, 1997) nor have they been consistent predictors of success in specific programs. Story and Mercer (2005) wrote about the need to expand admission criteria for medical schools to include professionalism, values, communication abilities, and interpersonal skills. Administrators often understand qualities or circumstances specific to graduate outcomes and may be better served to incorporate this knowledge into admission decisions. Programs may also seek to identify academic achievement variables most specific to graduate outcomes. For example, grades in support courses may or may not be predictive of success, dependent upon the relationship of the courses and graduate outcomes. When nonacademic and academic achievement variables are used in combination, programs can select students more specifically suited for the profession.

Careful evaluation of admission policies is important in light of the lack of current solid empirical guidance for such policies (Newton & Moore, 2007; Newton, Smith, & Moore, 2007). McLaughlin (2005) argued that evidence-based admission policies should produce retention rates closer to 100%, recognizing that academics are not the only reason students do not graduate on time. Unfortunately the information is inconsistent and inconclusive regarding the validity and reliability of these measures (Bickerstaffe, 2000; Hoover & Supiano, 2008). Many of the achievement-related variables, such as ACT and SAT scores, have been examined for their ability to predict short-term success, such as first-year grades. The consistent

link between these variables and long-term success, such as graduation rates and licensing exam results, still remains elusive (Stack & Kelley, 2002), yet the use of these variables remains very much the same (Mattson, 2007). The decision of Bates College of Maine to discontinue the use of the SAT exam as an admission requirement was based on its lack of predictability for its students' success (Hiss, 2001). Pitzer College of California and Sarah Lawrence College of New York also implemented SAT-optional admission policies after careful evaluation of the exam's inconsistent predictability (Hoover, 2003). This lack of empiric stability presents a challenge to higher education administrators who make admission policy decisions.

All higher education institutions are responsible for continuous, comprehensive, and systematic evaluations of educational and programmatic effectiveness (Farrell, Wallis, & Evans, 2007; Muse & Teal, 1993), including the effectiveness of admission practices. Accrediting agencies hold institutions and programs accountable for evaluation and necessary revision of such practices. Specifically regarding the admission process, Story and Mercer (2005) and Downey et al. (2002) emphasized the responsibility of seeking specific evidences that selection instruments and admission policies lead to desired academic and programmatic outcomes.

In light of the numbers of college applicants and the number of issues surrounding the admissions process, it is difficult to establish a system that not only serves its purpose, but one that also does so efficiently. "The number of students applying for admission to three or more colleges has more than doubled since the mid-60's" (Rhodes, 2006, p. A18). Money spent on an incomplete or inefficient

education is counterproductive to all involved parties. Story & Mercer (2005) warn that efficiency should not come at the expense of a rich and thoughtful process. However, efficiency is of growing importance in today's higher education's cost sensitive environment. Studying the predictive validity of admission criteria can help make policies and procedures more efficient (Dunlap, Henley, & Fraser, 1998).

For public institutions, limited resources and prioritization at the state government level translate into insufficient resources at the institutional level (Rhodes, 2006). Farrell et al. (2007) went as far as to say, "universities in the United States are undergoing changes and financial adjustments never experienced in the history of higher education" (p. 267). Private institutions are not immune to the challenge of maximizing limited resources, and the state of limited resources requires that any institution be accountable for its stewardship. Recently, resources have been devoted to admissions and alumni relations to focus on enrollment management, which increases the accountability for the use of those funds (Roman, 2007). An inefficient admission process can cost all of those involved (Pelech, Stalker, Regehr, & Jacobs, 1999; Sharif, Gifford, Morris, and Barber, 2003), and many of the programs that implement selective admissions are already expensive to operate. Nursing programs, for example, must meet teacher-student ratio requirements dictated by state boards, lab and equipment requirements dictated by current practice, accreditation standards, and faculty salary expectations dictated by the market for practicing nurses. Institutions should weigh the costs and benefits of the admission plan and seek to increase the productivity of the university and its prospective students (Hiss, 2001).

Financial concerns are not the only issues in high demand and of limited supply in higher education. Bissett (1995) and Farrell et al. (2007) suggested that critical thinking is a scarce resource essential to student success. The ability to analyze and solve problems and make decisions should also be valued and sought out in the admission applicant (Giddens & Gloeckner, 2005). Bissett (1995) also discussed critical thinking in terms of the ability to learn and develop skills. Glick (2000) described professional success as a complex and multidimensional entity, a combination of internal characteristics shaped by each student's individual experiences. As universities aim to produce active, engaged, and responsible citizens and leaders, Sternberg (2007) suggested that they use a model for admission decisions that seek out the skills of "wisdom, intelligence, and creativity, synthesized (WICS)" (p. B11). Predicting these abilities may prove to be more valuable in also predicting success than reviewing past academic achievement alone, even though these qualities may be difficult to quantify (Glick, 2000; Hiss, 2001). Administrators may also seek to find relationships between objective academic and subjective data.

Recently, political and legislative involvement in state and institutional decisions has increased. Institutional boards, community representatives, and faculty groups often debate admission policies (Selingo, 2001). In response to market demands for graduates in certain professions, political, legislative, and financial pressure leads to legislative recommendations or prescriptions for higher education policy (Seago & Spetz, 2003). Institutions must be ready to describe and defend specific policies, such as admission procedures, and the ways in which they meet the needs of society, especially in light of public calls for increased access to higher

education (Dunlap et al., 2998; Reisberg, 2000; Toby, 2002). Prevously, traditional standardized test scores were used because they were easily quantifiable and associated with accountability, prestige, and rankings (Farrell & Van Der Warf, 2007; Hoover, 2008, "Take tests down;" Mattimore, 2008; Sampson & Boyer, 2001). There is growing pressure for universities to base these decisions on student outcomes. Generally, political figures do not have direct experiences regarding admissions, and faculties know more about which students may be more successful in the classroom (Sjogren, 2003). However, those outside of the process may add a valuable perspective and share common goals. The partnerships among legislators, the community, and higher education institutions are crucial in achieving goals and outcomes and securing much needed funding (Farrell et al., 2007; Oliver, 1985; Sayles & Shelton, 2005), and focusing on the desire to serve the public good can strengthen those partnerships (Hoffman-Marr, 2005). Farrell et al. (2007) included local politicians in a study investigating attitudes and priorities for nursing programs and opinions regarding how to realize a common vision. One politician expressed a strong desire to support changes that are required of nursing programs, to sponsor legislation, and to vote on issues that would promote nursing education and practice. The United States is no longer the leader in college completion rates, and exploring ways to improve the admission process and achievement of outcomes is in the nation's best interest (Ehrenberg, 2007).

Nursing Education

It has been no secret that nursing has seen and will continue to see a national shortage in registered nurses (Bissett, 1995; Gallagher, Bomba, & Crane, 2001;

Sayles, Shelton, & Powell, 2003; Waterhouse & Beeman, 2003). The aging population in this country is increasing, leading to a larger patient population. Nurses are also aging and retiring, leading to an inadequate workforce. In the midst of the national nursing shortage (Seago & Spetz, 2003), nursing programs face much pressure to increase the number of qualified students, retain those students, and account for their success on the licensing examination. This is to be accomplished in an environment of limited resources (including qualified nursing faculty) and will not be accomplished in the absence of departmental assessment and modification of policies and processes and employment of creative and efficient solutions.

The challenges presented by the nursing shortage require that administrators be serious and strategic in attempts to begin with an admission class that is most likely to succeed through graduation and licensure. Recently, the deans and chairs of the nursing programs in the state in which State University resides met to discuss challenges to educational effectiveness in their respective schools and strategies to improve results. Specifically, they discussed possible causes and solutions related to the declining state averages on the NCLEX-RN. In addition, admission practices were discussed regarding their relationship to student success.

Although the country is short on the number of nurses, programs are often not short on the number of applicants. The number of applications most often exceeds the number of students that can be accommodated (Newton & Moore, 2007; Newton et al.; Rees, 2006; Seago & Spetz, 2003). Even though attempts have been made to increase enrollment in nursing programs across the country (“Thousands turned away,” 2004), positions are still limited (Bissett, 1995). In fact, in 2003, baccalaureate

nursing schools turned away more than 11,000 qualified students for the fall semester ("Thousands turned away," 2004). Institutional resources or market supply limit the number of nursing faculty, while patient safety concerns and accrediting agencies dictate faculty-to-student ratios. Nursing programs also face limitations in the number, type, and quality of clinical facilities available to students.

This study focuses on two of the essential measures of success, program completion, and NCLEX-RN scores. Often, as programs make changes to improve graduation rates, NCLEX-RN pass rates decrease (Bissett, 1995). Conversely, as programs increase the rigor required to improve NCLEX-RN pass rates, graduation rates decline (Rees, 2006). One of the best ways to have a positive impact on both program completion and NCLEX-RN pass rates is to develop, validate, and implement an admission policy that best predicts a student's potential for success in that program.

In order to consistently measure competency at the current entry-level of practice, the NCSBN reviews the NCLEX test plan and passing standard every three years (National Council, "Setting passing"). Because the exam reflects practice demands and the standard for licensure, nursing programs should also regularly review admission policies and the ability of those policies to predict success in program completion, licensure, and practice. In fact, in April of 2007, the NCSBN increased the passing standard from -.28 to -.21 logits. Reasonably, if the standard increased, NCLEX pass rates would likely decrease (National Council, 2005). Nursing programs must evaluate the ability of their admission policies to maintain

standards specific and adequate for selecting students that will be able to meet the challenges of entry into practice.

Although the nursing shortage calls for an increase in the number of qualified graduates that will pass the NCLEX-RN examination and will enter into nursing practice, a higher calling and of higher priority is the manner in which nurses are prepared to care for patients (Farrell et al., 2007). The National League for Nursing Accrediting Commission (2006) indicated that the "singular function of nursing is the improvement of the human condition" (p. 13). In addition to providing more graduates, nursing programs must ensure that these graduates are committed and are capable of the level of care required in contemporary nursing practice (Farrell et al., 2007). State boards of nursing and national accrediting bodies oversee schools of nursing with a focus on public safety, including the need for quantity and quality in the nursing profession (National League, 2006). Stack and Kelley (2002) pointed out that admission decisions can "shape the nature of a discipline or profession" (p. 335). In addition to academic achievement, administrators can subjectively evaluate commitment and motivation with interviews, questionnaires, or letters.

The examination of admission practices is also significant in light of NCLEX-RN result accountability. Each nursing program in this country must answer for graduate outcomes at state and national levels. Educational effectiveness and program quality is measured, in part, by graduation rates and first-time NCLEX-RN pass rates (Davenport, 2007; National League, 2006). In fact, if programs exhibit declining performance on the exam, administrators must immediately notify the accrediting agency. Schools not performing to the standard are placed on plans of improvements,

given probationary status, or stripped of their accreditation. This places the institution, department, faculty, and students at risk.

Accrediting agencies require a commitment of the nursing education unit to the patient, but they also require a commitment to the students (National League, 2006). Policies and practices must be consistent and nondiscriminatory in dissemination and implementation. The standard set for program integrity also requires that these policies and practices be current and accurate. For this reason, nursing administrators must strive to implement admission policies that are consistent, current, and effective.

State University School of Nursing

The State University School of Nursing enjoys an applicant pool of approximately 500 applicants (pre-nursing students) each year. However, there are only positions for approximately 96 students with each fall admission class. Of the 500 applicants, approximately 150-200 meet minimum qualifications. Approximately 50% of the qualified applicants are accepted. If an applicant is not selected, he or she may reapply the next year. No preference is given to those who have previously applied, because selection is based on score sheet percentages. Students have access to an advisor, who suggests ways to improve the score. Unfortunately, many qualified applicants either reapply several times before being accepted or are not accepted at all. These students lose money, time, and confidence with each year that passes. They continue to take required support courses while waiting to be admitted, and when they have taken all of the required courses, they may resort to taking courses that are not required and that they would not have otherwise taken in order to fill in their

schedules. To be fair to this applicant pool, the community from which it is drawn, and the profession in desperate need of qualified recruits, all nursing programs must review and revise admission policies with vigor.

Although State University has continued to meet accreditation standards and prescribed NCLEX-RN first time pass rates, the pass rates have declined over the past few years. In their 2002 accreditation report, the faculty boasted of a 10-year NCLEX-RN pass rate of 93.6%. In 2004, the pass rate was 79%, and the school presented a plan of improvement to the State Board of Examiners. The NCLEX-RN had increased in difficulty that year, but State University's pass rate was lower than state and national averages, even though the program had consistently performed higher than those averages in the past. The pass rate improved to 89% and 85% in 2005 and 2006, respectively. Although State University's nursing program has satisfactorily met graduation rate and NCLEX-RN benchmarks, administrators and faculty members cannot be satisfied with the status quo if they want to remain competitive and effective. Students and the patient population deserve more vigorous attempts to improve program and graduate quality.

Faculty members and university administrators have expressed the need for accurate validity and reliability data regarding admission standards, especially given the nature of competition for admission into the nursing program. Generally, they consider the SAT and ACT to be valid predictors of college success (Schneider & Dorans, 1999), but State University's School of Nursing has the responsibility to collect data from its own population. This is vital to making sound decisions and using valid and reliable predictive tools (Downey et al., 2002; McLaughlin, 2008).

Data and resources are readily available if administrators and faculty members are diligent in pursuing evidence-based practices. In fact, a graduate nursing program changed GRE requirements after finding that undergraduate GPA predicted GRE scores, and applicants with an undergraduate GPA of 3.5 or greater were no longer required to submit GRE scores (Newton & Moore, 2007).

The use of the Test of Essential Academic Skills (TEAS) exam serves as an example of the importance of program-specific data analysis. As stated earlier, State University's School of Nursing has yet to determine the effectiveness of the TEAS exam as a predictor of success in an associate degree-nursing program. Assessment Technologies Institute (ATI) published a technical manual in 2007, describing the validity and reliability of the exam. In this manual, ATI discussed the steps for content development and validation, which included general and discipline-specific review. The process included a thorough review for bias, internal consistency, and content and criterion validity; however, ATI determined that, in terms of criterion-related validity, the TEAS exam was more predictive of success in LPN nursing programs and on the LPN licensure exam than success in RN programs or on the NCLEX-RN exam. They recommended that registered nursing programs use the TEAS results in a multiple measurement context and should conduct their own validity studies to link the TEAS results to success.

Definition of Terms

1. ACT Compass Placement Test: Computerized Adaptive Placement Assessment and Support System. A college placement test that evaluates

students' skills in reading comprehension, writing, mathematics, and English (Concordant ACT assessment, 1999).

2. Admission score sheet: A document State University's School of Nursing uses to evaluate preadmission academic achievement and rank applicants.
3. Associate degree in nursing: A 2-year, entry-level program in nursing that focuses more on technical skills than theory in nursing.
4. ATI: Assessment Technologies, Inc. An education-focused company that markets and sells a comprehensive package of resources aimed at the improvement of outcomes in schools of nursing. Purchased separately or together, the package includes the preadmission screening exam, the TEAS test; formative and summative assessment exams; NCLEX-RN preparation materials; and remediation resources.
5. Benchmark: "A statement of expected achievement, frequently aspirational in nature, posed generally by a group or organization. A means by which a program can compare themselves with a larger group (National League, 2006, 76).
6. Concordance table: A tool for illustrating comparable scores on similar but different exams. Scores are not considered equal (ACT, 2009, "ACT-SAT Concordance"; ACT, 2009, "ACT-SAT Concordance: Understanding"; Schneider & Dorans, 1999).
7. Cumulative GPA: A student's college GPA at the time of admission to the nursing program. If the student did not take college courses prior to

admission, high school GPA was used. In this study, GPA is measured on a 4-point scale.

8. Entry level degree: A degree in nursing that qualifies the graduate to test for entry into practice or licensure. Entry level degrees in nursing may be awarded at the associate, diploma, or baccalaureate levels.
9. Entry level practice: "Preparing for and meeting the requirements to practice professional nursing in the workplace. It begins with the receipt of the degree and ends with the successful completion of the NCLEX examination" (Farrell et al., 2007, p. 269).
10. Equipercentile ranking: A method used to determine concordance scores on similar but different exams. Scores at which the percentiles are the same are considered comparable (Concordant ACT assessment, 1999; Schneider & Dorans, 1999). For example, the ACT score at the 50th percentile would be comparable to SAT scores at the 50th percentile.
11. First-time writers: graduate nurses who sit for the NCLEX-RN exam for the first time.
12. Graduate nurse: One who has graduated from a nursing program but has not yet taken or passed the NCLEX-RN exam.
13. Graduation rate: In this study, the percentage of students who complete the nursing program on time with the admission cohort.
14. Licensure: "The process by which a governmental agency gives affirmation to the public that the individual's engaged in an occupation or profession have

minimal education, qualifications, and competencies necessary to practice in a safe manner" (National League, 2006, 77).

15. Logits: Log odds unit. The NCLEX-RN is scaled using this unit of probability, considering the test taker's ability, the item difficulty level, and the passing standard. The scores are determined by the type of item the test taker finds challenging or is more likely to answer incorrectly (O'Neill, 2005).
16. LPN: A licensed practical nurse that has met state board requirements and has passed the NCLEX-PN examination. State board standards of practice determine the scope of practice of the LPN.
17. NCLEX-RN: National Council Licensure Examination for Registered Nurses. The licensure examination for registered nurses in the United States. The exam is developed and owned by the National Council of State Boards of Nursing.
18. NCLEX-RN blueprint or test plan: The framework of the content and concepts of the NCLEX-RN exam.
19. NCLEX-RN pass rates: Percentage of students who pass the NCLEX-RN in a given year on the first attempt.
20. NCSBN: The National Council of State Boards of Nursing. A council comprised of the boards of nursing in the United States and four of its territories. The mission of the NCSBN is to provide leadership to advance regulatory excellence for public protection (NCSBN, "Mission & Values").

