

**THE RELATIONSHIP BETWEEN SELECTED VARIABLES AND THE
NATIONAL COUNCIL LICENSURE EXAMINATION FOR REGISTERED NURSES:
A COMPARATIVE ANALYSIS OF PASS/FAIL PERFORMANCE FOR TRADITIONAL
AND SECOND-DEGREE BACCALAUREATE STUDENTS**

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Submitted to the Graduate Faculty of
School of Education in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

University of Pittsburgh

2009

UNIVERSITY OF PITTSBURGH

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University of Pittsburgh, 2009

This retrospective study was conducted to examine the relationship between selected variables and performance on the National Council Licensure Examination for Registered Nurses (NCLEX-RN). Data were collected from one hundred twenty graduates of a baccalaureate program; graduates completed either the traditional four-year track or an accelerated second-degree track. Variables included scores earned on seven standardized HESI tests, grades earned in fourteen nursing courses, and grade point averages calculated at six points throughout the curriculum. Relationships between NCLEX-RN performance and student age, gender, and ethnicity were also examined. A between-subjects comparative analysis based on pass/fail performance revealed students who passed the NCLEX-RN earned significantly higher HESI test scores, course grades, and grade point averages than those who were unsuccessful on the licensure examination. The relationship between ethnicity and NCLEX-RN performance revealed a lower passing rate for minority students. A comparison analysis based on program track revealed a significantly higher NCLEX-RN pass rate for second-degree students compared

to their traditional counterparts; second-degree students also earned significantly higher mean HESI test scores, course grades, and grade point averages. The HESI Exit Exam demonstrated the strongest correlation with NCLEX-RN success for both traditional and second-degree students; however, differences in NCLEX-RN correlates were revealed based on the program track. For the traditional students, NURS 3050 Nursing Care of Mothers and Newborns and the cumulative nursing grade point average (NGPA) demonstrated the strongest correlation with NCLEX-RN performance. For the second-degree students, NURS 4035 NCLEX Licensure Preparation course and the NGPA calculated after the first semester of nursing courses were the strongest correlates. In conclusion, there were significant differences between those who passed the NCLEX-RN and those who failed. Additionally, the study revealed second-degree students to be more successful in the nursing program and on the NCLEX-RN than their traditional counterparts. The results of this study support: the continued recruitment and admission of the second-degree students into the nursing program, the establishment of guidelines to more accurately identify students at-risk for failing the licensure examination based on progression criteria (i.e. course grades) and the implementation of support measures for minority and other at-risk students.

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ACKNOWLEDGEMENTS

In Randy Pausch's *The Last Lecture*, he writes about the "lost art of thank-you notes" and how "showing gratitude is one of the simplest yet most powerful things humans can do for each other". I am so grateful to all who have supported me throughout this journey, and for each of you, I offer this heartfelt thank-you note...

To my committee members: Dr. William E. Bickel – I offer my sincerest appreciation for your guidance and patience; you were a wonderful advisor who motivated and encouraged me with your unique words of wisdom ("Bickel-isms"). Your input throughout this entire process has been invaluable. Dr. Carl Ross – my wonderful mentor and colleague, but most importantly, my friend. Thank you for your continuous and genuine encouragement and for always picking up the phone to answer my ongoing questions. And thanks for the motivating mantra: "You're going to get done!" Dr. Glenn Nelson – thank you for accepting me into the doctoral program and supporting my efforts over the years. I will always be grateful for your willingness to support me and guide me along the pathway in higher education. Dr. Don Martin – thank you for your feedback. Dr. Lynda Davidson and Dr. Lynn George - thank you both for believing in me and affording me the opportunity to work for (and with) such wonderful people in the School of Nursing at Robert Morris University. To three very special women at RMU who I am proud to call my colleagues, and even more grateful to call my friends: Val Howard – thank you for being such a wonderful role model over the years. You truly inspired me to stay focused during most challenging times of juggling my family, work, and research -and you still

found ways to make me laugh. I so appreciate all your insight and guidance, and of course, your friendship. Kathi Perozzi - you provided me with my first teaching opportunity many years ago and have remained one of my biggest supporters; I will always be grateful for our good ole days in the lab. And to Kirstyn Kameg - you have taught me the value of staying on task until you get the job done and reminded me that it was okay to have some fun along the way. To Dave Majka and Kellie Laurenzi - thank you for your assistance and persistence - I couldn't have completed this study without you. To Patty Dempsey – you were always willing to offer your assistance and never failed to make me giggle. Thank you for brightening my days. And to the nursing faculty, staff, and students at RMU who cheered me on along the way – your encouragement never went unnoticed. To *The Association*, Libby Johnston, Kris Wingen, and Kim Buono - thank you for being such great neighbors, for providing much-needed diversions, great get-togethers and conversations. And thanks for letting me vent on all of our long walks together – I couldn't ask for better friends. To my parents, Joseph and Beverly Cozzo - you have been encouraging me to succeed for as long as I can remember. I am so grateful to have such loving parents who have always supported me and remain proud of my every accomplishment. To my three beautiful children, Samantha, Eric, and Alex: Thank you so very much for your patience and understanding while I pursued my educational goals. Your unending support and love made all the difference. I am truly blessed to have such amazing children; I can't imagine being more proud of anything else in this lifetime. To my incredible husband, Eddie – there are no words to express how much I appreciate all you have done for me over the years. This was a challenging journey but your unwavering love and support made it all possible. Thank you for being a constant source of encouragement, for having so much faith in my abilities and for your willingness to support my every endeavor – I am so lucky to have you in my life.