21. Nontraditional student: In this study, a student that did not enter postsecondary education immediately following high school or a student that experienced an interruption in his or her college education.
22. Pre-requisite course: In the case of State University's School of Nursing, a course required prior to admission to the nursing program. The required prerequisite courses include algebra, biology, and chemistry at either the high school or collegiate level. Generally, a course that serves as a foundation to successive courses (National League, 2006).
23. Program completion: In this study, graduation within the intended program of study. At State University, the intended program of study for the associate degree is two academic years. In order to complete the nursing program at State University, students must receive a C or above in every nursing and support course. In the nursing courses, students must achieve a 75% to receive the C. Students must maintain a 2.0 GPA and must receive a satisfactory rating in every clinical course component.
24. Program type: "A nursing education program that offers either a certificate, diploma, or recognized degree" (National League, 2006, p. 80). See also "entry level degree."
25. Range restriction: Because State University's admission policy requires minimum GPA and test scores, and only those that were accepted for admission into the nursing program are included in this study, the variation in these variables is lower than that of the general population (Reisig & DeJong, 2005).

26. RN: A licensed registered nurse; one who has completed degree requirements, fulfilled state board requirements, and passed the NCLEX-RN as entry into nursing practice.
27. Support course: A course required prior to graduation. In the case of State University, all of the non-nursing courses that are required in the nursing program (English; Diet Therapy; Anatomy and Physiology; Microbiology; Psychology; Sociology; Race, Class, and Gender; and American Government). The material learned in support courses is intended to supplement the major requirements (nursing courses).
28. Support course credit score: A score on the State University School of Nursing admission score sheet calculated according to the number of support course credits completed prior to admission into the nursing program (the higher the number of credits taken, the higher the score).
29. TEAS: Test of Essential Academic Skills. A paper and pencil or computerized exam developed and marketed by Assessment Technologies Institute to measure basic skills in reading, mathematics, science, English, and language usage. “It is intended for use primarily with adult nursing program applicant populations” (Assessment Technologies, 2007, p. 2).
30. Test blueprinting: The process by which faculty members map the framework of course tests. Often this process attempts to align exam questions to course outcomes and the NCLEX-RN test blueprint.

31. Traditional student: In this study, a student that entered postsecondary education immediately following high school and did not experience an interruption in his or her college education.

Assumptions

This study was conducted with the assumption that perfecting admission policies has the potential to significantly improve both retention and NCLEX-RN scores. It is also assumed that the student records provided accurate and reliable data and that the NCLEX-RN is a reliable and valid measurement instrument of graduate nurse competencies.

Summary of Chapter One

This chapter discussed the background and significance of the study and introduced the framework for the study, including the problem statement, purpose of the study, research questions, and the null hypotheses. The chapter described differences and commonalities in higher education and nursing program admission practices regarding implementation of policy and the use of academic achievement variables. The chapter also discussed the approach of State University's School of Nursing to nursing program admissions and the score sheet used to rank applicants based on preadmission academic achievement.

A university's responsibility to serve, the impact on constituents, and limited resources were cited as reasons that higher education institutions should continue to evaluate validity and reliability of admission policy. Specific to nursing education, the nursing shortage, patient care demands, and accreditation standards require systematic evaluation of admission practices.

The purpose of the study was to determine the ability of various preadmission achievement-related variables to predict nursing program completion and NCLEX-RN results. Consistent with this purpose, this study answers the following research questions:

1. What preadmission academic achievement variables are most predictive of program completion?
2. What preadmission academic achievement variables are most predictive of NCLEX-RN success?

Organization of the Study

Chapter One introduced the background and purpose of the study. The problem statement and research questions were also found within Chapter One, along with a discussion of the significance of the study. Chapter Two discusses relevant literature related to the greater higher education community and, more specifically, nursing programs. Chapter Three describes the methodology of the study, including information about the design, sample, data collection procedures, and analysis techniques. The limitations of the study are also discussed in Chapter Three. Chapter Four presents the results of the study, how they answer the research questions, and how they accept or reject the null hypotheses. Chapter Five discusses the results of the study, places these results within the context of prior research, and presents the implications for State University's School of Nursing, higher education policy, nursing education policy, and future research.

Chapter Two:

Review of Literature

Chapter Two presents the state of the literature regarding the use of preadmission academic achievement data to predict student success. This study focuses on program completion and board exam success in higher education and in nursing programs, as well as the predictors of other measures of success, such as final GPA.

Studies included in this chapter were limited to those using preadmission academic achievement as predictors or independent variables in order to remain consistent with the purpose and scope of this study. The discussion extends beyond nursing education to include other programs and professions in higher education as well, because the ability to identify the predictive value of academic achievement of student success continues to be problematic, and some of the challenges are similar among higher education institutions and their respective nursing programs. Studies on nursing education published prior to 2000 were excluded, because many changes have occurred in nursing education in the past 10 years.

In higher education, the literature has failed to identify consistent stable predictors. In nursing education, the conversion of the NCLEX-RN from a graded to a pass or fail exam in 1988 has further complicated attempts to predict student success (Lengacher & Keller, 1990; Waterhouse & Beeman, 2003).

Higher Education

Program Completion

Two recent studies examined the ability of preadmission academic achievement data to predict program completion in higher education. Alzahrani, Thomson, and Bauman (2005) conducted a study of 235 dental hygiene students and examined the predictive ability of overall GPA, science GPA, grades in prerequisite courses, the number of attempts to pass the courses, and a combination of admission criteria. Logistic regression revealed that the only significant predictor of program completion was the grade in oral pathology.

Truell and Woosley (2008) also attempted to predict program completion in a College of Business but used math and verbal ACT and SAT scores as predictor variables. The study consisted of 284 business students in a large public university and incorporated academic achievement predictors and demographic predictors, such as age. Logistic regression indicated that ACT and SAT math scores were significant but weak predictors of program completion, and verbal scores were not significant predictors at all.

Board Exam Success

The literature regarding the prediction of board exam success in higher education has been inconsistent and, at times, contradictory. Alzahrani et al. (2005) found that only the final grade in oral pathology predicted dental hygiene program completion, but when predicting NBDHE (National Board Dental Hygiene Examination) success, they found that no single predictor was significant. They did

find, however, that the combination of GPA, science GPA, and grades in prerequisite courses significantly predicted NBDHE success.

Another study involving 132 dental hygiene graduates from Ohio State University yielded different results. Bauchmoyer, Carr, Clutter, and Hoberly (2004) were able to predict NBDHE with entrance GPA, science GPA, and prerequisite course grades as individual predictors. English grades were not significant predictors, and math grades were weak but significant predictors of NBDHE success. Psychology, nutrition, anatomy, physiology, and microbiology grades were among the significant prerequisite course grade predictors.

Downey et al. (2002) also studied the ability of preadmission variables to predict dental hygiene national board scores. They used a forward stepwise multiple regression analysis to examine the predictions among 134 dental hygiene students. The independent variables were preadmission GPA, math/science GPA, and SAT scores, and of those variables, only the incoming GPA was able to significantly predict board exam success.

Dockter (2001) sought to determine the relationship between preadmission academic success and success on the national physical therapy (PT) licensing exam among 107 graduates. Those predictor variables with significant correlations with exam scores were entered into a stepwise linear regression model. Of the preadmission academic achievement variables examined, only the GPA in core courses was significantly correlated to exam scores. Previous degrees, clinical experiences, interviews, and writing samples were not significantly related to success

on the PT exam. In addition, none of the preadmission variables were able to predict exam success.

Other Measures of Success

Studies have investigated the role of academic achievement in the prediction of student success in higher education, but success is not always measured in terms of program completion and board exam success. Preadmission academic achievement variables have also been linked to other measures, such as cumulative graduation GPA and program course grades.

Gifford, Briceno-Perriott, and Mianzo (2006) examined the ability of locus of control and ACT scores to predict the cumulative GPA at the end of the first year of college. Among 3,000 college freshman, ACT scores and locus of control were significant predictors of first year GPA; however, both of the variables together accounted for only seven percent of the variance.

When Bauchmoyer et al. (2004) studied predictors of NBDHE success, they found final cumulative GPA to be the strongest. Among the 132 dental hygiene graduates, entrance undergraduate GPA, undergraduate science GPA, and all prerequisite course grades, with the exception of English grades, significantly predicted final cumulative GPA.

The research of Downey et al. (2002) seemed to contradict the results of Bauchmoyer et al. regarding the prediction of cumulative GPA at graduation. Although Downey et al. found that incoming GPA was predictive of cumulative GPA, math and science GPAs were not significant predictors. Final GPA was best predicted using both incoming GPA and total SAT scores.

Research in other allied health programs has also revealed information regarding the prediction of cumulative GPA. Platt, Turocy, and McGlumphy (2001) studied the records of 373 graduates from six different allied health programs. Overall, high school GPA and verbal SAT scores significantly predicted final GPA; however, results varied among programs. High school GPA was a significant predictor among athletic training, occupational therapy, and physical therapy graduates. Although verbal SAT scores were significant predictors overall, they were only significant in the occupational and physical therapy cohorts, when programs were treated as separate groups. Math SAT scores were not predictive of final GPA overall, but they significantly predicted GPA in the perfusion technology and physician assistant programs. Neither high school GPA, nor SAT scores were predictive of final GPA in the health management systems group.

Utzman, Riddle, and Jewell (2007) also studied an allied health cohort, specifically 3,582 physical therapy students from 20 different programs. They also used preprogram cumulative GPA and standardized test scores (GRE scores) as predictor variables. They did choose a different approach, though, as the outcome variable was a measure of student risk or difficulty, rather than success. The logistic regression models varied among programs, and undergraduate GPA and GRE scores were significant predictors of academic difficulty when controlling for program cohort, degree level, ethnicity, and age. In fact, research indicated that "as undergraduate GPA decreased by 0.10, the odds of encountering academic difficulty were increased by 15%" (p. 1170), and as verbal and quantitative GRE scores "decreased by 10, odds of academic difficulty were increased by 3% and 4%,

respectively" (p. 1170). These researchers did note that prediction varied significantly among programs and went on to say that the most accurate prediction of academic risk would be from program-specific data collection and analysis.

Business programs have also been the subjects of predictive and correlational studies involving academic achievement and student success. Fish and Wilson (2007) used regression analysis to predict final graduate GPA in a sample of 143 Master's of Business students in a Northeastern college. GMAT (Graduate Management Admission Test) scores and undergraduate GPA were the preadmission academic achievement variables in the study. Undergraduate GPA and verbal GMAT scores were significant predictors of final GPA, yet quantitative GMAT scores were not.

Siegart (2008) collected data from 25 different studies among 22 different executive MBA education programs to examine the relationship between admission factors and student performance. Siegart also used undergraduate GPA and GMAT scores, but program grades were the measures of student success. GMAT total scores had the highest predictive validity values as a single predictor of program grades; however, the combination of GMAT verbal and quantitative scores and undergraduate GPA was even a better predictor of program grades.

Reisig and DeJong (2005) assessed the ability of GRE scores and previous GPA to predict final GPA, program grades, and the number of incompletes recorded throughout the program of study of 278 criminal justice graduate students. Those with slightly higher GRE scores and high previous undergraduate GPAs were significantly more likely to perform better. Final GPA correlated significantly with previous GPA, GRE subscores, and GRE total scores. Low grades correlated significantly with low

analytic and composite GRE scores. The predictor variables were not significantly correlated with the number of incompletes recorded.

Nursing Education

Program Completion

Although program completion is a prerequisite to entry into nursing practice, there are few current studies that address admission criteria as predictors of graduation in nursing programs. Gallagher et al. (2001) studied the records of 121 associate degree nursing students to determine how well preadmission data predicted program completion. Discipline-specific preadmission exams, specifically the NET (Nurse Entrance Test) and the RNEE (Registered Nurse Entrance Exam), were not significant predictors. These exams are used to evaluate academic indicators, but the NET also evaluates nonacademic indicators, such as stress level and test-taking skills. The researchers also evaluated the ability of admission scores to predict program completion. The admission scores were based on GPA, science and math grades, and the RNEE results. The combination of these variables was not predictive of program completion.

NCLEX-RN Success

Gallagher et al. (2001) also attempted to predict NCLEX-RN success using NET scores, RNEE scores, and admission scores as predictor variables. As discussed above, admission scores were based on GPA, science and math grades, and the RNEE scores. Not only were these variables not predictive of program completion, but they also failed to predict NCLEX-RN success in an associate degree nursing program.

Other studies have examined NET scores in the prediction of NCLEX-RN success. Tipton et al. (2008) used an independent samples t-tests to determine if NET math and reading scores were different between those who were successful on the NCLEX-RN and those who were not successful. The sample consisted of 385 associate degree nursing students, and researchers found that there was not a significant difference in math and reading NET scores between those who were and those who were not successful on the NCLEX-RN.

Sayles et al. (2003) conducted a study of 78 associate degree nursing graduates that evaluated the relationship between NET scores and ACT scores and NCLEX-RN success. This study was not predictive in nature, but unlike the other studies mentioned above, the researchers found a significant relationship between composite, math, and reading NET scores and NCLEX-RN success. This result was confirmed by t-test analysis. The t-test also validated that ACT composite and sub-scores were not significantly related to NCLEX-RN success.

The National League for Nursing (NLN) also markets a test, the Pre-Admissions Test, to assess the readiness of nursing program applicants. Schmidt (2000) used that test to predict NCLEX-RN success among 5,698 students from 135 different schools. The hierarchical logistic regression analysis revealed that the Pre-Admissions Test was not a significant predictor of NCLEX-RN success at the diploma, associate, and baccalaureate levels.

Beeman and Waterhouse (2001) also studied standardized test scores as factors in NCLEX-RN success, but the SAT was the exam of interest, and the study was completed in a baccalaureate degree program. Researchers examined the records

of 538 graduates and used Pearson correlations and discriminant analysis to predict NCLEX-RN success. SAT math scores were significantly related to NCLEX-RN success, but SAT verbal scores were not. Beeman and Waterhouse (2001) also looked at preadmission course grades such as biology, physiology, and pathophysiology grades for their ability to predict NCLEX-RN success. All three course grades were significantly related to success; furthermore, in the discriminant analysis, researchers were able to correctly categorize students as those who would pass or fail for 93% of the students.

Beeson and Kissling (2001) also conducted a study in a baccalaureate program in an attempt to identify the predictive value of pre-nursing course grades in predicting NCLEX-RN success. Logistic regression and t-test analyses were employed to review the records of 505 graduates. The pre-nursing courses included in the study were anatomy, physiology, microbiology, psychology, sociology, lifespan development, and developmental patterns of family. Researchers found that students who passed the NCLEX-RN had significantly fewer grades of C or lower in these courses than did the students who failed the exam. Researchers grouped the courses and their grades into physiology, biology, and cognate course GPA categories. Physiology-based GPA, biology GPA, and cognate course GPA were all significantly higher for those who passed the NCLEX-RN.

Prerequisite course grades have also been studied with preadmission GPA in their ability to predict NCLEX-RN success. Seldomridge and DiBartolo (2004) used logistic regression, Pearson correlations, and t-test analyses to predict NCLEX-RN success among 186 baccalaureate nursing graduates in a rural mid-Atlantic public

institution. They evaluated anatomy and physiology, pathophysiology, chemistry, and statistics grades, along with preadmission GPA and the number of C's in the prerequisite courses. Pearson correlations indicated that pathophysiology grades and preadmission GPA were positively and significantly related to NCLEX-RN success. A significant but negative relationship existed between the number of C's in prerequisite courses and NCLEX success. These results were confirmed by t-test analysis, and there were significant differences between those who did and those who did not pass the NCLEX-RN in each of the preadmission variables. The researchers also conducted a stepwise logistic regression analysis, but the results were not consistent with those of the Pearson and t-test analyses. The grade in pathophysiology was the only predictive preadmission variable. The analysis indicated that as the letter grade in the course increased by one letter grade, the odds of passing the NCLEX-RN increased by five times.

In addition to the investigation of prerequisite GPA and prerequisite course grades, Daley, Kirkpatrick, Frazier, Chung, and Moser (2003) also investigated the impact of ACT scores on NCLEX-RN success. Their study consisted of a total of 224 baccalaureate graduates, divided into two cohorts based upon the standardized exam that the students took as they exited the program. Within the cohort that took the Mosby Assess Test, ACT scores and prerequisite GPA were significantly higher for those successful on the NCLEX-RN. Anatomy and pathophysiology grades were also higher for those successful on the licensure exam, but chemistry, social science, and zoology grades were not significantly different between those who were and those who were not successful on the NCLEX-RN. Among those who took the HESI Exit

Examination, there were no significant differences in prerequisite GPA, prerequisite grades, or ACT scores between those who were successful on the NCLEX and those who were not successful.

Other Measures of Success

Gallagher et al. (2001) attempted to predict NCLEX-RN success, but they also measured success in terms of grades in the first nursing course. They studied the records of 121 associate degree nursing students and found that the RNEE was a better predictor of successful completion of the first nursing course than the NET. A t-test analysis revealed that NET math scores were actually higher among those who were not successful; however, the RNEE scores were higher for those who were successful. In the logistic regression model, RNEE reading comprehension scores were significant predictors of the first nursing course grades. The researchers also examined the predictive value of admission scores consisting of pre-nursing GPA, science and math grades, and RNEE scores. Even though RNEE scores had predictive value alone, the admission scores did not significantly predict success in the first nursing course.

Summary of Chapter Two

A summary table of the literature organized by study can be found in Appendix C and displays the author, year, purpose, predictor variables, analyses, and major findings of each study. Another summary table organized by predictor can be found in Appendix D and displays the research findings that support or do not support each of the preadmission academic achievement variables discussed in Chapter Two.

Results were often inconsistent or contradictory among studies. For example, Alzahrani et al. (2005) was unable to predict board exam success using GPA, science grades, and prerequisite course grades. Bauchmoyer et al. (2004) found those same variables to be significant factors in board exam success.

Studies that included participants from more than one program found that results varied among programs (Platt et al., 2001; Siegert, 2008; Utman et al., 2007). Results varied among programs in the same study and among studies, but they also varied within the same study when predicting different measures of success. Alzahrani et al. (2005) attempted to predict success using a combination of preadmission variables. The combinations successfully predicted board exam success, but the same combination was not a significant predictor of program completion.

This chapter discussed studies published since the year 2000 regarding preadmission variables and their ability to predict student success in higher education and nursing programs. This review of the literature defined success as completion of the program and a passing score on licensure exams. Studies that evaluated preadmission variables but measured success in other ways, such as final GPA, were also included in the discussion.

Chapter Three:

Method

This chapter describes the research design of the study. It includes a description of the population and sample, data collection and analysis techniques, and limitations of the study. The research design is based on the purpose of the study, which is to predict program completion and NCLEX-RN success in an associate degree nursing program, specifically State University's School of Nursing (a pseudonym). The study is based on the assumption that if these two measures of success are predicted prior to admission, nursing programs will select the students most likely to succeed, leading to improved retention and NCLEX-RN pass rates. Even though the specific variables from the nursing admission score sheet used at State University are the focus of the design, the preadmission academic achievement variables that appear on the score sheet are commonly used to make admission decisions in other nursing programs and in other higher education departments.

Research Methodology

This retrospective quantitative study aimed to predict program completion and NCLEX-RN success for the classes of State University's associate degree nursing program admitted in 2005, 2006, and 2007, using preexisting data from the University. Program completion and NCLEX-RN success are prerequisites to entry into nursing practice; therefore, these were the chosen measures of student success and the dependent variables for this study.

Predictor variables were chosen based on the variables included on the State University nursing admission score sheet and careful review of the literature. The

scope of this study was limited to preadmission academic achievement variables. These variables provided an objective means to evaluate applicants, though future studies may explore more subjective, noncognitive preadmission variables.

The State University School of Nursing tabulated applicant admission scores based on the score sheet and a specific combination of academic achievement variables. In order to improve generalizability and the effectiveness of the predictive study, predictor variables were extracted from the State University nursing admission score sheet and entered into the prediction models in their traditional forms.

Institutional Approval

The provost at State University and the dean of the School of Nursing provided written permission to complete the study and collect data. The request for this approval can be found in Appendix E. Institutional Review Board for the Protection of Human Subjects (IRB) approval was received from both West Virginia University and State University. Data from State University was readily available in graduate records and was coded to protect the identity of the participants.

University Profile

State University is a public, four-year institution located in a rural community of approximately 20,000 people in the Northeast United States. State University offers baccalaureate and graduate degrees, in addition to associate degrees in nursing and technology. Currently the enrollment in the university is approximately 4,500 students. The demographics of the student body are similar to that of the rural community to which it belongs. The majority of students are of Caucasian ethnicity (92%) and Appalachian culture, and 94% are in-state students. Countries represented

by students at State University include, but are not limited to, Japan, China, Nepal, Bulgaria, and Germany. The average student age is 25 years old. Eighty percent of the students are 29 years old or younger, and the median age is 22 years old. Currently 44.8% are female, and 55.2% are male.

State University requires that applicants submit transcripts and standardized test scores unless the student has already completed a college degree. Nontraditional students are not required to submit ACT or SAT scores unless the scores are needed for course placement decisions. Applicants working on the first degree must have a 2.0 high school or college GPA and an ACT or SAT composite score of 18 or 870, respectively. If a student has a 3.0 GPA, he or she is eligible for admission regardless of test scores, as long as core course requirements are successfully completed. To fulfill prerequisite (core) requirements, prospective students must complete four units or years of English, three in social studies, four in math (with three at a higher level than basic algebra), three in college preparatory laboratory sciences, one in the arts, and two in foreign language (both in the same language) in high school or previous college work prior to admission. The nursing and teacher education programs are considered selective programs and enforce more vigorous admission policies. The nursing admission policy is discussed throughout this chapter.

In this study, nursing student success was measured, in part, by program completion or graduation rate. State University has been vigilant in attempts to improve these same measures institution-wide. Overall graduation rates have remained consistent over the last few years. The six-year graduation rate for those admitted in 2000 and 2001 was 36% in both 2006 and 2007. The percentage of

students attending State University in the fall semester of 2006 that were also enrolled in the fall of 2007 was 70%. The strategic plan and campus-wide initiatives have aimed to increase graduation rates and to enrich the experience of the student. State University also recognizes the importance of preparing graduates for professional practice.

Population

The nursing program at State University began as an associate degree program in the 1960's. Until 2006, the school had only two different directors. The second director of the program served from 1983 to 2006 and developed the admission policy discussed in this study.

The School of Nursing offers the associate's degree, but it also offers an accelerated LPN (Licensed Practical Nurse) articulation program, which began in 2005. LPN students are admitted in the fall as part of an associate degree cohort. The model schedule is slightly different, but LPNs graduate with the other associate degree students. The School of Nursing receives approximately 500 applications a year for approximately 96 available positions, and approximately 150 meet minimum qualifications.

The School of Nursing, in compliance with accreditation standards, measures program success in terms of student success. Articulated in program outcomes, the School of Nursing aims to achieve a graduation rate of 75% and a NCLEX-RN pass rate of 88% for first-time writers. In addition to student achievement factors, program outcomes also reflect emphasis on student and employer satisfaction.

The student population, in general, consists of in-state students of Appalachian culture. Most of the students are nontraditional with an average age of 26, and the population consists of students of varying socioeconomic status. Many of the students are first-generation college students, and 10% are matriculating as high-school graduates. Approximately 90% of the nursing student population is female, which is consistent with the distribution of gender among all nursing applicants; however, this differs from the population of the university as a whole. Approximately 45% of the State University population is female. The ethnic make-up of the nursing student population reflects the composition of the state, and approximately 97% of the students are white or Caucasian.

Although the diversity of the nursing student population is similar to that of the institution, nursing students consistently score higher on standardized tests and achieve higher grade point averages. State University students have an average GPA of 2.64, and the average GPA for nursing students is 3.45. The average ACT scores for State University are 18 composite, 17 math, 19 science, and 18 English. In 2006, the average scores for nursing students were 22 composite, 21 math, 23 science, and 24 English.

Sample

This study included students admitted in 2005 (n=94), 2006 (n=97), and 2007 (n=103), which are also referred to the classes of 2007, 2008, and 2009, respectively. The total number of participants based on admission class was 294 participants. In the prediction of program completion, the sample consisted of 294 participants. Because only program graduates are eligible to sit for the licensure exam, the prediction of

NCLEX-RN success included only those students that successfully completed the program, or 196 students.

The demographic data collected for the sample, data type, data source, and coding methods are described in Table 1.

Table 1

Demographics of the Sample

Data	Data Type	Data Source	Coding
Admission class	Nominal	School of nursing records (paper files)	Year of admission
Graduating class	Nominal	School of nursing records (paper files)	Year of graduation
Score sheet	Dichotomous Nominal	Student paper files	0 = ACT 1 = TEAS
Gender	Dichotomous Nominal	School of nursing records (paper files)	0 = male 1 = female
Ethnicity	Dichotomous Nominal	School of nursing records (paper files)	0 = non-white or Caucasian 1 = white or Caucasian

Data	Data Type	Data Source	Coding
High school graduate	Dichotomous Nominal	Student paper files	0 = not a college freshman 1 = college freshman
Student type	Dichotomous Nominal	Electronic records	0 = nontraditional 1 = traditional
Year of high school graduation	Interval	Student paper files	Year of graduation from high school
GED (General Equivalency Diploma)	Dichotomous Nominal	Student paper files	0 = no GED 1 = GED

Admission Score Sheet

In 1984, State University's School of Nursing began using an admission score sheet similar to those displayed in Appendixes A and B in an attempt to be more objective in the selection of nursing students. Students are ranked according to score sheet percentages, if they meet all of the minimum school of nursing admission requirements. Students have access to a pre-nursing advisor, who helps them prepare

their applications and advises regarding how they can be better prepared for the selection process.

According to the former dean of nursing who created the score sheet, the academic achievement variables were chosen because of their ability to predict student success in objective terms and their ability to demonstrate various levels and avenues of achievement. She also consulted the literature, accreditation standards, and her own experience to guide variable selection (Personal communication, September 8, 2008). The current state of the literature reveals conflicting evidence regarding the variables chosen (See Appendix D). Variables included standardized test scores, preadmission cumulative GPA, prerequisite course grades (biology, algebra, and chemistry), support course grades and credit hours, and LPN licensure. Support courses for State University's School of Nursing included English courses; introductory courses in psychology and sociology; diet therapy; political science (American government); and a race, class, and gender course. Students admitted in the fall of 2005 and 2006 took the TEAS exam, but their admission score sheets included the ACT scores for admission decisions. Students admitted in the fall of 2007 had ACT scores or concordant scores (ACT Compass scores or SAT scores) on record, but TEAS scores replaced the ACT scores on the admission score sheet.

Each category is weighted different (See Appendixes A and B). For example, the TEAS or ACT scores account for 16 of the total points, and cumulative GPA accounts for five of the total points. The coding method for grades was originally based on traditional coding methods (A=4, B=3, C=2, D=1, F=0). The weighting for

the other variables was selected arbitrarily at first and was revised through informal trial and error (Personal communication, September 8, 2008).

Points for each category are summed and divided by the total points possible (38 points) to calculate a percentage. The percentages are used to rank applicants based on the number of seats available. The score sheet relies heavily on support course performance (10 of the 38 points), but high school students applying for the nursing program often do not have the opportunity to complete support courses. In order to provide opportunity for high school graduates, the scores of students who have not taken any college courses are divided by 33 points, rather than 38 points. High school students may choose to take advanced placement college courses, but if they want to count the grades in those courses as support course grades on the score sheet, they must also be scored based on the 38-point total.

The situation has occurred in which two or more applicants have the exact same percentage that also happens to be the cut-off score for admission. For example, if the school has 96 vacant student positions, the 96th position falls at 90.5%, and more than one student has a 90.5%, administrators have to determine which student gets the last position. In this type of situation, a second analysis is completed, and the GPA is multiplied by either the number of college credits or the TEAS composite score. Currently, if one of the students in question was admitted directly from high school, the TEAS composite score is used, because high school students will not necessarily have college credits.

It is important to note that when adding up the total possible points for each category, there are more than 38 points possible for the score sheet. Applicants can

acquire a percentage greater than 100%, but they are still ranked according to their actual percentages. The five points awarded to the LPN applicants are considered bonus points and are not included in the 38-point total. According to the pre-nursing advisor, the five points awarded for support course GPA are also considered bonus points and are not included in the 38-point total. These five built-in bonus points may allow students that take support courses to improve the score despite lower point totals in other categories, such as cumulative GPA. The heavy reliance on support course performance reflects the former dean's belief that successful performance in college is a primary indicator of performance at this level (Personal communication, September 8, 2008). Current studies are inconsistent in findings regarding the relationship between college performance and student success (See Appendix D).

It is also important to note that the score sheet including ACT scores did not include reading scores, yet it did include ACT composite scores, which are considered an average of all of the ACT sub-scores. The Reading ACT scores were not included in the beginning, because the dean did not feel that the literature supported reading scores as a reliable indicator of success. Currently, there is a lack of evidence either supporting or discounting the use of reading scores to predict student success. According to the former dean, although the composite would reflect, in part, reading scores, the faculty did not see an urgent need to add the reading scores despite the fact that they identified reading as an essential skill in nursing education (Personal communication, September 8, 2008). When the School of Nursing replaced the ACT with TEAS scores, the TEAS reading scores were included, but the composite scores were eliminated.

The scope of this study is limited to preadmission academic achievement variables; however, few of the participants complete every support course prior to admission. The researcher sought to obtain meaningful predictions regarding support course GPA and, in order to include support course GPA in the analysis, collected support course data from student transcripts even if the course(s) were not completed prior to admission.

Finally, applicants must successfully complete biology, algebra, and chemistry courses for admission; however, how students fulfill those requirements may vary. Students may use high school or college grades in that category: whichever will yield a higher score.

Data Collection

With permission from the provost of State University and the dean of the School of Nursing, student records were accessed to collect data to answer the following research questions:

1. What preadmission academic achievement variables are most predictive of program completion?
2. What preadmission academic achievement variables are most predictive of NCLEX-RN success?

A sample letter requesting permission to complete the study is found in Appendix E. The researcher accessed data through student transcripts (electronic records), score sheets (student paper files), school of nursing records (paper files), test scores (electronic records), and reported NCLEX results (paper files and online verification

through the state board of nursing). Data was collected, coded, and kept in a locked, secured location.

The School of Nursing revised the admission score sheet in 2007 to replace the ACT scores with TEAS scores; however, both ACT and TEAS scores were collected for all of the participants either by the score sheet or by computerized record. It is important to note that the admission score sheet based in part on ACT scores did not include ACT reading scores; however, the score sheet based in part on TEAS scores included reading scores. Both ACT reading and TEAS reading scores were evaluated for all of the participants.

Some of the students who apply to State University do not report ACT scores. In this case, concordant SAT or COMPASS tables were used to identify SAT and COMPASS scores comparable to ACT scores (ACT, 2009, "ACT-SAT Concordance;" "Concordant ACT assessment," 1999; Schneider & Dorans, 1999). The concordant ACT scores were used in the analysis.

Tables 2 through 4 present the data collected, data type, data source, and coding values.

Table 2

Outcome Variables

Data	Data Type	Data Source	Coding
Program Completion	Dichotomous Ordinal	School of nursing records (paper files)	0 = did not complete the program 1 = completed the program
NCLEX-RN Success	Dichotomous Ordinal	School of nursing records (paper files) Online verification	0 = failed the NCLEX-RN on the first attempt 1 = passed the NCLEX-RN on the first attempt

Table 3

Predictor Variables

Data	Data Type	Data Source	Coding
TEAS scores	Interval	Student paper files School of nursing records (paper files)	Reading, math, English and science scores as separate predictors
ACT scores	Interval	Student paper files Electronic records	Reading, math, English and science scores as separate predictors
Cumulative GPA at admission	Interval	Student paper files	GPA on a 4-point scale

Data	Data Type	Data Source	Coding
Prerequisite GPA including biology, chemistry, algebra	Interval	Calculated based on prerequisite course grades	GPA on a 4-point scale
Support course credit hours prior to admission	Interval	Student paper files	Number of credits taken
General education support course GPA (English; sociology; political science; race, class, & gender)	Interval	Student paper files Electronic records (transcripts)	GPA on a 4-point scale
Health-related support course GPA (psychology, diet therapy)	Interval	Student paper files Electronic records (transcripts)	GPA on a 4-point scale
Science support course GPA (anatomy and physiology, microbiology)	Interval	Student paper files Electronic records (transcripts)	GPA on a 4-point scale
LPN experience	Dichotomous Nominal	Student paper files	0 = is not a LPN 1 = LPN
High school GPA	Interval	Student paper files	GPA on a 4-point scale

Table 4

Additional Data Collected

Data	Data Type	Data Source	Coding
Total admission score	Interval	Student paper files	Percentage
Total admission score	Interval	Student paper files	Number
TEAS scores	Interval	School paper files	Composite scores
ACT scores	Interval	School paper files	Composite scores
Prerequisite type	Dichotomous Nominal	Student paper files Electronic records (transcripts)	0 = 1 or more prerequisites at the high school level 1 = all prerequisites taken at the college level
Support course credit score	Interval	Student paper files	0-6 based on number of credits taken
All support course grades	Ordinal	Student paper files Electronic records (transcripts)	0 = F, 1 = D, 2 = C, 3 = B, 4 = A
Prerequisite course grades including biology, chemistry, and algebra	Ordinal	Student paper files Electronic records (transcripts)	0 = F, 1 = D, 2 = C, 3 = B, 4 = A

Data Analysis

Figure 2 displays the predictor variables, statistical analysis, and outcome variables of this study. Descriptive and inferential statistical analyses were performed with SPSS 17.0 for Windows®. Descriptive statistics (means, medians, frequencies, percentages, crosstabs, and correlations) were used to describe the sample and the data and to evaluate the fulfillment of model assumptions.

Backward stepwise logistic regression models were employed to answer the research questions and evaluate the ability of the preadmission academic achievement variables to predict program completion and NCLEX-RN success. Logistic regression was the analysis of choice because the outcome variables, program completion and NCLEX-RN success, are dichotomous, and the predictor variables are either categorical or continuous.

TEAS scores, ACT scores, preadmission cumulative GPA, prerequisite GPA, the number of support course credits taken preadmission, and support course GPA were included in the main regression model. Support course GPA was further divided into three categories based on the nature of each support course and its relationship to the nursing curriculum. Each of the three categories were entered into the model as separate predictors. General education support courses included two introductory English courses; sociology; political science; and a race, class, and gender course. The introductory psychology and diet therapy courses were designated as health-related support courses, and the anatomy and physiology and microbiology courses were placed in the science support course category.