1.0 INTRODUCTION

In order to practice as a registered nurse in the United States, completion of a State Board-approved nursing program and successful performance on the National Council Licensure Examination for Registered Nurses (NCLEX-RN) are both required. The NCLEX-RN is developed by the National Council of State Boards of Nursing (NCSBN) and “assesses whether a candidate has the ability to provide safe and effective care upon entry into practice” (Wendt & Kenny, 2007a, p. 78). The impact of failing the licensure examination can extend beyond the individual candidate, who not only suffers emotionally, but also financially due to the loss of potential RN wages and benefits. The educational institution from where the candidate graduated is also affected as NCLEX-RN pass rates are among the program criteria used to maintain state board approval, national accreditation, and in competitive markets, to attract prospective nursing students. This hiring agency (i.e. hospital) suffers the financial consequences of hiring and orienting a new graduate nurse (GN) who, upon, failing, is unable to continue in the position. Passing the NCLEX-RN is the final step in the licensure process; therefore, the nationwide licensure pass rate is a good indicator of the number of new nurses entering the workforce. Licensure failure equates to a decreased number of qualified nurses to fill registered nurses (RN) vacancies; this is a growing concern in light the current nursing shortage which is predicted to continue over the next two decades.

The extent of the nursing shortage is an uncertain phenomenon, considering the multitude and variability of events that could stimulate growth, or worsen the decline. Facts that are certain include the large majority of practicing registered nurses heading for retirement, the aging baby boomer population placing unprecedented demands on the healthcare system, and schools of nursing limiting student enrollment due to a shortage of nursing faculty (American Association of Colleges of Nursing [AACN], 2007; AACN, 2008a; and Buerhaus, Staiger, & Auerbach, 2009). Among the most staggering estimations of nurse vacancies are those projected by the U.S. Bureau of Labor Statistics, estimating the need for more than one million new and replacement nurses by 2016 (United States Bureau of Labor Statistics, 2007).

Passing the NCLEX-RN is a critical outcome for individual graduates, nursing education programs, and the overall healthcare industry. Educators agree the multidimensional nature of student performance on the licensure examination makes it difficult to predict; however, an examination of institution-specific factors is worthy of investigation and analysis amidst a concerning healthcare crisis. Through an examination of student characteristics and academic outcomes, variables that facilitate (or hinder) motivation and achievement can be examined. Ultimately, the ability to identify factors most significantly associated with licensure success can assist faculty with informed decision-making with regard to admission and progression, curriculum development, and policy planning. Additionally, variables identifying students as at-risk for failing the licensure examination can result in the development and timely implementation of student support strategies in an effort to improve student and program success. Considering the overall impact of licensure performance in nursing, an examination of the multivariate characteristics affecting student performance is warranted.

1.1 PROBLEM STATEMENT

Research is lacking on the degree of influence of academic and non-academic variables on student success at one private four-year institution. Student success is measured by passing the National Council Licensure Examination for Registered Nurses (NCLEX-RN) on the first attempt; NCLEX-RN is the examination required of all graduate nurses in order to practice as a registered nurse in the United States. Graduates of this particular baccalaureate program have completed either the traditional (four-year) or accelerated second-degree (15- month) track. Though accelerated baccalaureate programs have been in operation for decades nationwide, little remains published regarding factors associated with this unique population of students and their academic outcomes. Comparative studies are also lacking in nursing education. Programs offering both the traditional and accelerated baccalaureate options can examine and compare student and program characteristics, and their relationship to academic outcomes, such as program and licensure success.

Determining which variables influence licensure success can assist faculty in developing a model of student success. The model can guide faculty decisions regarding the admission, progression, and graduation of students most likely to achieve NCLEX-RN success. In addition, an exploration of variables associated with NCLEX-RN failure may facilitate the identification of at-risk students, at whom remediation strategies and interventions can be targeted. Early identification of at-risk behaviors is particularly essential in accelerated baccalaureate nursing tracks, as the rapid progression through the program allows limited time for remediation.

1.2 PURPOSE OF THE STUDY

One of the many responsibilities of a faculty is to evaluate student outcomes; in nursing education, it can be argued that one of the most critical outcomes is successful performance on the nursing licensure examination. The primary purpose of this study was to investigate the relationship between selected variables and performance (pass/fail) on the National Council Licensure Examination for Registered Nurses (NCLEX-RN). The selected variables included HESI test scores, nursing course grades, grade point averages, age, gender, and ethnicity. A secondary aim of the study was to compare traditional and second-degree students with respect to group constitution and performance to determine what, if any, significant differences exist.

1.3 RESEARCH QUESTIONS

- 1) Which, if any, of the selected study variables significantly correlate with performance on the NCLEX-RN examination?
- 2) With respect to the study variables, what differences exist between students who pass the NCLEX-RN and those who fail?
- 3) With respect to the study variables, what differences exist between the traditional students and the second-degree students?