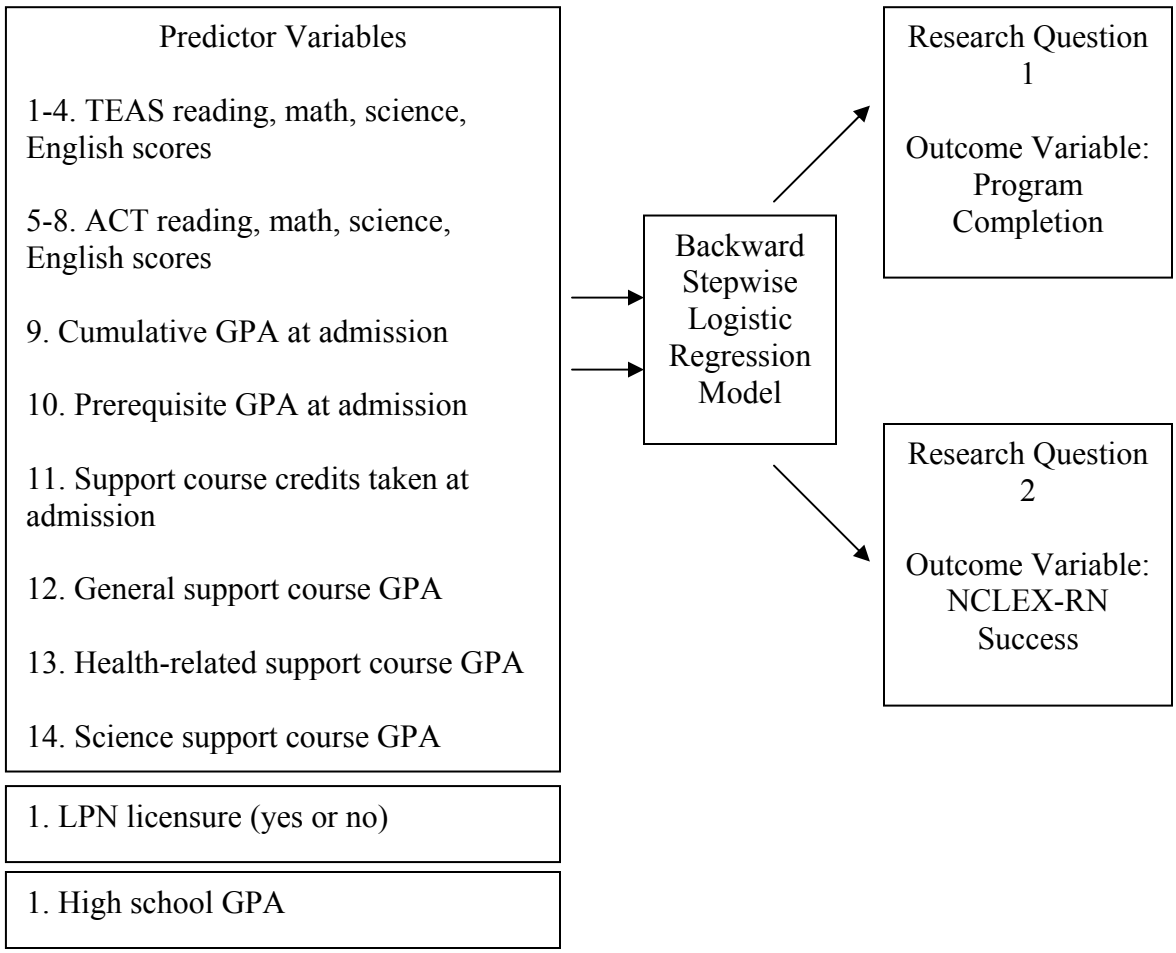

Figure 2. Research design.

Only the LPNs admitted in 2007 were required to take the TEAS exam. TEAS exam scores were not accessible for LPNs admitted in 2005 and 2006; therefore, most of the LPNs in the sample would have been eliminated if LPN status was included as a predictor variable in the main model. Also, high school GPA was accessible for the admission classes of 2006 and 2007 but not for those admitted in 2005. If high school GPA were included in the main regression model, those admitted in 2005 would have been eliminated. As a result, LPN status and high school GPA were entered into two separate regression models as illustrated in figure 2.

A power analysis was conducted to identify appropriate sample size given the number of predictor variables. According to Field (2005), 13-14 predictor variables and a medium effect require approximately 160 participants, and approximately 20 predictor variables can be used for a sample size of 200 participants (p. 173). The size of the sample was 294 participants when predicting program completion and 196 participants when predicting NCLEX-RN success. The sample size is smaller for the NCLEX-RN success model, because those who did not complete the program were not eligible to sit for the NCLEX-RN exam.

Compliance with logistic regression assumptions, model fit, the ability of each model to predict the outcome correctly, and effect sizes were evaluated. Tests for assumptions included the evaluation of outliers and influential cases through examination of standardized residuals, Cook's distances, leverage values, and DfBeta values for the constant and predictors. When outliers were identified, the cases were checked for accuracy. A crosstabs analysis was conducted to identify cells of low frequencies that may compromise the regression. Tests for multicollinearity were also perfomed, including tolerance and VIF statistics and evaluation of the correlations among variables. The criterion for multicollinearity was established ($r_{xy} = .7$), and none of the variables exhibited a relationship stronger than .532. A Box Tidwell Transformation Test was conducted for each variable to identify linear relationships between the predictor and the log odds of the outcome variable. The goodness of fit was evaluated through Hosmer and Lemeshow tests and model likelihood ratio chi-square analyses. Effect size was reported in the form of Nagelkerke R-square statistics. For each predictor, standardized regression coefficients (β), standard error

(SE), Wald statistics (χ^2), significance levels (p), odds ratios (Exp(B)), and confidence intervals (CI) were reported. The criterion for statistical significance was established at the .05 level.

Limitations

Generalizability

This study involved samples taken from one university, limiting the ability to generalize results to other institutions or programs. However, the results of this study may be of interest to higher education institutions and to nursing education programs across the country. The State University nursing program grants an associate's degree; however, the same licensing examination (NCLEX-RN) is used for entry level practice regardless of the type of program, and retention and NCLEX-RN pass rates for this school of nursing were similar to state and national averages. Every nursing graduate in the United States must take the same exam, and accredited nursing programs must comply with similar standards. In fact, the former dean of nursing that served from 1983-2006 reported that five other nursing schools in the state inquired about the admission policy and score sheet at State University and implemented the score sheet either in part or in its entirety in their own programs (Personal communication, September 8, 2008).

The sample lacks ethnic diversity, but this mirrors the population from which it was drawn. For this institution, it was vital that the sample of the study represent the population that State University serves (Symes, Tart, & Travis, 2005). This does make it difficult, however, to generalize to institutions that serve a more ethnically diverse student body.

Control of External Variables

The challenges facing nursing education will not be met in the absence of assessment and modification of policies and processes in the ever-changing health care and higher education environments. Conducting a study within this dynamic environment limits the ability to control variables, such as faculty-to-student ratio, class size, faculty turnover, the content and complexity of coursework, available resources for teaching and learning, and changes in the NCLEX-RN (Waterhouse & Beeman, 2003).

State University and its School of Nursing has experienced changes over which this study has limited control. For example, the School of Nursing increased their fall admission enrollment from 60 in 2000 to 80 in 2001 and 96 in 2007 in response to needs of the state, the profession, the university, and the community for more graduates. This addressed only part of the issue, though, as the need to retain these students also existed.

In response to this challenge, the School of Nursing created remedial nursing courses in 2004. Students that were not successful in adult health nursing courses could meet course requirements upon successful completion of the corresponding remedial courses. This enabled students to continue in the program without interruption in their program of study. The adult health courses were chosen because the highest attrition occurred during those courses. The graduation rate increased from 79% to 94% the first year after implementation of the remediation program; however, NCLEX-RN first-time pass rates were 79% and 89% in the years 2004 and

2005, respectively. The change in policies continues to make comparing program completion and NCLEX-RN success between graduating classes difficult.

In order to satisfy the objectives of the program, the state board, and accrediting agencies, the dean and the faculty explored additional curricular changes. These included, but were not limited to, expansion of the mastery courses to include students who had passed adult health nursing courses by a margin of less than or equal to five percent (at-risk students); implementation of a new assessment package; the use of blueprinting practices for course exams, and examination and revision of the topics covered in the curriculum.

It is difficult to control for change within nursing programs, but it may also be argued that the purpose of selective admissions is to identify students that are more likely to succeed in the program. This increased probability may be more connected to the individual's potential for success than to the program's curriculum, as long as the curriculum and changes therein are consistent among students. In fact, the changes may improve chances for success for all students.

This study is limited to preadmission academic achievement variables, and it is possible that a significant amount of the variance in student success is attributed to other variables. This is consistent with the small effect sizes reported in Chapter Four. Program completion and NCLEX-RN scores may also be influenced by a student's psychosocial background; however, this study does not control for qualitative sample characteristics, such as presence and degree of test-taking anxiety, self-confidence levels, support systems, and the number and impact of roles and responsibilities. Program completion and NCLEX-RN success is not determined solely by a student's

academic potential, and students withdraw from nursing programs for reasons other than academic failure alone. A limitation of this study includes the inability to account for these variations in student experiences.

Range Restriction

Applicants for the State University School of Nursing must meet minimum GPA, standardized test, and course grade requirements. Also, average GPA and ACT scores are higher among nursing students than those of the university and of the population as a whole. Because this study included only those accepted into the program with the highest academic achievement scores, the range of scores in the sample is limited. Range restriction can result in overly conservative validity coefficients (Dunlap, Henley, & Fraser, 1998; Reisig & DeJong, 2005; Stack & Kelley, 2002). One way to limit the effects of range restriction is to include multiple measures of academic performance (Dunlap et al., 1998; Mountford et al., 2007; Reisig & DeJong, 2005). This study examined over 16 different preadmission academic achievement measures.

Summary of Chapter Three

This chapter discussed the methodology used to answer the research questions and to evaluate the ability of preadmission academic achievement variables to predict program completion and NCLEX-RN success. The discussion included the research design, protection of human subjects, population, sample, data collection techniques, data analysis, and limitations of the study.

The study included the 2005, 2006, and 2007 admission classes at State University in its associate degree nursing program. Sample size for the prediction of

program completion and NCLEX-RN success was 294 and 196 students, respectively. An admission score sheet and the review of the literature led to the selection of preadmission academic achievement variables used to predict student success. Logistic regression models were used to address the research questions.

Limitations of the study included generalizability, limited racial diversity, limited control of external variables, and possibly range restriction. In order to improve the usefulness of the findings of the study, multiple variables were used as predictors, three complete admission classes were used in the sample, variables were measured in their traditional forms, commonly used preadmission predictors were chosen, and the outcome measures are the two main indicators of success, especially in nursing programs.

Chapter Four:

Findings

Introduction

This chapter presents a detailed account of the results of this study. The first section of this chapter presents the descriptive statistics of the sample, including the demographic and academic achievement variables. The next two sections organize the results according to research questions one and two and the prediction of program completion and NCLEX-RN success. A summary of Chapter Four follows the discussion of the logistic regression results.

Specifically, the research questions were:

1. What preadmission academic achievement variables are most predictive of program completion?
2. What preadmission academic achievement variables are most predictive of NCLEX-RN success?

Descriptive Statistics

Demographic Variables

This study included students admitted in 2005 (n=94, 32%), 2006 (n = 97, 32%), and 2007 (n = 103, 35%). The total number of participants was 294. All of the participants were included in the prediction of program completion (research question one), but only those who completed the program were eligible to take the NCLEX-RN exam. Thus, the sample size for the analysis of research question two was 196.

As stated in Chapter Three, the nursing student population is similar to that of the institution, but nursing students are predominantly female. In this sample, 82% of

the participants were female, and 98% of the sample was Caucasian. Five of the participants were non-White/non-Caucasian and represented five different countries.

The year the student graduated from high school was recorded in lieu of age. Graduation dates ranged from 1968 to 2007, and for those with GEDs (n = 12, 4%), the year reflected the year that the GED was obtained. The mean graduation year was 1998 (SD = 7.7). Seven percent of the sample graduated before 1985, and 34% of the sample graduated after 2003. In this study, traditional students were those who entered postsecondary study immediately following high school and did not experience an interruption in his or her college education. Traditional students made up 40% of the sample, and of those 116 students, 20 participants (7% of the total sample) entered the nursing program as high school graduates (college freshman). Sixty percent of the sample (n=175) were nontraditional students. Sixty-five percent of the sample (n = 191) was admitted using the score sheet based on ACT scores, compared to 35% (n = 103) using the score sheet based on TEAS scores.

A crosstabs analysis was evaluated for the occurrence of the demographic variables among those who did/did not complete the program. The data can be observed in Table 5. The attrition rate for the entire sample (N = 294) was 33%. Attrition was highest among those that were admitted in 2006 (42%) and least among those that were admitted in 2007 (26%). The attrition rate for those admitted using ACT scores was higher (37%) than for those using TEAS scores (26%).

Table 5

Demographic Variables and Program Completion

Variable	No completion (n = 98)		Completion (n = 196)	
	n	%	n	%
Admission year				
2005	30	32	64	68
2006	41	42	56	58
2007	27	26	76	74
Score sheet used				
ACT	71	37	120	63
TEAS	27	26	76	74
Year of high school graduation				
1968 – 1979	4	67	2	33
1980 – 2002	44	28	114	72
2003 – 2007	50	38	80	62
Gender				
Male	20	38	33	62
Female	78	32	163	68
Ethnicity				
Non-Caucasian	4	80	1	20
Caucasian	94	33	195	67
High school graduates				
Not a college freshman	89	33	182	67
College freshman	6	30	14	70
GED				
High school diploma	90	32	189	68
GED	5	42	7	58
Student type				
Nontraditional	48	27	127	73
Traditional	47	41	69	59

Note. The percentages in this table do not refer to the percentage of the sample as a whole. Rather, they refer to the percentage of subjects among corresponding horizontal cells of the crosstabs analysis.

As part of the crosstabs evaluation, the data regarding the year of high school graduation was observed for trends. It was noted that among the six that graduated before 1980, only two completed the program. The attrition rate decreased from 67% to 27% when including those who graduated between 1980 and 1985. The attrition rate for those graduating after 2003 was 38%. The attrition rate was similar between those who were admitted as high school graduates (n = 6, 30%) and those who were not college freshman (n = 89, 33%), and the attrition rate of both groups was similar to the attrition rate of the sample as a whole (33%). Twelve of the participants were admitted to the nursing program with a GED rather than a high school diploma. Of the 12, five did not successfully complete the program (42%). The attrition rate for those with a high school diploma was 32%; however, the size of the sample with GEDs was small. Although high school graduates completed the program at a similar rate to those who were not college freshman, the group of traditional students had a higher attrition rate (41%) than the nontraditional students (27%). In order to be considered traditional, the student had to enter a higher education institution the summer or fall semester following high school graduation without interruption in enrollment.

Attrition among genders appeared to be similar. Sixty-two percent of the males, and 68% of the females completed the program. Ninety-eight percent of the sample was Caucasian. Of the five non-Caucasian students, only one student successfully completed the program. Of the 289 Caucasian participants, 196 (67%) successfully completed the program.

Pearson correlations were conducted to evaluate relationships among demographic variables. The correlations can be found in Appendix F. Year of high school graduation was significantly related to the score sheet used (r=.208, p<.05), whether or not the student entered as a college freshman (r=.266, p<.05), whether the student entered with a high school diploma or GED (r=-.198, p<.05), and whether the student was traditional or nontraditional (r=.663, p<.05). Student type was also significantly related to score sheet used (r=.117, p<.05), whether or not the student was a college freshman (r=.334, p<.05), and whether the student had a GED or high school diploma (r=-.169, p<.05).

The admission score sheet used, year of high school graduation, whether or not the participant had a GED, and student type (nontraditional versus traditional) seemed to be different among those who completed/did not complete the program. These variables were entered into a logistic regression model to see if they were significant predictors of program completion. Ethnicity was not included in the model despite the appearances of differences in success rates because only five of the participants fell in the non-Caucasian category, and ethnicity did not meet the sampling adequacy assumption for logistic regression.

The demographic prediction model was a significant fit with the data [χ^2(2, N=290)=9.55, p<.05]; however, the model did not change the ability to correctly assign participants to the completion groups, which was consistent with the small effect size (R^2 = .045). Table 6 displays the standardized regression coefficients, standard errors, Wald statistics, significance levels, odds ratios, and confidence intervals for the variables remaining in the final step of the backward stepwise

regression analysis. The year of high school graduation and GED variables were removed in steps 1 and 2, respectively.

Table 6

Demographic Variables Predicting Program Completion

						95% CI	
Variable	B	SE	Wald	*p*	Exp(B)	LL	HL
Constant	.81	.19	19.05	.000	2.24		
Score sheet	.57	.28	4.17	.041	1.76	1.02	3.03
Student type	-.652	.259	6.35	.012	.521	.314	.865

The score sheet used and student type were significant predictors of program completion. The score sheet comprised of the TEAS exam scores was a better indicator of success than the score sheet including the ACT scores. Success was more likely among nontraditional students than among traditional students.

A crosstabs analysis was also completed to evaluate the occurrence of the demographic variables among those who passed or failed the NCLEX-RN. The data can be observed in Table 7. It is important to note that only those who completed the program within the two-year program of study were included in the analysis. The pass rate for the entire sample (N=195) was 87%. The failure rate was highest among those who were admitted in 2007 (15%) and were evaluated based on the TEAS score sheet. The failure rates for those admitted in 2005 and 2006 were similar (12% and 11%, respectively). These two groups were evaluated using the ACT admission score sheet.