1.4 SIGNIFICANCE OF THE STUDY

This investigation determined the existence of a relationship between selected variables and performance on the National Licensure Examination for Registered Nurses (NCLEX-RN). Though volumes of research on predictor studies exist in the literature, gaps still exist for the nurse educator. The majority of studies reviewed limited their outcome data to licensure *success*. Though success is the outcome of choice and well-suited for the establishment of admission, progression, and graduation decisions, it is also important to examine *failure* as an outcome. Academic and demographic factors significantly correlated with licensure failure can assist with the development and timely implementation of support strategies for at-risk students. The implementation process should be strategic in nature, particularly for the accelerated program, as students enrolled in this option progress quickly and limited time is available for remedial interventions.

With respect to different program options (i.e. second-degree, accelerated), there also exists the need to fully understand what effect (if any) the diverse nursing student profile and program variability has on outcomes (i.e. NCLEX-RN performance). This is a particularly important consideration in the midst of economic uncertainty as displaced workers looking for a second career may turn to nursing, a profession with promising job security. Faculties teaching in accelerated programs have reported increases in the admission of more men and members of racial and ethnic groups that are traditionally underrepresented in nursing (Wink, 2005). There is evidence of significant growth in the number of accelerated and second-degree programs being offered nationwide; the potential influx of non-traditional students will have an impact on student demographics and diversity. Despite the reported growth in the number of accelerated second-degree programs to 205 representing 43 states nationwide (American Association of

Colleges of Nursing [AACN], 2008b), little research has been published about how this new pool of students compares to their traditional counterparts with regard to academic and licensure success. A comparative analysis of traditional and second-degree students can provide educators with valuable information; if accelerated and second-degree students prove to be highly successful, the development of additional programs should be considered as a strategy to facilitate a more rapid entry of qualified men and women into the nursing profession.

In addition to educators, the results of this study will be of value to program administrators, all of whom must demonstrate an acceptable NCLEX-RN pass rate in their respective programs. Licensure examination pass rates are utilized by State Boards of Nursing in the approval process. According to the Pennsylvania State Board of Nursing, “a school for registered nurses is placed on provisional status if less than 60% of its first-time examinees pass the examination; a nursing program which fails to correct deficiencies within 2 years may be removed from the Board's list of approved programs” (Pennsylvania Bulletin, 2008). In addition, reputable pass rates can earn a program accreditation from national associations, such as the American Association of Colleges of Nursing (AACN), the only national organization dedicated exclusively to furthering baccalaureate and graduate nursing education. Licensure pass rates are also used as a benchmark to indicate program success and can garner much-desired attention from prospective students in competitive markets.

Finally, it would be remiss to ignore the impact of the results of this study on the healthcare agencies recruiting and hiring new graduates. In 2004, the estimated cost of orienting a new graduate nurse in the hospital was nearly \$15,000 per graduate (Lindy & Reiter, 2006). Unfortunately, if unsuccessful on the licensure exam, the new graduate must be replaced. The additional cost of recruiting and orienting a replacement employee, plus the lost productivity, can

bring the estimate to \$65,000 per graduate. Consequently, nurse recruiters can be added to the list of individuals with a piqued interest in data related to graduate nurse performance on the licensure examination.

1.5 THEORETICAL FRAMEWORK

Educators are often charged with assisting students to become more motivated and self-regulated with regard to learning; in other words, encouraging students to commit themselves to meaningful academic goals (or sub-goals), making adjustments as necessary, and establishing more challenging goals as earlier ones are accomplished (Miller & Brickman, 2004). Many theoretical perspectives have been discussed in the literature to better understand the concept of motivation and how it affects human behavior; in particular, the study of academic motivation places the concepts of self-determination and future-oriented self-regulation and at its core. This study is grounded in the literature from educational psychology and considers the social-cognitive perspective of motivation and self-regulation within an academic context.

One theory that has proven useful in explaining the variation in individual behavior associated with educational outcomes across the age span (elementary to college students) is self-determination theory (SDT). A major focus of SDT has been to supply a more differential approach to motivation by considering the perceived forces that move a person to act; the research guided by SDT has focused on the social-contextual conditions that facilitate (or hinder) the natural processes of self-motivation (Ryan & Deci, 2000a). According to Ryan and Deci (2000a, 2000b) to be motivated means to be moved to do something; a person who is energized

to reach an end is motivated, whereas one who feels no impetus or inspiration is characterized as unmotivated (2000a, p. 54). Most contemporary theories of motivation assume that people initiate and persist at behaviors to the extent that they believe the behaviors will lead to desired outcomes or goals (Deci & Ryan, 2000, p. 227). Motivation is often treated as a singular construct, however, it includes all aspects of activation and intention and varies based on experiences and consequences (Ryan & Deci, 2000b). Not only does the amount of motivation one puts forth to achieve a goal vary, but the types, or levels, of motivation can differ as well. By considering the perceived forces that move a person to act, SDT has been able to identify distinct types of motivation, each with its own consequences for learning, performance, personal experience, and well-being (Deci & Ryan, 1985; Ryan & Deci, 2000a; and Ryan & Deci, 2000b).

The most basic distinction of motivational types offered by theorists is between intrinsic motivation and extrinsic motivation. Intrinsic motivation is described as doing something because it is inherently interesting and enjoyable, while extrinsic motivation refers to doing something to attain an outcome separate from the learning itself (Ryan & Deci, 2000a; Ryan & Deci, 2000b). In early research, the two forms of motivation were considered antagonistic; furthermore, only intrinsically motivated behaviors were assumed to be self-determined and autonomous (reflecting one's choice), while extrinsically motivated behaviors were thought to be far less autonomous and more controlled by external contingencies (Deci, Vallerand, Pelletier, & Ryan, 1991; Vansteenkiste, Lens, & Deci, 2006). More recently, however, research in SDT has proposed that there are different types of extrinsic motivation, all of which vary greatly with regard to autonomy. Consider the following example offered by Ryan and Deci (2000b):

Students who do their homework because they personally grasp its value for their chosen career are extrinsically motivated, as are those who do the work only because they are

adhering to their parents' control. Both examples involve instrumentalities rather than enjoyment of the work itself, yet the former case of extrinsic motivation entails personal endorsement and a feeling of choice, whereas the latter involves compliance with an external regulation...they vary in their relative autonomy (p. 71).

The different types of extrinsic motivation were more thoroughly defined with respect to the concept of internalization, which refers to the "taking in" of a value or regulation. According to Deci et al. (1991), internalization is viewed as a motivated process by which people transform an external regulation (i.e., praise from the teacher) into an internal process which no longer requires such external contingencies (p.328). Internalization is theorized by SDT to be energized by three psychological needs: competence, autonomy, and relatedness (Ryan & Deci, 2000a; Ryan & Deci, 2000b; and Vansteenkiste et al., 2006). According to Deci et al. (1991) opportunities to satisfy any of the three needs (competence, autonomy, and relatedness) contributes to one being motivated and self-determined, and when the goal is highly valued, the internalization process is facilitated. In nursing, it can be argued that degree attainment, followed by licensure success, can become invaluable as forces of motivation to persist and remain engaged in a nursing program. Though competence-related (academic) outcomes are often considered extrinsically regulated (earning praise for good grades), the behavior can become intrinsically motivated (inherently satisfying) if it is perceived as instrumental to something personally valuable, such as attaining a new career and improving socioeconomic mobility.

Even more specific to nursing education, the process of internalization could involve the three aforementioned psychological needs as follows: *Competence*, which includes understanding how to attain various outcomes (registered nurse licensure) and being effective in

performing the requisite actions (academic success and passing the licensure examination); *autonomy*, which refers to being self-initiating and self-regulating in one's own actions (choosing to attain a new career; choosing one type of registered nurse education pathway [i.e., BSN] over another); and *relatedness*, which involves the need to feel connected to others within a particular group (student cohort and characteristics).

For the purpose of this study, autonomy is best represented by choice of career (registered nurse) and educational pathway (baccalaureate); competence refers to those variables that demonstrate one is effective in performing the requisite actions necessary to attain an outcome, which are reflected in performance (i.e. test scores, course grades and GPA); and relatedness refers to characteristics which fuel a sense of belonging to a group of individuals (i.e., age, gender, and ethnicity) or to a program (traditional or second-degree). As described earlier, fulfilling any of the three psychological needs (competence, autonomy, and/or relatedness) will energize the internalization process and contribute to actions becoming more self-motivated and intrinsically satisfied toward goal attainment.

Goal-directed behavior is certainly not new to educational researchers. Most human actions are thought to be goal-directed, and individuals engage in actions they believe will result in desirable expectations (Miller & Brickman, 2004). Bandura referred to these actions as outcomes expectations; the greater the personal value of the anticipated outcomes and the stronger the belief that one is capable of generating the behavior necessary to obtain the outcomes (self-efficacy), the greater the likelihood that the action will be taken (Zimmerman, Bandura, & Martinez-Pons, 1992). Explorations of motivational dynamics have targeted the motives (within a particular context) that regulate one's study habits, with less attention devoted to discovering how goal contents affect the perceived relevance of learning (Vansteenkiste, et al.,

2006). Earlier research efforts that were aimed at understanding student motivation primarily focused on short-term (proximal) goals; however, future (distal) goals can also play a role in self-regulated learning behavior and motivation. According to Miller and Brickman (2004), personally valued future-oriented goals can also influence student motivation and self-regulated behavior. The authors provide the following argument to support their premise:

...personally valued future goals influence proximal self-regulation through their impact in the development of proximal sub goals leading to future goal attainment. The development of a system of proximal sub goals increases the likelihood that proximal tasks are perceived as instrumental to attaining future goals (p. 9).

In consideration of both the aforementioned self-determination theory (SDT) and future-oriented motivation theory, an example of relevance to nursing is offered: A student's achievement in her first semester of nursing courses was motivated by her parents' threat to withdraw financial assistance. The student's behavior in this case would be considered extrinsically motivated, and therefore, less self-regulated; however, if the student personally values the future-oriented goal of becoming a registered nurse, her behavior is internalized and she becomes more intrinsically motivated to succeed. Passing the first semester of nursing also demonstrates attainment of a proximal goal, which is instrumental to achieving the future goal (becoming a nurse) and can further influence the motivation to succeed. The literature did not offer information regarding the compounding, or synergistic, effect of self-determination and future-oriented motivation on student behavior; however, based on similar theories of self-regulation, it can be expected that students who demonstrate higher levels of achievement (attaining proximal goals) will initiate more goal-directed behavior aimed at obtaining a desired future-oriented outcome. A visual representation (Figure 1) of the combination of self-

determination and future-oriented motivation theories was developed by the researcher to provide a theoretical framework to guide this investigation of variables correlating with NCLEX-RN success and goal attainment, becoming a registered nurse.