A decrease in program completion rates occurred among those who graduated from high school on or after the year 2003. The pass/failure rates were similar between those who entered the program as high school graduates and those who did not. The pass rate among those admitted as college freshmen was 85% (15% failure rate), compared to a 87% success rate (13% failure rate) for those who did not enter as college freshmen. The crosstabs analysis indicated that the pass rate among those who entered the program with a GED and were able to complete the program was 100%. All seven graduates with GEDs sitting for the NCLEX-RN passed the exam.

The pass rate among those with a high school diploma was 87% (13% failure rate). Nontraditional students had a considerably higher success rate (94%) than traditional students (75%). Again, this correlated with the data regarding the year of high school graduation and NCLEX-RN success.

The pass rates among genders appeared to be different. Among males, 18% failed the NCLEX-RN, and among females, 12% failed. Only one non-Caucasian student completed the program, and that student was successful on the exam. The sample size, however, is too small from which to draw valid conclusions regarding ethnicity and NCLEX-RN success.

Table 7

Demographic Variables and NCLEX-RN Success

Variable	Failure (n = 25)		Success (n = 170)	
	n	%	n	%
Admission year				
2005	8	12	57	88
2006	6	11	50	89
2007	11	15	63	85
Score sheet used				
ACT	14	12	107	88
TEAS	11	15	63	85
Year of high school graduation				
1972 – 2002	6	5	109	95
2003 – 2007	19	24	60	76
Gender				
Male	6	18	27	82
Female	19	12	143	88
Ethnicity				
Non-Caucasian	0	0	1	100
Caucasian	13	25	169	87
High school graduates				
Not a college freshman	23	13	159	87
College freshman	2	15	11	85
GED				
High school diploma	25	13	163	87
GED	0	0	7	100
Student type				
Nontraditional	8	6	118	94
Traditional	17	25	52	75

Note. The percentages in this table do not refer to the percentage of the sample as a whole. Rather, they refer to the percentage of subjects among corresponding horizontal cells of the crosstabs analysis.

Year of high school graduation, student type (nontraditional versus traditional), gender, and whether or not the graduate had a GED seemed to be different among those who passed or failed the NCLEX-RN exam. A logistic regression analysis was employed to examine the predictive validity of these variables. The GED variable was removed from the model because sampling was inadequate. No one with a GED, who also completed the program, failed the exam. The year of high school graduation was also removed from the model, because a strong relationship existed between that variable and student type (r=.663).

The demographic model used to predict NCLEX-RN success was a significant fit with the data with a small effect size [R^2=.129, $\chi^2(2, N=195)=13.90$, $p<.05$]. The effect size was consistent with the model's inability to improve the percentage of correctly classified cases. The specific regression coefficients can be found in Table 8.

Table 8

Demographic Variables Predicting NCLEX-RN Success

						95% CI	
Variable	B	SE	Wald	*p*	Exp(B)	LL	HL
Constant	2.22	.54	16.82	.000	9.20		
Gender	.60	.54	1.26	.263	1.83	.64	5.26
Student type	-1.60	.46	11.89	.001	.20	.08	.50

Student type was a significant predictor of NCLEX-RN success; however, gender was not an indicator of success. Nontraditional students were more likely to

pass the NCLEX-RN than traditional students among those who successfully completed the program.

Academic Achievement Variables

This study aimed to evaluate the ability of 16 different preadmission academic achievement variables to predict program completion and NCLEX-RN success. The mean and standard deviations of each variable can be found in Table 9. It is important to note that mean test scores and GPAs were higher than that of the general population. Range restriction was discussed in Chapter Three as a potential limitation of the study. Particularly high were the mean TEAS reading scores (M=90.21, SD=5.73), which ranged from 57 to 100 (100 points possible).

The correlation coefficients among all predictor variables can be found in Appendix G. The strongest relationships were between ACT math and science scores (r=.532, $p<.05$), ACT reading and English scores (r=.473, $p<.05$), ACT science and English scores (r=.442, $p<.05$), and ACT math scores and high school GPA (r=.432, $p<.05$).

Overall, test scores were significantly and positively related to each other, although the strengths of those relationships varied. ACT subscores were significantly related to high school GPA, but TEAS subscores were not. Overall, GPA variables were significantly related to each other. For example, cumulative GPA was significantly and positively related to high school GPA (r=.245, $p<.05$) and prerequisite course GPA (r=.202, $p<.05$). Support course GPA categories were also significantly related to each other. Higher GPAs were not generally related to higher test scores. In fact, cumulative GPA had a significant negative relationship with

TEAS science and English scores (r=-.148 and r=-132, respectively, $p<.05$). It is also important to note that the number of support course credit hours taken prior to admission had a negative relationship with all other variables, even though some of those relationships were not significant.

Table 9

Descriptive Statistics for Predictor Variables

Variable	N	M	SD
TEAS scores			
Reading	257	90.21	5.73
Math	257	70.43	11.38
Science	257	72.39	8.86
English	257	79.00	7.47
ACT scores			
Reading	280	23.06	4.17
Math	284	20.99	3.56
Science	280	22.30	2.99
English	281	23.02	3.59
GPA			
Cumulative	290	3.35	.41
Prerequisite	290	3.68	.38
High school	194	3.32	.49
Support course hours	290	17.47	7.30
Support course GPA			
General education	289	3.58	.41
Health-related	290	3.57	.51
Science	290	3.52	.59

Research Question One

The first research question asked: What preadmission academic achievement variables are most predictive of program completion? The null hypothesis stated that the independent variables are not predictive of program completion.

Results

A backward stepwise logistic regression model was employed to determine the ability of TEAS and ACT subscores; cumulative, prerequisite, and support course GPAs; and the number of support course credit hours taken prior to admission to predict program completion. The regression analysis included 246 participants. Forty-eight records were eliminated because they were missing data related to one or more of the variables.

A Hosmer and Lemeshow test indicated that there is no significant difference between predicted and actual values and a good fit with the data. The likelihood ratio model chi square also indicated a significant fit [R^2=.190, χ^2(4, N=246)=51.84, p<.05]. The model as a whole correctly predicted 33% of the failures and 91% of the successes; however, this was only an overall increase of three percent. The null model correctly predicted 71% of the cases, and the regression model correctly predicted 74% of the cases. The Box Tidwell Transformation Test indicated that TEAS science scores violated the linearity assumption. This usually decreases the power; however, TEAS science scores were found to be significant regardless of the violation and limited power.

TEAS math scores, TEAS science scores, ACT math scores, and science support course GPA were entered into the final step of the analysis. Of these

variables, TEAS science scores and science GPA were significant predictors of program completion. The data for the final step can be found in Table 10. For every unit increase in TEAS science scores, the probability of program completion increases by a factor of 1.07, and for every unit increase in science GPA, students were almost 5 times more likely to successfully complete the program. When interpreting the odds ratios, it is important to note that the scale of the variables varies. For example, an increase in GPA from 3.0 to 4.0 is a more significant change than a one-point increase on a 100-point TEAS exam.

Table 10

Main Model (Final step) Predicting Program Completion

						95% CI	
Variable	β	SE	Wald	*p*	Exp(B)	LL	UL
Constant	-8.54	2.00	18.09	.000	.00		
Science GPA	1.59	.31	26.54	.000	4.90	2.68	8.97
TEAS science	.065	.02	3.79	.001	1.07	1.03	1.11
ACT science	-.119	.06	3.79	.052	.89	.79	1.00
TEAS math	.028	.02	3.47	.062	1.03	.99	1.06

High school GPA was entered into a separate logistic regression model because this data was only obtainable for two of the admission classes, 2006 and 2007. This data set also excluded those who received GEDs. The total sample size for the model was 194 participants.

The chi-square statistic indicated that the model was not significantly better when high school GPA was entered [$\chi^2(1, N=194)=.07$, $p=.797$]; however, the

Hosmer and Lemeshow test indicated that the model was a good fit with the data. Nagelkerke's R-square indicated no effect of high school GPA on program completion (R^2=.000).

The data regarding the predictive value of high school GPA can be found in Table 11. This variable was not a significant predictor of program completion and did not improve the ability to correctly predict success or failure.

Table 11

High School GPA Model Predicting Program Completion

						95% CI	
Variable	β	SE	Wald	*p*	Exp(B)	LL	UL
Constant	.64	.15	17.94	.000	1.90		
High school GPA	.08	.31	.07	.797	1.08	.60	1.97

LPN status was also entered into a separate regression model because only the LPNs in one of the admission classes (2007) were required to take the TEAS exam. The LPN model was not significantly better than the null model with a very small effect size [R^2=.005, χ^2(1, N=291)=1.39, *p*=.238]. The model also did not increase the percentage of cases accurately predicted regarding program completion.

Consistent with the model fit tests and effect size, LPN status was not a significant predictor of program completion (see Table 12). It should be noted that the sample of LPNs was small (n=30), and the number of LPNs that did not complete the program was also small (n=7), but the sampling adequacy assumption was met for the regression model. Of the seven LPNs that did not complete the program, three withdrew as a result of academic failure. Exit data was not obtainable for the other

four to review details surrounding their withdrawal; however, review of transcripts for three of the four revealed a history of academic difficulty.

Table 12

LPN Model Predicting Program Completion

Variable	β	SE	Wald	*p*	Exp(B)	95% CI LL	95% CI UL
Constant	.68	.13	26.65	.000	1.97		
LPN licensure	.51	.45	1.30	.255	1.67	.69	4.05

ACT and TEAS composite scores were entered into a separate model for exploratory purposes. These variables were not included in the main regression analysis because they represent an average of the other scores. The overall model was a significant fit to the data with a small effect size [R^2=.05, χ^2(2, N=246)=12.29, p<.05], but it increased the overall accuracy of predicting program completion by less than one percent. TEAS composite scores were significant predictors of program completion; however, ACT composite scores were not significant predictors (see Table 13).

Table 13

Composite Score Model Predicting Program Completion

Variable	β	SE	Wald	*p*	Exp(B)	95% CI LL	95% CI UL
Constant	-.59	1.99	7.85	.005	.004		
TEAS composite	.10	.03	10.31	.001	1.10	1.04	1.17
ACT composite	-.05	.06	.56	.454	.96	.85	1.08

The variables above were considered individually. In addition, the combination of variables was entered into a logistic regression analysis in the form of total score sheet percentages to determine the ability of State University's score sheet scores to predict program completion. Tests for model fit were inconsistent. The model was a significantly better fit with the admission score percentage [R^2=.032, χ^2(1, N=290)=6.71, p<.05], but the Hosmer and Lemeshow test indicated that a significant difference existed between actual and predicted values. Admission score percentage was a significant predictor of program completion (see Table 14); however, overall, the model only improved the ability to predict success and failure correctly from 67% (null model) to 68%, which is consistent with the small effect size.

Table 14

Admission Score Model Predicting Program Completion

						95% CI	
Variable	β	SE	Wald	*p*	Exp(B)	LL	UL
Constant	-5.37	2.42	4.93	.026	.005		
Total percentage	.06	.03	6.31	.012	1.07	1.01	1.12

Multiple regression models were used to identify significant predictors of program completion. All of the significant predictors (score sheet used, student type, TEAS science scores, science GPA, TEAS composite scores, and total score sheet percentage) were placed into a combined model to identify overlapping effects.

The model exhibited good fit with the data and a larger effect size than previous models [R^2=.247, χ^2(3, N=256=48.71, p<.05]. The model was able to

correctly classify 33% of those that did not complete the program and 91% of those that did complete the program. That was an overall improvement of 3% from the null model (71% to 74%).

Regression coefficients for the final step of the analysis can be found in Table 15. Total score percentage, score sheet used, and TEAS composite scores were no longer significant and were removed from the model. Student type, TEAS science scores, and science GPA continued to exhibit significant predictive validity regarding program completion.

Table 15

Combined Model of Significant Predictors of Program Completion

						95% CI	
Variable	B	SE	Wald	*p*	Exp(B)	LL	HL
Constant	-7.84	1.70	21.32	.000	.000		
Science GPA	1.48	.30	24.92	.000	4.41	2.46	7.89
TEAS science	.06	.02	9.05	.003	1.06	1.02	1.09
Student type	-.70	.31	5.18	.023	.50	.27	.91

Summary

Preadmission academic achievement variables were entered into logistic regression analyses to determine their ability to predict program completion (N=246). The main model involved TEAS exam and ACT exam subscores; cumulative, prerequisite, and support course GPAs; and the number of support course hours taken

prior to admission. Of these variables, only TEAS science scores and science support course GPA were significant predictors of program completion.

High school GPA and LPN status were entered into separate models, and neither variable proved to be a significant predictor of program completion. The high school GPA model included 194 participants and excluded those with GEDs and all of the participants admitted in 2005. The LPN model included 291 participants; however, only 30 of these participants were admitted as LPNs, and only seven of them failed to complete the program.

ACT and TEAS composite scores were evaluated for exploratory purposes (N=246). TEAS composite scores were able to significantly predict program completion, but ACT composite scores were not significant predictors. Admission score sheet total percentages were also entered into a separate model to see if State University's use of a combination of variables was able to predict program completion. The logistic regression analysis revealed that the percentage was a significant predictor.

The significant predictors from each model were entered into a final model to determine overlapping effects. Total score sheet percentage, the score sheet used, and the TEAS composite scores were no longer significant predictors; however, student type, TEAS science scores, and science GPA were still predictive of program completion.

Overall, effect sizes for models able to significantly predict program completion were small. This was reinforced by the lack of the ability of the models to significantly improve the percentage of cases correctly classified (predicted) as

failures or successes. The main model and the combined model of significant predictors were able to predict 33% of the failures correctly while maintaining a 91% prediction rate for success. These two models also exhibited the largest effect sizes.

Research Question Two

The second research question asked: What preadmission academic achievement variables are most predictive of NCLEX-RN success? The null hypothesis stated that the independent variables are not predictive of NCLEX-RN success. Only those participants that completed the program were eligible to take the NCLEX-RN.

Results

The variables and various models used to predict program completion were also conducted to predict NCLEX-RN success. The sample size for research question two was 196 participants because only those who completed the program within the expected two-year program of study were included. Students who do not complete the program are ineligible to sit for the exam. Cases with missing data were eliminated from the individual analyses.

The main regression model was a significant fit to the data [R^2=.239, χ^2(3, N=173)=24.91, p<.05]. The model improved the classification of failures to 24% with a 99% classification rate for successes. The overall percentage was increased from 86% to 88%. The Box Tidwell Transformation Test indicated that TEAS science scores and health GPA failed the linearity assumption, decreasing the power related to these variables. This is of less concern because both variables were found to be significant predictors of NCLEX-RN success. It is important to note that evaluation

of residuals and influential diagnostics revealed conflicting data. Two cases were considered outliers with standardized residuals greater than 3.28, and the DfBeta values for these cases were greater than expected (4.05 and 3.46). Despite these outliers, the Cook's distances for all cases were within expected limits. The leverage value for one of the cases was larger than expected but was associated with a different case than the one listed above.

The final step of the analysis included TEAS reading and science scores and health-related support course GPA. The data for the final step can be found in Table 16. All three variables in the final step were significant predictors of NCLEX-RN success. For every unit increase in TEAS reading or science scores, the participants' chances for success increased by factors of 1.12 and 1.08, respectively. With every unit increase in health-related support course GPA, the participants' chances for success were 3.25 times higher.

Table 16

Main Model (Final Step) Predicting NCLEX-RN Success

						95% CI	
Variable	B	SE	Wald	*p*	Exp(B)	LL	HL
Constant	-18.17	5.12	12.60	.000	.000		
TEAS reading	.11	.05	5.47	.019	1.12	1.02	1.23
TEAS science	.08	.03	7.80	.005	1.08	1.02	1.14
Health GPA	1.18	.51	5.35	.021	3.25	1.20	8.82

High school GPA for the admission classes of 2006 and 2007 were entered into a logistic regression model. Only those who completed the program were included, and those with GEDs were excluded. Total sample size was 125 participants.

Goodness-of-fit data was not consistent. The Hosmer and Lemeshow Test indicated that the model was a good fit to the data; however, the chi-square statistic suggested that the prediction did not significantly improve [$\chi^2(1, N=125)=1.30$, $p=.254$], consistent with the small effect size [$R^2=.019$]. One outlier was identified, but Cook's distances, leverage values, and DfBeta values were all within expected limits.

The specific regression data can be found in Table 17. High school GPA was not a significant predictor of NCLEX-RN success and did not improve the ability to predict success or failure. In fact, the regression coefficient for this variable was negative, indicating than an increase in high school GPA may even be associated with a decreased chance for success.

Table 17

High School GPA Model Predicting NCLEX-RN Success

						95% CI	
Variable	B	SE	Wald	*p*	Exp(B)	LL	HL
Constant	4.10	2.09	3.84	.050	60.40		
High school GPA	-.67	.661	1.21	.271	.51	.16	1.68

The model using LPN status to predict NCLEX-RN success included those who completed the program and for whom data was obtainable (N=195). The results of this analysis should be interpreted with caution, because a crosstabs analysis indicated that sampling may not be adequate. The cell representing LPNs that failed the exam consisted of only one participant. Twenty-two of the 23 LPNs that completed the program passed the NCLEX-RN. Also, the chi-square statistic indicated that the model is not a significant fit to the data [R^2=.020, χ^2(1, N=195)=2.11, p=.146], and a Hosmer and Lemeshow Test was unable to be completed because a single dichotomous predictor was used in the analysis. With the above in mind, LPN status was not a significant predictor of NCLEX-RN success, and specific results can be found in Table 18.