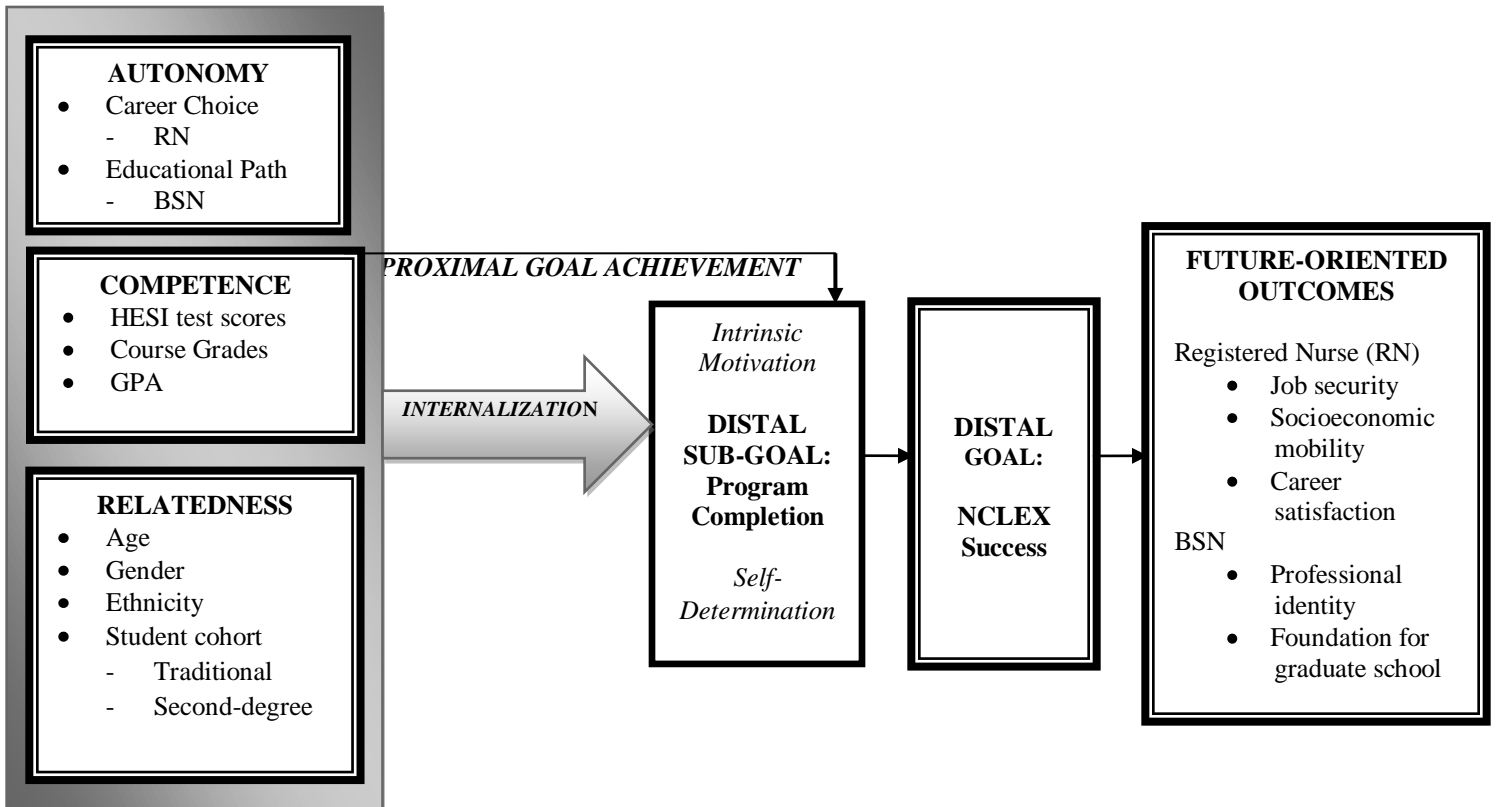


Figure 1 Representation of Theoretical Framework to Study Registered Nurse Attainment

As illustrated in Figure 1, becoming a registered nurse is a future-oriented outcome, theorized to influence the achievement of proximal goals (represented by competence variables); additionally, the psychological components of feeling autonomous (choosing a particular educational pathway and program track) and relatedness (identifying with fellow students and

with a profession) allow the student to internalize the goal, fueling intrinsic motivation and self-determination toward the next level of achievement (distal sub-goals). As students achieve meaningful educational goals, they establish and commit themselves to new, more meaningful goals (Miller & Brickman, 2004). This study utilized the concepts of both self-determination theory and future-oriented motivation theory to examine the relationship between proximal goal achievement and distal goal attainment.

1.6 DEFINITIONS OF TERMS

For the purpose of this study, the following operational definitions were utilized:

Graduate Nurse (GN): An individual who has satisfactorily completed all requirements for a Bachelor of Science Degree in Nursing (BSN) from his/her respective academic institution.

HESI Exit Examination: A standardized, computer-based comprehensive examination administered to all senior students during the final semester of the nursing program. HESI exam scores have been established as a valid predictor of student performance on the licensure examination.

HESI Specialty Tests: A standardized computer-based examination administered to all students at the end of the following specialty courses: Pediatrics, Maternity, Medical-Surgical I and II, Psychiatric/Mental Health, and Community Health.

National Council Licensure Examination for Registered Nurses (NCLEX-RN): The examination used to test the entry-level competence of candidates for licensure as registered

nurses using computer adaptive testing (CAT). The exam is required for graduates of accredited nursing programs and is graded as pass/fail.