Table 18

LPN Model Predicting NCLEX-RN Success

						95% CI	
Variable	B	SE	Wald	*p*	Exp(B)	LL	HL
Constant	1.82	.22	68.34	.000	6.17		
Science GPA	1.27	1.05	1.48	.224	.357	.46	27.71

ACT and TEAS composite scores were analyzed for the ability to predict NCLEX-RN success. Goodness-of-fit statistics indicated that the model was a good fit to the data [R^2=.117, χ^2(2, N=173)=10.99, p<.05]; however, the regression model was unable to increase the overall percentage of correctly predicted cases. Two cases were identified as potentially influential using standardized residuals, leverage values,

or DfBeta values. All of the Cook's distances were within expected limits. Results can be found in Table 19. Consistent with the prediction of program completion, TEAS composite scores were significant predictors of NCLEX-RN success.

Table 19

Composite Score Model Predicting NCLEX-RN Success

						95% CI	
Variable	B	SE	Wald	*p*	Exp(B)	LL	HL
Constant	-8.65	3.21	7.27	.007	.000		
TEAS composite	.11	.04	6.76	.009	1.12	1.03	1.22
ACT composite	.08	.09	.76	.384	1.09	.90	1.30

Total score sheet percentages were evaluated among those who completed the program (N=194). The logistic regression model was employed to predict NCLEX-RN success. The results of the analysis should be interpreted with the knowledge that the model did not significantly fit with the data and exhibited a small effect size [R^2=.032, χ^2(1, N=194)=3.32, *p*=.068]. This was consistent with the Hosmer and Lemeshow Test which suggested that a significant difference existed between actual and predicted values. It is also important to note that a Box Tidwell Transformation Test revealed a violation in the linearity assumption and a potential decrease in power. The results can be found in Table 20. With the above in mind, admission percentage scores were not significant predictors of NCLEX-RN success.

Table 20

Admission Score Model Predicting NCLEX-RN Success

						95% CI	
Variable	B	SE	Wald	*p*	Exp(B)	LL	HL
Constant	-5.65	4.35	1.68	.195	.004		
Total percentage	.08	.05	2.97	.085	1.08	.99	1.18

The significant predictors from the various NCLEX-RN prediction models were entered in a backward stepwise logistic regression analysis to identify overlap in the aforementioned results. Significant predictors included were student type; TEAS reading, science, and composite scores; and health-related support course GPA.

Goodness-of-fit statistics were inconsistent. The likelihood ratio chi-square indicated a good fit [$\chi^2(4, N=180)=33.86, p<.05$]; however, the Hosmer and Lemeshow Test indicated a poor fit. The effect size ($R^2=.310$) and classification results were similar to that of the main model. Failures were predicted correctly 24% of the time, and success was predicted at a rate of 99%. The combined model increased the overall percentage of correctly classified cases from 86% to 88%.

The TEAS composite score was removed after the first step, and the final step analysis can be found in Table 21. Student type, TEAS reading and science scores, and health-related support course GPA remained significant predictors of NCLEX-RN success.

Table 21

Combined Model of Significant Predictors of NCLEX-RN Success

						95% CI	
Variable	B	SE	Wald	*p*	Exp(B)	LL	HL
Constant	-16.86	4.99	11.40	.001	.000		
Student type	-1.59	.52	9.27	.002	.20	.07	.57
TEAS reading	.11	.05	4.86	.027	1.11	1.01	1.23
TEAS science	.09	.03	7.86	.005	1.09	1.03	1.16
Health GPA	1.06	.51	4.32	.038	2.90	1.06	7.90

Summary

Logistic regression analyses were employed to predict NCLEX-RN success among those who completed the associate degree program within the expected two-year program of study. The main model yielded three significant predictors: (a) TEAS reading scores, (b) TEAS science scores, and (c) health-related support course GPA. TEAS math and English scores, ACT subscores, cumulative GPA, prerequisite GPA, science support course GPA, and general education support course GPA failed to significantly predict NCLEX-RN success.

LPN status and high school GPA were entered separately into logistic regression models, and neither variable proved to be a mathematically significant predictor of NCLEX-RN success. It is important to note, though, that 22 of 23 LPNs completing the program passed the NCLEX-RN, and the size of the cell representing LPNs that failed (n=1) may have been inadequate.

Other variables were explored for their ability to predict NCLEX-RN success, including ACT and TEAS composite scores and total admission score sheet percentages. Of these variables, only the TEAS composite score were identified as significant predictors.

The significant predictors from each NCLEX-RN success model were entered into a combined model to discover overlapping effects among them. The TEAS composite score was removed in the stepwise analysis, but student type, TEAS reading and science scores, and health-related support course GPA remained significant predictors.

Similar to the results of the program completion prediction, the main model and the combined model of significant predictors yielded the largest effects. In both models, failures were predicted correctly at a rate of 24%, and success was predicted correctly 99 % of the time.

Summary of Chapter Four

Chapter Four presented the demographic characteristics of the sample, the descriptive data of the predictors, the correlations among predictors, and the logistic regression results of the study. Both research questions were answered, and the null hypotheses were rejected; however, few of the independent variables proved to be significant predictors of program completion and/or NCLEX-RN success.

Student type, TEAS science scores, and science support course GPA, were significant predictors of program completion, but none of the regression models could significantly improve the overall ability to correctly classify (predict) cases as failures or successes. The score sheet used, TEAS composite scores, and total score sheet

percentages were significant predictors until entered into a regression model with the other significant predictors. Using the significant predictors did increase the ability to predict failure to complete the program to 33% while maintaining a 91% successful completion classification rate. ACT subscores; TEAS reading, English, and math scores; cumulative, prerequisite, and high school GPAs; general education and health-related support course GPAs; LPN status; the number of support course credit hours taken prior to admission; and ACT composite scores were not significant predictors of program completion.

Student type and TEAS science scores were also significant predictors of NCLEX-RN success, but science support course GPA was not a significant predictor of NCLEX-RN success. TEAS reading scores and health-related support course GPA were significant predictors of NCLEX-RN but were not predictors of program completion. TEAS composite scores were identified as significant predictors until combined with other significant variables. The final model was able to increase the percentage of cases predicted correctly for NCLEX-RN failures (24%) without a drop in the successful prediction of success (99%).

Chapter Five:

Summary, Conclusions, and Recommendations

Summary of the Study

The purpose of this study was to determine the ability of various preadmission achievement-related variables to measure program completion and NCLEX-RN results in the associate degree nursing program at State University. State University is a public, four-year institution with an enrollment of approximately 4,500 students. The School of Nursing receives approximately 500 applications each year and accepts approximately 96 of those applicants. The population of nursing students is similar to that of the university with the exceptions of gender, ACT scores, and GPAs. Nursing students are generally female with higher ACT scores and cumulative GPAs.

The sample for this study consisted of 294 nursing students admitted in 2005, 2006, and 2007. Because only those who complete the program are able to take the NCLEX-RN, the sample for the prediction of NCLEX-RN success was 196 participants. A logistic regression analysis was completed to measure the ability of ACT and TEAS subscores; cumulative, prerequisite, support course, and high school GPAs; LPN status; and the number of support course credit hours taken prior to admission to predict program completion (research question one) and NCLEX-RN success (research question two).

TEAS science scores were significant predictors for both program completion and NCLEX-RN results [Exp(B)=1.06 and Exp(B)=1.09, respectively, p=<.05]. For every unit increase in TEAS science scores, the student's chances for completing the program and passing the NCLEX-RN also increased by approximately one unit. For

example, if the score is raised from a 60 to a 65, the student would be five times more likely to complete the program. The literature review did not yield an empirical comparison for these results; however, research did reveal conflicting evidence regarding the predictive validity of nursing-specific exams, such as the NET exam (Gallagher et al., 2001; Sayles et al., 2003; Tipton et al., 2008). TEAS reading scores were able to significantly predict NCLEX-RN results [Exp(B)=1.11, $p<.05$], but they were not significant predictors of program completion. There is limited research evaluating the ability of reading subscores to predict student success. TEAS math and English scores failed to significantly predict program completion and NCLEX-RN success.

ACT scores (math, English, reading, and science) also failed to predict both outcome variables. The literature presented conflicting results regarding the predictive validity of ACT and SAT math and English scores. For example, Truell and Woosley (2008) found that ACT math scores and SAT math scores were predictive of program completion; however, Downey et al. (2002) and Sayles et al. (2003) found that they were not predictive of board exam success. Three different studies (Beeman & Waterhouse, 2001; Downey et al., 2002; Truell & Woosley, 2008) found SAT verbal scores to lack predictive validity, compared to one study (Platt et al., 2001) that established significant predictive ability. Two studies (Sayles et al., 2003; Truell & Woosley, 2008) rejected the predictive value of ACT English scores, and no studies included in the review of literature assigned significance to the predictive value of ACT English scores (see Appendix D).

Although Platt et al. (2001) supported the predictive validity of high school GPA, in this study GPAs (college cumulative, high school cumulative, and prerequisite) failed to significantly predict either outcome variable. However, the results of this study are consistent with studies by Alzahrani et al. (2005) and Gallagher et al. (2001) in which college GPA failed to predict program completion. Gallagher et al. (2001) also rejected the ability of college GPA to predict board exam success. The findings of this study, however, contradict the findings of Bauchmoyer et al. (2004) and Downey et al. (2002) that predicted board exam success using college GPA.

Of the support course categories (general education, health-related, and science), only science GPA was predictive of program completion [Exp(B)=4.41, p=<.05]. In fact, when the science GPA was increased by one unit, students were over four times more likely to complete the program. Health-related GPA was predictive of NCLEX-RN success [Exp(B)=2.90, p<.05], indicating that students were almost three times more likely to pass the NCLEX-RN with every unit increase in health-related GPA. Even though predictive studies regarding health-related courses were not reported in this study, science GPA was evaluated as a predictor in several studies with inconsistent results. Consistent with this study, Alzahrani et al. (2005) and Gallagher et al. (2001) found that science GPA was not predictive of NCLEX-RN and board exam success; however, these same studies also rejected the ability of that variable to predict program completion. Bauchmoyer et al. (2004) and Beeson and Keeling (2001) supported the ability of science GPA to predict NCLEX-RN success, contrary to the results of this study. Often students take support courses as they wait to qualify

or rank high enough for admission. The number of credit hours taken prior to admission was not a significant predictor of student success in this research.

The predictive value of demographic variables was also evaluated. Of those variables, student type was the only significant predictor. Nontraditional students were more likely to complete the program and pass the NCLEX-RN than traditional students [Exp(B)=.50 and Exp(B)=.20, respectively, $p<.05$].

The combined regression model for the prediction of program completion, consisting of all significant predictors, was able to correctly predict 33% of the failures and 91% of those that successfully completed the program. The combined regression model for the prediction of NCLEX-RN success was able to correctly predict 24% of the failures and 99% of those that passed the NCLEX-RN exam among those who completed the program within the expected program of study.

Conclusion

The null hypotheses for both research questions one and two were rejected regarding certain preadmission academic achievement variables. TEAS science scores were predictive of both program completion and NCLEX-RN success. TEAS reading scores were predictive of NCLEX-RN success but not program completion. Science GPA was predictive of program completion, and health-related GPA was predictive of NCLEX-RN success. Demographic factors were also evaluated for the ability to predict success, and of those variables, student type (traditional versus nontraditional) was predictive of both outcome variables. Nontraditional students were most likely to succeed. Academic achievement variables that were not predictive of either outcome variable included all ACT subscores, TEAS math and

English scores, cumulative GPA, prerequisite GPA, high school GPA, LPN licensure, general education support course GPA, and the number of support course hours completed prior to admission.

It was interesting to note that the achievement variables predictive of success were those most closely related to the discipline of nursing and the sciences. Reading TEAS scores were an exception, but their relationship to NCLEX-RN success may have been expected because the NCLEX-RN exam requires critical reading of up to 265 questions in six hours.

ACT scores were related to high school GPA, which is consistent with the purported purpose and construct of the ACT exams. However, neither ACT scores nor high school GPA were predictive of program completion or NCLEX-RN success. It is important to note, though, that concordant scores (comparable scores for different but similar exams) were used for those that had taken SAT or COMPASS exams instead of the ACT, and concordant scores are not intended for use for admission ranking.

Although math test scores were not predictive of program completion or NCLEX-RN success, a crosstabs analysis revealed that some of the participants with low math test scores were able to succeed in achieving licensure. This may reflect a limited emphasis on math skills in the nursing program studied and the NCLEX-RN exam, the inability of the ACT and TEAS to measure math abilities that correlate with nursing practice requirements, or the ability of nursing professionals to practice with lower level math skills, even though nurses are required to calculate medication dosages on a daily basis.

LPN status was not predictive of program completion, and transcripts for all but one of the LPNs that did not finish the program within the expected time frame exhibited evidence of previous academic difficulty. It is often assumed that LPNs, because of their educational and practice background, would have significantly higher chances to succeed in a program for registered nurses. That premise is not consistent with the results of this study. According to the regression analyses, LPN licensure was not predictive of program completion. The analysis also indicated that LPN licensure was not a significant predictor of NCLEX-RN success; however, 22 of the 23 LPNs that completed the program passed the NCLEX-RN exam, which may be clinically significant. The discrepancy may be attributed to the violation of the sampling adequacy assumption.

Overall, the various academic achievement variables explained a small amount of the variance in student success. The results of this study suggest that using more achievement-related variables to make admission decisions is not necessarily a better approach to predict success for the students and the program. Caution should be exercised when using traditional measures without empirical evidence that those measures are directly related to the priority outcome measures. Following are recommendations for policy development and future research.

Recommendations for Practice

State University School of Nursing Admission Policies

The following items are presented as recommendations for State University's School of Nursing. The recommendations are presented according to general

observations, demographic variables, test scores, and other academic achievement variables.

General observations. The School of Nursing should expand this study and continue to assess, amend, and evaluate admission policies, specifically regarding the relationship between those policies and student success. The School of Nursing aims to be objective in applicant selection and the use of a score sheet; however, it should be remembered that fairness is reinforced when the variables used in that selection are also empirically valid. The score sheet had been used for over 20 years without formal evaluation, and this study revealed that many of the variables used on the score sheet were not significant predictors of success.

Score sheet percentages were not significant predictors when controlling for TEAS science scores, science GPA, and student type. The School of Nursing should use the results of this study to amend the existing policy and score sheet with a plan for continued evaluation of the prediction of student success.

The use of the School of Nursing score sheet and the student selection process should be simplified, easy to understand, and standardized. The score sheet appears to be objective and straightforward, but there are many different ways to complete the requirements and earn points. Currently, prospective students meet with a pre-nursing advisor who spends hours of group and one-on-one time with applicants to discuss the sheet and how to improve total scores. A more uniform and easily understood process may avoid confusion and save time and resources in advising.

During the evaluation of transcripts, it was noted that many students had academic histories that included multiple W's, D's, and F's in prerequisite or support

courses, yet the score sheet for the corresponding student revealed a 4.0 GPA for the prerequisite course grade category or support course category. This was possible because applicants were able to use the highest grades received in a class or class category. These effects may be minimized if applicants are required to average the grades received in a given class or category.

The variables in this study explained a small portion of the variance in program completion and NCLEX-RN success. The School of Nursing should explore other variables and methods related to student success, striving for empirically supported admission decisions.

Demographic variables. Only two percent of the sample for this study represented ethnic diversity. The School of Nursing should seek ways to improve access for ethnically diverse populations. Only one of the non-Caucasian participants completed the nursing program at State University; therefore, faculty and administrators should also explore ways to assist this population throughout the program. This would include exploration of factors that improve the probability of success and those that act as barriers.

Traditional students were at higher risk for failure in this study. The School of Nursing should further explore the reasons that nontraditional students were more likely to succeed than traditional students in both program completion and NCLEX-RN results. Additional support should be provided to help traditional students move toward success. Even though traditional students were at higher risk, high school graduate status was not a significant predictor of success. College freshmen were as likely to succeed statistically as other participants in the study. There is no need for

State University to limit the ability of high school graduates to enter the nursing program.

Test scores. State University's School of Nursing used COMPASS and SAT concordant scores to replace ACT scores. Concordant scores are not intended to be equivalent scores; therefore, if ACT scores were used for admission decisions, it would be inappropriate to use concordant scores in that manner. ACT scores were not significant predictors of student success in this study; however, it should be noted that some of the ACT scores were COMPASS or SAT concordant scores.

Test scores may be used as a minimum threshold for applicants, rather than as a means to rank applicants. The results of this study support more emphasis on the TEAS science (predictive of program completion and NCLEX-RN results) and reading scores (predictive of NCLEX-RN results). TEAS English and math scores were not significant predictors of success.

Based on the regression and crosstabs evaluations, it is recommended that the School of Nursing explore raising the minimum TEAS science score and assign greater weight to higher TEAS science scores. TEAS science scores were significant predictors of both program completion [Exp(B)=1.06, $p<.05$] and NCLEX-RN success [Exp(B)=1.09, $p<.05$]. Everyone in this study with a TEAS science score greater than 90 completed the program successfully, and only two with a score greater than 80 failed to complete the program. The number of students that failed to complete the program increased noticeably at a score of 60 or below. Of those who completed the program, everyone with a score greater than 90 passed the NCLEX-RN, and everyone with a score less than 56 failed the exam.