National Council State Board of Nursing (NCSBN): A not-for-profit organization whose membership comprises the boards of nursing in the 50 states, the District of Columbia, and four United States territories-American Samoa, Guam, Northern Mariana Islands, and the Virgin Islands

Second-degree student: A student who possesses a non-nursing baccalaureate (or higher) degree but does not hold registered nurse licensure and is enrolled in the second-degree track of the baccalaureate program. Completion of the accelerated program will lead to the Bachelor of Science in Nursing (B.S.N.) degree in approximately 18 months, depending on pre-requisite courses.

Traditional student: A student who does not possess a college degree or registered nurses licensure and is admitted to the four-year baccalaureate nursing program. Completion of the program leads to the Bachelor of Science in Nursing (B.S.N.) degree.

1.7 ASSUMPTIONS AND LIMITATIONS

For the purpose of this study, the following assumptions were made:

- Academic and/or demographic variables influence NCLEX-RN performance
- Students in each of the graduating classes comprising the sample were equally qualified based on admission criteria established by the program

- The NCLEX-RN is a reliable and valid instrument for measuring graduate nurses' minimal level competency for entry into the professional practice of nursing
- The HESI specialty and exit examinations are reliable and valid instruments for predicting success on the NCLEX-RN
- All existing data contained in student files and utilized for the purpose of this study were accurate and truthful

The following limitations were identified:

- Participants in the study were from a convenience sample from one private baccalaureate nursing program in one geographical area; therefore, the results of the this study may not be generalized to large public universities or to all geographical areas
- A curricular change occurred in academic year 2007 to include a stand-alone licensure preparation course during the final semester of all tracks in the baccalaureate nursing program; it is not known how this will impact NCLEX-RN results
- A new passing standard for the NCLEX-RN was implemented on April 1, 2007 by the National Council of State Boards of Nursing; it is not known how this change will affect the NCLEX-RN pass rates.
- NCLEX-RN is reported as pass-fail only; any correlation based on dichotomous variables will be lower than a correlation based on variables with a continuous score

2.0 LITERATURE REVIEW

The literature review (a) reported the magnitude of the nursing shortage, including factors contributing to the increased demand for registered nurses, as well as the impact of licensure performance on the healthcare industry; (b) provided an overview of registered nurse education programs and the licensure examination process; and (c) discusses a review of research studies examining the relationship between of academic and non-academic variables and performance on the nursing licensure examination.

2.1 NURSING SHORTAGE

The delivery of care to hospitalized patients is complex and requires the coordinated efforts of many healthcare professionals; an insufficient supply of essential personnel, such as registered nurses (RNs), is a critical stressor on the healthcare system at large (Buerhaus et al., 2007). The current nursing shortage is well-documented and publicized, having begun in 1998 and continuing well into the present, making this the longest shortage in 50 years (Auerbach, Buerhaus, & Staiger, 2007). Shortages are commonly measured in terms of unfilled but budgeted positions in healthcare facilities for nurses with specific qualifications; forecasts of shortages are usually framed as the differences between expected supply and expected positions at some point in the future (Clarke & Cheung, 2008). The difference between supply and demand

typically results in lack of resources and/or services, and as the American Hospital Association's national survey of hospitals illustrates, the continued high vacancy rates for health care professionals are affecting patient access to services. According to the American Hospital Association (2007), 40% of hospitals surveyed reported difficulties recruiting nurses in the past year.

The use of forecasting models has allowed researchers and government analysts to estimate the current and future need for registered nurses; however the range of the projected need varies by source. Using a revised projection model, Auerbach, Buerhaus, & Staiger (2007) compared the supply of full-time equivalent (FTE) registered nurses with the demand projections from Health Resources and Services Administration (HRSA) to reveal a projected shortage of 340,000 RNs by the year 2020; this estimate is significantly less than earlier projections of 876,000. Researchers with the Health Resources and Services Administration (HRSA) released projections estimating a shortage of more than one million nurses by the year 2020, predicting that all 50 states would experience a shortage to varying degrees by the year 2015 (Health Resources and Services Administration [HRSA], 2006). Perhaps the most widely cited nursing shortage projection in the literature is reported by the United States Bureau of Labor Statistics, estimating the need for more than one million new and replacement registered nurses by the year 2016 (United States Bureau of Labor Statistics, 2007). Government analysts project that more than 587,000 new nursing positions will be created through 2016 (a 23.5% increase), making nursing the nation's top profession in terms of projected job growth (AACN, 2008a). Variability exists in forecasting the extent of the nursing shortage, as evidenced by the wide range of estimations set forth by projection models; however, analysts and researchers concur that the shortage is expected to intensify.

Developing initiatives to improve the shortage of registered nurses requires an understanding of the factors contributing to the shortage. A brief overview of contributing factors is offered, as an understanding of the nursing shortage further solidifies the justification for studies with a potential impact on nursing education and practice.

Changing demographics are influencing both the supply of registered nurses and the demand for healthcare. The supply of current registered nurses is projected to decrease as a rapidly aging RN population prepares for retirement. According to findings from the *Nursing Management Aging Workforce Survey* (as cited in AACN, 2008a), 55% of surveyed nurses indicated their intention to retire between 2011 and 2020. The average age of the RN population in 2004 was reportedly near 47, with those 30 years of age and younger representing only 8% of the nursing population (HRSA, 2006). Furthermore, the U.S. population is aging as well; as the 76 million people born during the baby boomer generation (1946-1964) become seniors in the year 2010 and beyond (Buerhaus, Staiger, & Auerbach, 2009); they will begin placing unprecedented demands on the health care system.