TEAS reading scores were not significant predictors of program success; however, they did significantly predict NCLEX-RN success [Exp(B)=1.11, $p<.05$]. Everyone in this study with a reading score below 70 failed to complete the program, and the chances of passing the NCLEX-RN appeared to increase considerably at a score of 90 or more. TEAS reading scores should be emphasized, and the School of Nursing may consider raising the minimum score as part of the admission selection process.

TEAS English scores were not significant predictors of both program completion or NCLEX-RN success. However, those with English scores below 60 had a lower rate of program completion, and all graduates with scores greater than 89 passed the NCLEX-RN. It is recommended that these subscores not be used to rank applicants, but if these scores are used to establish minimum requirements, the School of Nursing may consider raising the minimum scores.

ACT scores were related to high school GPA. Neither of these variables were significant predictors of student success. With this in mind, it is not empirically suggested that ACT scores or high school GPA be used for admission decisions at this particular school of nursing.

Other academic achievement variables. Science support course GPA was the strongest predictor of program completion [Exp(B)=4.41, $p<.05$]. Yet, it is difficult at the current time for students to get into microbiology and other science support courses prior to admission. Faculty and administrators should collaborate with the science faculty and administrators to explore ways to make science courses available to students prior to admission or in the first semester of their studies.

If possible, science grades (anatomy, physiology, and microbiology) and health-related course grades (psychology and nutrition) should be given greater emphasis when making admission decisions. The School of Nursing may want to require a higher minimum science and health-related GPA. A decrease in program completion rates was noted with science GPAs of less than 3.0, and NCLEX-RN success rates consistently increased with every unit increase in health-related GPA. The NCLEX-RN success rate doubled when health-related GPAs increased from 2.5 to 3.0.

General education support course GPA was not a significant predictor of student success; furthermore, an increase in the total number of support course credit hours taken prior to admission is associated with lower academic performance in other areas of the admission score sheet. For this reason, the School of Nursing may want to consider eliminating scoring related to general education courses.

Cumulative GPA and prerequisite GPA were not significant predictors of success. In fact, cumulative GPA had a negative relationship with other academic achievement variables, specifically TEAS science scores. It is recommended that overall cumulative GPA and prerequisite GPA be removed as determinants for admission as currently used. Or, if the School of Nursing chooses to use cumulative and prerequisite GPAs, it is recommended that they be used to establish minimum requirements rather than to rank applicants.

LPN licensure was not a significant predictor of program completion. It is often assumed that LPNs will be successful because their background and previous academic preparation are closely related to that of registered nursing programs. The record of each of the LPNs who did not successfully complete the program was

evaluated, and for all but one of those LPNs, there was evidence of previous academic difficulty. The LPN sample size was small but adequate for the prediction of program completion. Only one LPN who completed the program failed the NCLEX-RN exam. Twenty-two of 23 of the LPNs completing the program passed the exam, which would seem to indicate that if LPNs are selected for admission and are able to complete the program are selected for admission, they will also be likely to pass the NCLEX-RN exam. The recommendation here is that the School of Nursing continue to acknowledge the accomplishments of the LPN; however, the LPN should be required to meet the same requirements as other applicants, which is not the case at present.

Higher Education and Nursing Education Admission Policies

Based on this study and the current state of the literature, the following are presented as considerations for higher education institutions and nursing program admission policies.

The School of Nursing at State University uses a score sheet to rank applicants for admission. The process for completing the score sheet was not as straightforward as was intended. In fact, group and one-on-one sessions between prospective students and an advisor who has been trained in the nursing admission procedures are conducted in an attempt to limit confusion and enable more applicants to be better prepared and to maximize scores. Admission procedures should be succinct and easily administered and should not be easily confused, manipulated, or compromised in any fashion (Admissions today, 2005; Fauber, 2006; Holley, 2006; Muse & Teal, 1993; Seago & Spetz, 2003).

In this study, State University's School of Nursing used a tool that has not been empirically supported or even evaluated for admission decisions. Many of the variables used in the preadmission score sheet did not significantly predict program completion or NCLEX-RN success, the main indicators of student success. Universities and nursing programs should engage in continuous improvement appraisals of the effectiveness of admission policies and the ability of those policies to predict success (Muse & Teal, 1993). Other quantitative predictors (writing samples, interviews, and other academic indicators) and qualitative predictors (motivation, personal attributes, and perseverance) may be able to add to the amount of variance of student success that can be explained.

This study resulted in small effect sizes, explaining a very small amount of the variance in student success and failure. This is consistent with Kretchman's (2006) recommendation to avoid basing admission decisions on any one single factor. This study evaluated over 16 academic achievement variables, which may also suggest that academic achievement can provide only a small portion of the total variance in student success.

In this study, most test scores failed to be powerful predictors of student success. Administrators should use caution when using test scores as a determinant in admission decisions. Fauber (2006) suggested that test scores be used as a threshold, not a determinant for admission. Minimum scores should be empirically established. When used as a determinant, test scores should be considered within the context of background and other relevant factors (Admissions today, 2005; Hoover, 2008, "Take tests down;" Lavergne, 2007).

Cumulative, prerequisite, and high school GPAs were not significant predictors of student success in this study; however, science support course GPA was a significant predictor of program completion [Exp(B)=4.41, $p<.05$], and health-related GPA was a significant predictor of NCLEX-RN success [Exp(B)=2.90, $p=<.05$]. This may suggest that GPA requirements should focus more on those courses most related to the program of study and professional requirements. Holley (2006) suggested increasing GPA requirements to improve the chances for success but incorporating methods to make sure that the GPA consisted of coursework most related to the academic program.

Recommendations for Future Research

This study aimed to determine the ability of preadmission academic achievement variables to predict program completion and NCLEX-RN success in an associate degree nursing program. Range restriction, external variables, and limited generalizability were cited as limitations of the study. Given the widespread use of preadmission academic achievement variables in admission policies and decisions in higher education institutions and nursing programs, this study is still useful. The current state of the literature presents inconsistencies in identifying predictors of success. This issue is of great importance and requires the pursuit of effective admission policies, adequate tracking, and continued research (Muse & Teal, 1993). Inconsistencies in the literature should stimulate further research rather than discourage continued study (Pelech et al., 1999). The following are recommendations for future research:

- Replicate the study using participants from multiple nursing programs to address sampling bias and generalizability.
- Replicate the study using the independent variables used in this study to validate the results.
- Replicate the study using additional predictors in an attempt to increase the amount of variance explained.
- Explore the effects of post admission intervening variables (Muse & Teal, 1993; Reisig & DeJong, 2005).
- Explore if non-traditional students are more successful than traditional students in other nursing programs, and, if so, explore why this is so.
- Investigate further the relationship between LPN licensure and student success in registered nursing programs.
- Conduct a thorough investigation of the reasons for withdrawal or failure, including circumstances other than academic difficulty, which could influence academic performance (Vandenhouten, 2008). Some of these variables may include financial hardship, personal problems, impaired health, program-related stressors, or poor fit with the nursing program or profession (Uyehara et al., 2007).
- Explore the prediction of success in practice and in the nursing profession in addition to educational success.
- Regarding NCLEX-RN success and failures, explore unusual conditions or circumstances surrounding testing (Aucoin & Treas, 2005). For example,

students who fail the NCLEX-RN may report recent traumatic life events, extreme test anxiety, or lack of preparation.

- Evaluate patterns of success and failure among those who did not complete the program upon the first attempt but were readmitted to the program.
- Use the recommendations from this study to develop a new admission score sheet.
- Evaluate the ability of a revised score sheet to predict student success.

There are various other independent variables that may be explored for the ability to predict success in higher education, nursing education, and State University's nursing program. Other academic achievement related variables may include writing samples (Ahmadi & Raiszadeh, 1997; Downey et al., 2002; Holley, 2006); whether pre-nursing courses were taken in high school, community colleges, or universities(Newton, Smith, & Moore, 2007); the number of development courses taken (Marti, 2001); and how many times courses were repeated (Newton et al., 2007). In this study, the number of support course credit hours taken was not a significant predictor of student success; however, it did have a negative relationship with other academic achievement variables. It may be beneficial to explore the effects, if any, that the student's academic history has on success, specifically regarding the success of those who enter the program with all non-nursing courses completed (Newton et al., 2007), the number of times the applicant had applied to the program, and the number of W's, D's, or F's recorded in the student's academic history.

Personal attributes or characteristics may also be explored regarding the prediction of student success. Variables that may be explored include character and moral reasoning (Bore et al., 2005; Elliott & Epstein, 2005; Mountford et al., 2007), self-esteem (McLaughlin, 2008), interpersonal behaviors (Bore et al., 2005; Mountford et al., 2007), motivation (Elliott & Epstein, 2005; Mountford et al., 2007; Reisig & DeJong, 2005), and perseverance (Lavergne, 2007). Other skills or talents that should be explored might include communication abilities (Burdman, 2007; Elliott & Epstein, 2005; Mountford et al., 2007), emotional intelligence, and leadership behaviors (Elliott & Epstein, 2005; Hoover, 2008, "At admissions conference;" Sternberg, 2007).

Life experiences (Mountford et al., 2007) and socioeconomic status (Burdman, 2004) may also affect student success. A student's work experience and health care experience should be investigated as well (Burdman, 2004; Seago & Spetz, 2003). The school of nursing featured in this study awards bonus points to LPNs, but no consideration is given to nursing assistants, respiratory therapists, or other health care professionals. Given the rigor of nursing programs, the number of hours that the student works per week in comparison to the number of credit hours taken may also prove to be a factor affecting the student's success (Burdman, 2004; Seago & Spetz, 2003). In 2009, State University's School of Nursing began awarding points to those who have previously been awarded degrees in other fields. It would be interesting to know if those with previous degrees have a higher probability of success.

The use of interviews has been one of much debate (Fauber, 2006). Interviews potentially introduce personal bias and human emotion into the admission process

(Fauber, 2006; Goho & Blackman, 2006; Holley, 2006), and conducting interviews can be time-consuming both in preparation and implementation (Goho & Blackman, 2006; Holley, 2006; Kretchman, 2006). The reliability and validity of the interview process and the predictive validity has also been called into question (Dockter, 2001; Goho & Blackman, 2006). Interviews do, however, present information that may not be obtained by examination of academic success related to the fit between the potential student and the program and may be used successfully as a final screening tool (Fauber, 2006). Mountford et al. (2007) found that interviews were predictive of comprehensive exam success and time to degree in educational leadership programs. Structured, empirically supported interviews conducted by trained personnel do have higher potential for success (Elliott & Epstein, 2005; Fauber, 2006; Goho & Blackman, 2006), and the predictive validity of interviews should continue to be vigorously explored (Ahmadi & Raiszadeh, 1997; Downey et al., 2002; Fauber, 2006; Holley, 2006).

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Appendix A

Admission Score Sheet with TEAS Exam Scores

DEPARTMENT OF NURSING
SCORE SHEET FOR SELECTION OF CANDIDATES

NAME_____ SOC. SEC._____
YEAR HS GRADUATION_____ GED_____

1. **TEAS COMP PERCENTILE** / **TEAS SCORE** / **POINT SCORE**

50-59……..1 point	_____Reading	_____
60-69……..2 points	_____Math	_____
70-79……..3 points	_____Science	_____
80+…….4 points	_____English	_____

2. **CUMULATIVE GPA** (College GPA if 10 credits or more completed. GED=2 points if less than 10 college credits. Minimum 2.0 required)
2.0-2.49…..2 points GPA _____
2.5-2.99…..3 points
3.0-3.49…..4 points
3.5-4.0……5 points

3. **BIOLOGY, CHEMISTRY, ALGEBRA (Pre-requisites)**
D……1 point Biology_____
C……2 points Chemistry_____
B……3 points Algebra_____
A……4 points

4. **SUPPORT COURSES**

COURSE	**CREDIT**	**GRADE**	**QUAL.PTS.**	**VALUE OF CREDITS**
ENGL 1104	_____	_____	_____	
ENGL 1108	_____	_____	_____	26-29……6 points
PSYC 1101	_____	_____	_____	21-25……5 points
SOCY 1110	_____	_____	_____	16-20……4 points
POLI 1103	_____	_____	_____	11-15……3 points
FOSM 2220	_____	_____	_____	6-10……..2 points
BIOL 1170	_____	_____	_____	1-5……1 point
BIOL 2205	_____	_____	_____	
INTR 1100	_____	_____	_____	
TOTAL	_____		_____	Credits Score_____

GPA _____ (GPA = Quality points/credits) (See scale #2)GPA Score _____

5. **LPN** No_____ Yes_____ (5 point bonus) LPN BONUS _____

TOTAL_____
PERCENTAGE SCORE **% SCORE_____**
Divide by **33** if High School Only
Divide by **38** if College Credits

ACT/SAT or COMPASS Scores
English (min 28 or 450) _____
Math (min 19 or 460) _____
***English 0097_____ *Math 0095_____**

No Chemistry_____
No Biology_____
No algebra_____
TEAS<50_____
No 2.0 GPA_____
Below ACT min_____

Appendix B
Admission Score Sheet with ACT Exam Scores

DEPARTMENT OF NURSING
SCORE SHEET FOR SELECTION OF CANDIDATES

NAME_____ SOC. SEC._____
YEAR HS GRADUATION_____ GED_____

1. **ACT** — **ACT SCORE** — **POINT SCORE**

13-16……..1 point (Min. 18 or 410)	_____English*	_____
17-20……..2 points (Min. 19 or 430)	_____Math**	_____
21-24……..3 points	_____Science	_____
25+…….4 points	_____Composite	_____

*English 0097_____ **Math 0095_____

2. **CUMULATIVE GPA** (College GPA if 10 credits or more completed. GED=2 points if less than 10 college credits. Minimum 2.0 required)
2.0-2.49…..2 points — GPA _____
2.5-2.99…..3 points
3.0-3.49…..4 points
3.5-4.0……5 points

3. **BIOLOGY, CHEMISTRY, ALGEBRA (Pre-requisites)**
A……4 points — Biology_____
B……3 points — Chemistry_____
C……2 points — Algebra_____
D……1 point

4. **SUPPORT COURSES**

COURSE	**CREDIT**	**GRADE**	**QUAL.PTS.**	**VALUE OF CREDITS**
ENGL 1104	_____	_____	_____	
ENGL 1108	_____	_____	_____	26-29……6 points
PSYC 1101	_____	_____	_____	21-25……5 points
SOCY 1110	_____	_____	_____	16-20……4 points
POLI 1103	_____	_____	_____	11-15……3 points
FOSM 2220	_____	_____	_____	6-10……..2 points
BIOL 1170	_____	_____	_____	1-5……1 point
BIOL 2205	_____	_____	_____	
INTR 1100	_____	_____	_____	
TOTAL	_____		_____	Credits Score_____

GPA _____ (GPA = Quality points/credits) (See scale #2) GPA Score _____

5. **LPN** No_____ Yes_____ (5 point bonus) LPN BONUS _____

TOTAL_____
% SCORE_____

PERCENTAGE SCORE
Divide by **33** if High School Only
Divide by **38** if College Credits

No Chemistry_____
No Biology_____
No Algebra_____
Below ACT min_____
No 2.0 GPA_____

Appendix C

Summary of the Literature Organized by Study

Prediction of program completion in higher education

Study	Sample/Setting	Purpose	Predictors	Analyses	Findings
Alzahrani, Thomson, & Bauman (2005)	235 students Old Dominion University Dental Hygiene Program	Measure utility of predictors used to select students most likely to graduate and pass the NBDHE	GPA, science GPA, grades in prerequisite courses, number of attempts to pass courses, admission criteria points	Logistic and linear regression	The final grade in oral pathology was the only significant predictor of program completion. Admission criteria points were not predictive of program completion.
Truell & Woosley (2008)	284 students College of Business in a large public Midwestern university	Determine if the college of business admission criteria and other variables predicted student graduation	Math and verbal aptitude as measured by ACT or SAT scores	Logistic regression	Math scores were weak but significant predictors of program completion. Verbal scores were not significant predictors of program completion.

Prediction of board exam success in higher education

Study	Sample/Setting	Purpose	Predictors	Analyses	Findings
Alzahrani, Thomson, & Bauman (2005)	235 students Old Dominion University Dental Hygiene Program	Measure utility of predictors used to select students most likely to graduate and pass the NBDHE	GPA, science GPA, grades in prerequisite courses, number of attempts to pass courses, admission criteria points	Logistic and linear regression	The combination of preadmission variables (admission criteria points rating) significantly predicted NBDHE success. No single predictor was significant.

Bauchmoyer, Carr, Clutter, & Hoberly (2004)	132 graduates Ohio State University dental hygiene program	Examine the relationship between preadmission requirements, basic college science requirements, site of academic preparation, cumulative dental hygiene GPA, and NBDHE score	Entrance GPA Chemistry & Biology GPA Prerequisite course grades including: math, English, psychology, nutrition, anatomy, physiology, and microbiology	Pearson correlation Regression analysis ANOVA	Entrance and Science GPA were significant predictors of NBDHE results. English grades did not significantly predict NBDHE results. Math grades were weaker but significant predictors of NBDHE results. All other prerequisite courses significantly predicted NBDHE results.
Dockter (2001)	107 physical therapy students from 4 admission classes North Dakota	Determine relationship between preadmission factors and academic success and success on the national PT licensing exam	Previous degrees Core GPA Interviews Writing samples Clinical experiences Admission score (GPA, interview, writing)	Stepwise linear regression	GPA in the core courses was the only preadmission variable significantly related to success on the PT licensing exam. None of the preadmission variables were able to predict board exam success.
Downey, Collins, & Browning (2002)	134 dental hygiene students Georgia	Examine predictive reliability of incoming GPA, math/science GPA, and SAT scores	Preadmission GPA Math/science GPA SAT scores	Forward stepwise multiple regression	Incoming GPA was the only significant predictor of dental hygiene national board exam success.