The future supply of registered nurses is not expected to meet the demand for new and replacement nurses over the next decade. According to the American Association of Colleges of Nursing (2008a), enrollment into baccalaureate nursing programs increased by 5.4% in 2007, marking the seventh consecutive year of enrollment growth; however, this positive trend remains significantly lower than the 16.6% increase in 2003. HRSA officials estimate that in order to meet the future demand for RN services, “the U.S. must graduate approximately 90% more nurses from U.S. nursing programs” (as cited in AACN, 2008a). Statewide initiatives to promote the nursing profession and increase recruitment are underway; however, many schools have been forced to limit student enrollment, negating the effects of these efforts. The National League for

Nursing's (NLN) Comprehensive Survey of All Nursing Programs (2005) reported that schools of nursing were forced to reject more than 147,000 qualified applicants in 2005; indicating that record numbers of potential RNs are awaiting placement. The 2006 AACN survey identified faculty shortages as the primary reason for turning away qualified applicants; reportedly, 71% of schools responding to the survey indicated that an insufficient number of faculty affected student enrollment (AACN, 2008c). Aside from the faculty shortages, other barriers to decreasing student enrollment include the lack of both physical facilities and sites for clinical placements (Kuehn, 2007).

Finally, it is important to address the National Council Licensure Examination for Registered Nurses (NCLEX-RN). Though the NCLEX-RN will be addressed in greater detail in the following section, it is important to discuss the relationship of performance on this examination to the nursing workforce. Passing the licensure NCLEX-RN is essentially the final step in obtaining a licensure to practice as a registered nurse; the NCLEX-RN pass rate, therefore, is a good indicator of the number of new nurses entering the profession (NCSBN, 2009). According to the National Council of State Boards of Nursing (NCSBN), the national licensure pass rate for 2008 was 86.7%; meaning more than 17,000 U.S.-educated graduate nurses *failed* the NCLEX-RN on the first attempt (NCSBN, 2009). At the Pennsylvania state level, over 1,000 potential registered nurses will not be added to the workforce due to their inability to pass the licensure examination between October 2007 and September 2008 (Pennsylvania State Board of Nursing, 2008). Of great concern to the healthcare industry is the loss of potential employees to fill the growing number of vacancies; in addition, many facilities report significant financial losses with licensure failure. It is a common practice for hospitals and other healthcare agencies to recruit and hire graduate nurse (GNs), often offering RN wages

and benefits. When the GN is successful on the examination, he/she is already in place and well-oriented to the facility; however, when the GN fails the exam, he/she is demoted or terminated, resulting in financial loss for the hiring agency. According to a study by Lindy and Reiter, the cost to orient a new graduate nurse in an acute care hospital was nearly \$15,000 in 2004. If the new graduate was unsuccessful on the licensure examination and subsequently replaced by another new nurse, the agency incurred the additional costs of recruiting and orienting a replacement employee, overtime compensation to ensure adequate staffing, and lost productivity, all of which increased the total cost to between \$39,000 and \$65,000 per graduate nurse (Reiter, Young, & Adamson, 2007). As the cost to recruit and hire new registered nurses increases, the need to predict success becomes increasingly apparent. Factors related to licensure success may result in the selection of new graduates prepared to enter the registered nurse workforce.

2.2 REGISTERED NURSE EDUCATION AND LICENSURE

A registered nurse (RN) license can be obtained in the United States by completing one of three educational pathways: Diploma school, associate-degree program, or baccalaureate program. Graduates of all three programs are eligible to take the same licensure examination and obtain the same title as registered nurse; however, the educational preparation differs in length and orientation. This section offers an overview of each program of study, including historic milestones which formed the foundation for registered nurse education in the United States. Additionally, a review of the development of registered nurse licensure is presented.

Diploma Programs

The oldest and most traditional type of registered nurse education is the hospital-based diploma program. Florence Nightingale, credited as the *founder of nursing*, opened the first fully endowed school of nursing in the world at St. Thomas' Hospital in London in 1860 (Catalano, 2009; Goodnow, 1953). The training was hospital-based and lasted only one year, but required the new nurses to remain in the hospital for an additional three years for added experience (Goodnow, 1953, p. 87). The Nightingale School provided a model for nursing schools throughout Europe and the rest of the world. The first diploma school of nursing established in the United States was at the New England Hospital for Women and Children in 1872, which was opened by Dr. Susan Dimock; the nursing program was originally one year, then lengthened to eighteen months in 1877, then to a two-year program in 1893 (Goodnow, 1953). Education in diploma schools continued to offer little or no classroom or theoretical study; students learned basic nursing skills exclusively by hands-on experience during long shifts in the hospital (Catalano, 2009). This model of nursing education afforded hospitals a steady supply of nurses who were familiar with organizational protocols and procedures (Buerhaus, Staiger, & Auerbach, 2009). As the number of hospitals increased, so did the need for nurses; essentially, every large hospital developed its own training program where the student nurses were used as free labor (Catalano, 2009; Cherry & Jacob, 2008).