Prediction of other measures of success in higher education

Study	Sample/Setting	Purpose	Predictors	Analyses	Findings
Bauchmoyer, Carr, Clutter, & Hoberly (2004)	132 graduates Ohio State University dental hygiene program	Examine the relationship between preadmission requirements, basic college science requirements, site of academic preparation, cumulative dental hygiene GPA, and NBDHE score	Entrance GPA Chemistry & Biology GPA Prerequisite course grades including: math, English, psychology, nutrition, anatomy, physiology, and microbiology	Pearson correlation Regression analysis ANOVA	Entrance GPA and Science GPA (grades from 2 chemistry courses and 1 biology course) were significant predictors of cumulative graduation GPA. English grades did not significantly predict cumulative graduation GPA. Math grades were weaker but significant predictors of cumulative graduation GPA. All other prerequisite courses significantly predicted cumulative graduation GPA.
Downey, Collins, & Browning (2002)	134 dental hygiene students Georgia	Examine predictive reliability of incoming GPA, math/science GPA, and SAT scores	Preadmission GPA Math/science GPA SAT scores	Forward stepwise multiple regression	Incoming GPA was the most significant predictor of final GPA. Final GPA was best predicted using both incoming GPA and total SAT scores.
Fish & Wilson (2007)	143 students MBA program Northeastern college	Investigate potentially relevant factors to predicting one-year MBA performance and based upon the results, potentially modify the graduate admissions process.	GMAT score Undergraduate GPA	Correlation Regression analysis	Undergraduate GPA and verbal GMAT scores were significant predictors of final graduate GPA. GMAT quantitative scores did not significantly predict final graduate GPA.

Gifford, Briceno-Perriott, Mianzo (2006)	3,000 college freshman Large public university	Examine locus of control and ACT scores and their role as predictors of academic success	ACT scores Locus of control	Pearson correlations Stepwise linear regression	ACT scores and locus of control were significant predictors of end of first year cumulative GPA. Both variables accounted for 7% of the variance.
Platt, Turocy, & McGlumphy (2001)	373 graduates from 6 different allied health programs	Investigate preadmission criteria and their ability to predict college GPA	High school GPA SAT scores	ANOVA Pearson correlation Stepwise forward regression	When the sample was considered as a whole, high school GPA and verbal SAT scores were predictive of college GPA, but SAT math scores were not significant predictors. There were no significant predictors in the health management systems program. High school GPA significantly predicted GPA in the athletic training program. Math SAT scores significantly predicted GPA in the perfusion technology and physician assistant programs. High school GPA and verbal SAT scores predicted GPA in the occupational therapy and physical therapy programs.

Reisig & DeJong (2005)	206 masters and 72 doctoral students in criminal justice	Provide assessment of predictive validity of GRE and previous GPA on academic performance	GRE scores Prior GPA	Bivariate correlations Orded logit regression	Students with slightly higher GRE/GPA were significantly more likely to perform better. Final GPA significantly correlated with prior GPA, GRE subscores, and GRE total scores. The correlations between low grades and GRE analytic and GRE total scores were significant but weak. The number of incompletes were not significantly correlated with GPA or GRE scores.
Siegert (2008)	25 studies among 22 unique executive programs each program ranged from 34-206 subjects	Determine the relation between common admission factors and performance in a sample of executive programs	Undergraduate GPA GMAT scores	Bivariate and multiple correlation	GMAT total scores had the highest predictive validity values as a single predictor of program grades. The highest predictive value was achieved when GMAT verbal and quantitative scores were combined with undergraduate GPA. Predictive validity varied among programs.
Utzman, Riddle, & Jewell (2007)	3,582 students from 20 physical therapy education programs	Determine whether admissions data could be used to estimate physical therapist students' risk for academic difficulty	Undergraduate GPA GRE scores	Logistic regression	Undergraduate GPA and GRE scores were significant predictors of academic difficulty. The regression models varied among programs.

Young (2008)	203 applicants Doctoral program in educational leadership Pacific coast state	To explore the viability of academic predictors for doctoral applicants rejected, admitted but not graduating, and those graduating	Undergraduate GPA GRE Scores	Descriptive discriminant analyses	Verbal GRE scores correlate significantly with the classification of students as applied but rejected, accepted but did not graduate, and accepted graduated.

Prediction of program completion in nursing education

Study	Sample/Setting	Purpose	Predictors	Analyses	Findings
Gallagher, Bomba, & Crane (2001)	121 associate degree nursing students	Determine if the NET is a better predictor of academic success than the RNEE	NET scores RNEE scores Admission scores based on GPA, science and math grades, and RNEE scores	t-tests logistic regression	Admission scores were not predictive of program completion. NET scores were not predictive of program completion.

Prediction of NCLEX-RN success in nursing education

Study	Sample/Setting	Purpose	Predictors	Analyses	Findings
Beeman & Waterhouse (2001)	538 graduates Baccalaureate nursing program	Determine significant predictors of success on the CAT NCLEX-RN and the extent to which success can be accurately predicted.	SAT scores Biology grades Physiology grades Pathophysiology grades	Pearson correlation Discriminant analysis	SAT math scores and biology, physiology, and pathophysiology grades were significantly related to NCLEX-RN success. SAT verbal scores were not significantly correlated with NCLEX-RN success. Overall 93% of students were correctly categorized by the discriminant analysis as those who would pass or fail the NCLEX-RN.
Beeson & Kissling (2001)	505 graduates Baccalaureate nursing program Southeastern US	Identify predictors of success for baccalaureate nursing graduates on the NCLEX-RN	Prenursing course grades including anatomy, physiology, microbiology, psychology, sociology, lifespan development, and developmental patterns of family	Logistic regression Two Sample t-test	Students who passed the NCLEX-RN had significantly fewer grades of C or below than students who failed. Physiology-based course GPA, biology GPA, and cognate course GPA were significantly different between those who passed and those who failed the NCLEX-RN.

Daley, Kirkpatrick, Frazier, Chung, & Moser (2003)	224 graduates Generic baccalaureate nursing program	Determine whether significant differences existed between students who successfully completed the NCLEX-RN and those who were not successful	Prerequisite GPA Grades from prerequisite courses including chemistry, anatomy, sociology, and zoology courses ACT scores	Independent t-tests Chi-square tests	In the cohort that took the Mosby Assess Test (N=121), ACT scores and prerequisite GPA were significantly different between those successful on NCLEX-RN and those unsuccessful. The human anatomy and pathophysiology grades were significantly higher for those that were successful on the NCLEX-RN. Chemistry, social science, and zoology grades were not significantly different between groups. In the cohort that took the HESI Exit Examination (N=103), there were no significant differences in prerequisite GPA, prerequisite grades, or ACT scores between groups.
Gallagher, Bomba, & Crane (2001)	121 associate degree nursing students	Determine if the NET is a better predictor of academic success than the RNEE	NET scores RNEE scores Admission scores based on GPA, science and math grades, and RNEE scores	t-tests logistic regression	Admission scores were not predictive of NCLEX-RN success. NET scores were not predictive of NCLEX-RN success.

Sayles, Shelton, & Powell (2003)	78 associate degree nursing graduates	Determine the relationship between NET scores and NCLEX-RN success	NET scores ACT scores	Pearson correlation t-tests	Composite NET scores were related to NCLEX-RN success according to correlational analysis. ACT composite and sub-scores were not significantly different between those who passed and those who did not pass the NCLEX-RN.
Schmidt (2000)	5698 nursing students from 135 different schools	Examine the degree to which DRT scores and Pre-Admissions Test scores could predict success or failure on the NCLEX-RN	Pre-Admissions Test scores	Hierarchical logistic regression	The Pre-Admissions Test scores were not predictive of NCLEX-RN success at the diploma, associate, or baccalaureate degree levels.
Seldomridge & DiBartolo (2004)	186 graduates Baccalaureate nursing program Rural, mid-Atlantic public institution	Determine variables that best predict NCLEX-RN success and failure	Preadmission GPA Prerequisite course grades including Anatomy and Physiology, Pathophysiology, Chemistry, and Statistics Number of C's in prerequisite courses	Logistic regression Two sample t-test Pearson correlations	It was more difficult to predict NCLEX-RN success than to predict NCLEX-RN failure. According to the Pearson correlations and t-test results, all of the preadmission academic achievement variables were significant factors in NCLEX-RN success. In the logistic regression model, pathophysiology was the only preadmission variable that significantly predicted NCLEX-RN success.

Tipton, et al. (2008)	385 associate degree nursing students Community college	Assess the role of academic performance and other variables on NCLEX-RN performance	NET scores	Independent samples t-test	NET math and reading scores were not significantly different based on whether or not a student passed the NCLEX-RN.

Prediction of other measures of success in nursing education

Study	Sample/Setting	Purpose	Predictors	Analyses	Findings
Gallagher, Bomba, & Crane (2001)	121 associate degree nursing students	Determine if the NET is a better predictor of academic success than the RNEE	NET scores RNEE scores Admission scores based on GPA, science and math grades, and RNEE scores	T-test Logistic regression	NET math scores were higher for the group not successful in the first nursing course. RNEE scores were higher for those who successfully completed the first nursing course. The RNEE reading comprehension subscore was a significant predictor of success in the first nursing course. Admission scores were not good predictors of success in the final nursing course.

Appendix D

Summary of Literature Organized by Predictor

Preadmission Academic Predictor	Studies Supporting Validity	Outcome Variable	Studies Rejecting Validity	Outcome Variable
College GPA	Bauchmoyer et al., 2004	Board exam success Cumulative GPA	Alzahrani et al., 2005	Program completion Board exam success
	Downey et al., 2002	Final GPA Board exam success	Gallagher et al., 2001	Program completion NCLEX success Final course grades
	Fish & Wilson, 2007	Cumulative GPA	Seldomridge & DiBartolo, 2004	NCLEX success
	Reisig & DeJong, 2005	Final GPA Program grades	Siegert, 2008	Program grades
	Utzman et al., 2007	Academic Difficulty	Young, 2008	Program completion
High school GPA	Platt et al., 2001	College GPA		
Science GPA	Bauchmoyer et al., 2004	Board exam success Cumulative GPA	Alzahrani et al., 2005	Program completion Board exam success
	Beeson & Kissling, 2001	NCLEX success	Gallagher et al., 2001	Program completion NCLEX success

Prerequisite grades	Bauchmoyer et al., 2004	Board exam success Cumulative GPA	Daley et al., 2003 Downey et al., 2002	NCLEX success Final GPA Board exam success
	Beeman & Waterhouse, 2001	NCLEX success	Gallagher et al., 2001	Program completion
	Beeson & Kissling, 2001	NCLEX success		NCLEX success Final course grades
	Dockter, 2001	First year GPA Board exam success	Seldomridge & DiBartolo, 2004	NCLEX success
Number of course attempts			Alzahrani et al., 2005	Program completion Board exam success
Number of C's in prerequisite courses	Beeson & Kissling, 2001	NCLEX success	Seldomridge & DiBartolo, 2004	NCLEX success
RNEE scores	Gallagher et al., 2001	1st course grades	Gallagher et al., 2001	Program completion NCLEX success Final course grades
NET scores	Sayles et al., 2003	NCLEX success	Gallagher et al., 2001	Program completion NCLEX success 1st course grades
			Tipton et al., 2008	NCLEX success
SAT Total scores	Downey et al., 2002	Final GPA	Downey et al., 2002	Board exam success
SAT Math scores	Beeman & Waterhouse, 2001	NCLEX success	Downey et al., 2002	Final GPA Board exam success
	Truell & Woosley, 2008	Program completion	Platt et al., 2001	College GPA

SAT Verbal scores	Platt et al., 2001	College GPA	Beeman & Waterhouse, 2001	NCLEX success
			Downey et al., 2002	Final GPA Board exam success
			Truell & Woosley, 2008	Program completion
ACT scores	Daley et al., 2003	NCLEX success		
	Gifford et al., 2006	First year GPA		
ACT Math scores	Truell & Woosley, 2008	Program completion	Sayles et al., 2003	NCLEX success
ACT English scores			Truell & Woosley, 2008	Program completion
			Sayles et al., 2003	NCLEX success
GMAT total scores	Siegert, 2008	Program grades		
GMAT Quantitative scores			Fish & Wilson, 2007	Cumulative GPA
GMAT Verbal scores	Fish & Wilson, 2007	Cumulative GPA		
GRE Total scores	Reisig & DeJong, 2005	Final GPA Program grades		
	Utzman et al., 2007	Academic difficulty		
GRE Quantitative scores	Reisig & DeJong, 2005	Final GPA Program grades	Young, 2008	Program completion

GRE Verbal scores	Reisig & DeJong, 2005	Program completion Final GPA
	Young, 2008	Program completion

Appendix E

Institutional Consent

Provost
State University
Address

Dean
School of Nursing
Address

Dear Provost and Dean,

I am completing a doctoral program of study in educational leadership studies at West Virginia University. I will defend my prospectus in February.

I am writing to seek written approval/consent from the nursing department to conduct a study entitled "Preadmission academic achievement variables as predictors of nursing program completion and NCLEX-RN success."

The study will evaluate the ability of the variables used to select nursing students for admission in their ability to predict success in students who graduated or will graduate in 2007, 2008, 2009. I believe the study will provide valuable information to the State University School of Nursing and higher education administrators.

The data is readily available in student files, electronic records, and School of Nursing data. Names will not be attached to data and will be coded to protect anonymity. Institutional Review Board for the Protection of Human Subjects approval will be sought at State University.

Your signature below indicates your consent to collect that data contingent upon the conditions set forth in this letter. Thank you for your time and consideration of my request. Contact information follows. Please let me know if you have any other questions or if you would like to know more about the study.

Sincerely,

Tanya L. Rogers, APRN, BC, MSN
Address
Phone
Email

_____
Provost

_____
Dean

Appendix F
Correlation Coefficients Among Demographic Variables

Variable	1	2	3	4	5	6	7
Score sheet used	-	.208*	-.064	.041	-.031	-.009	.117*
Year of high school graduation	.208*	-	-.060	.058	.266*	-.198*	.663*
Gender	-.064	-.060	-	.075	.093	.098	.020
Ethnicity	.041	.058	.075	-	.036	.027	.108
College freshman	-.031	.266*	.093	.036	-	-.056	.334*
GED	-.009	-.198*	.098	.027	-.056	-	-.169
Student type	.117*	.663*	.020	.108	.334*	-.169*	-

Note. Sample size for high school GPA was considerably smaller than that of the other variables (n=179).
*p<.05.

Appendix G
Correlation Coefficients Among Predictor Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TEAS scores															
Reading	-	.190*	.280*	.419*	.224*	.070	.236*	.203*	.002	-.033	.078	-.113	.093	.007	.139*
Math	.190*	-	.266*	.294*	.140*	.357*	.283*	.099	-.087	.015	.140	-.243*	-.076	-.005	.005
Science	.280*	.266*	-	.310*	.186*	.139*	.228*	.140*	-.148*	-.112	-.145*	-.141*	-.013	-.004	.093
English	.419*	.294*	.310*	-	.243*	.183*	.235*	.281*	-.132*	-.098	.131*	-.224*	-.025	-.004	.036
ACT scores															
Reading	.224*	.140*	.186*	.243*	-	.266*	.415*	.473*	-.005	-.098	.272*	-.216*	.111	.009	.141*
Math	.070	.357*	.139*	.183*	.266*	-	.532*	.387*	-.016	.183*	.432*	-.393*	.068	.046	.101
Science	.236*	.283*	.228*	.235*	.415*	.532*	-	.442*	-.013	.003	.357*	-.291*	.043	.066	.071
English	.203*	.099	.140*	.281*	.473*	.387*	.442*	-	-.016	-.019	.310*	-.290*	.152*	-.004	.071
GPA															
Cumulative	.002	-.087	-.148*	-.132*	-.005	-.016	-.103	-.016	-	.202*	.245*	-.220*	.398*	.309*	.222*
Prerequisite	-.033	.015	-.112	-.098	-.098	.183*	.003	-.019	.202*	-	.316*	-.119*	.054	-.033	.080
High school	.078	.143	-.145	.131	.272*	.432*	.357*	.310*	.245*	.316*	-	-.334*	.142*	.107	.060
Support course hours	-.113	-.243*	-.141*	-.224*	-.216*	-.393*	-.291*	-.290*	-.220*	-.119*	-.334	-	-.112	-.022	-.129
Support course GPA															
General education	.093	-.076	-.013	-.025	.111	.068	.043	.152	.398*	.054	.142*	-.112	-	.423*	.410*
Health-related	.007	-.005	-.004	-.004	.009	.046	.066	-.004	.309*	-.033	-.022	.107	.423*	-	.331*
Science	.139*	.005	.093	.036	.141*	.101	.071	.071	.222*	.080	-.129*	.060	.410*	.331*	-

Note. Sample size for high school GPA was considerably smaller than that of the other variables (n=179).
*p<.05.

CURRICULUM VITAE

Tanya Rogers graduated with an associate's degree in nursing from Fairmont State University in Fairmont, West Virginia, where she completed her baccalaureate degree in 1998. In 2004, she obtained a master's degree in nursing education from West Virginia University.

Tanya has 13 years of experience as a registered nurse and has worked in a variety of settings; including critical care, medical-surgical nursing, and cardiothoracic surgery recovery. She has eight years of experience as a faculty member, and she is currently an associate professor of nursing in a baccalaureate degree nursing program.