In the year 1880, there were only 15 hospital-based diploma schools of nursing in the United States; by 1900, the number of diploma programs expanded to 432 programs and by 1909, over 1,100 hospital-based diploma programs were in existence (Hawkins, 2000). The current preparation of a diploma nurse varies in length from two to three years at a hospital school of nursing where graduates are awarded a certificate (not an academic degree) (Zerwekh

& Claborn, 2006). Prior to the 1960s, nearly all nursing education took place in hospital-based diploma schools; however, as more associate degree and baccalaureate programs became available, the number of diploma programs decreased significantly. Previous research has found the diploma route to registered nursing licensure the least attractive, consistent with the decline in enrollment (Lehrer, White, & Young, 1991). According to the American Nurses Association (2007), diploma schools now represent the smallest percentage of nursing education programs nationwide at 4 percent. Diploma schools reported a decrease in applications of more than 13% between 2005 and 2006; though a decrease of applications was reported for all three types of educational programs during that same time period, the diploma schools reported the largest decline (National League for Nursing, 2008).

Associate Degree Programs

The associate degree program has the distinction of being the first, and only, educational program for nursing that was developed from planned research and controlled experimentation, with the original project directed by Mildred Montag at Teachers College of Columbia University in 1952 (Zerwekh & Claborn, 2009). Montag published her doctoral dissertation, *The Education of Nursing Technicians*, in which she outlined the concept of the associate degree nurse (which she labeled the “technical nurse”) and proposed that training take place in a community college setting (Huston, 2006) with an emphasis on developing the skills necessary to provide high-quality bedside care (Catalano, 2009). In the proposed two-year curriculum, there was to be a balance between general education and nursing courses, and a more integrated approach to clinical learning; unlike the diploma programs, the emphasis was to be on education, not service (Cherry & Jacob, 2008).

During World War II, the need to train nurses more quickly became critical, and the development of the two-year Cadet Nurse Corp proved to be successful (Spalding, 1954). After the war, Congress made funds available to community colleges to offer two-year associate degree programs in many technical fields and educators reasoned that nursing education belonged in a college setting (Baer, D'Antonio, Rinker, & Lynaugh, 2001). With the support of foundations and federal funds, associate degree in nursing (ADN) programs experienced the fastest growth in nursing education. From 1960 – 1970, the number of ADN programs swelled from 57 to 437 (Buerhaus, Staiger, & Auerbach, 2009). Significant growth of associate degree programs continued into the 1990s, increasing by 103% and in some years, produced more graduates annually than diploma and baccalaureate programs combined (Huston, 2006).

The current preparation of the associate-degree nurse is typically completed at a community college over a period of 18-21 months (Zerwekh & Claborn, 2006). Although applications to all types of RN programs reportedly dropped by 8.7% between 2005 and 2006, the associate degree programs reported the smallest decrease at 6.4 percent (National League for Nursing [NLN], 2006). The most recent data available reported that 909 associate degree programs nationwide granted degrees to 53, 118 graduates in academic year 2004 – 2005 (NLN, 2006).

Baccalaureate Programs

Baccalaureate programs have long been touted as the preparation of choice for those considering professional roles in nursing. As early as the late 1800s there was an appeal by nurse leaders for university affiliation; initially, to provide nursing students with science courses, as demonstrated in 1889 when Mercy Hospital in Chicago was among the first to join with Northwestern University for this purpose (Zerwekh & Claborn, 2009). These early collegiate

programs were a mixture of college-level classes and diploma school clinical experiences, and unfortunately for the early university attendees, this affiliation did not lead to an academic degree (Catalano, 2009).

Generally acclaimed as the first university program to be conducted in the higher education setting, the University of Minnesota School of Nursing opened in 1909 (Kalisch & Kalisch, 1995). Minnesota offered a five-year curriculum leading to the Bachelor of Science in Nursing (BSN) degree, comprising two years of pre-nursing academic courses, two years of professional nursing course and clinical work, and one year of specialized instruction (Bentley, 2004). Followed by Yale University and Western Reserve University (currently known as Case Western Reserve University), these early baccalaureate programs specialized in preparing nurses for public health nursing, teaching, and supervisory positions

Baccalaureate programs slowly increased in the decades to follow due to efforts by nurse leaders to transform nursing from an occupation to a profession, in part, by moving nursing education into university settings; despite the push for professionalism, however, baccalaureate programs never grew nearly as fast as associate degree programs (Buerhaus, Staiger, & Auerbach, 2009). By the beginning of World War II there were 76 programs granting baccalaureate degrees in nursing (Catalano, 2009). According to the U.S. Department of Health and Human Services, as cited in Buerhaus, Staiger, and Auerbach (2009), the number of baccalaureate programs expanded from 172 in 1960, to 377 in 1980; the number of graduates from baccalaureate programs grew from 4,000 in 1960 to over 24,000 in 1980. The most recent statistic offered by the American Nurses Association (ANA) reported 573 U.S. colleges and universities offering the BSN in 2005 (ANA, 2007).

The current preparation of the baccalaureate nurse is four to five years in length and includes courses in the liberal arts, sciences, and humanities. The emphasis is on critical decision-making skills, exercising independent nursing judgment, and acquiring research skills (Zerwekh & Claborn, 2006). Similar to the enrollment trends in diploma and ADN education, baccalaureate programs have recently experienced a decrease in applications. According to the National League for Nursing (NLN), a 12.4 percent decrease in baccalaureate applications from 114,000 in 2005 to 100,000 in 2006 was reported (NLN, 2008). The NLN also reported a significant difference in cohort size by program type: In 2004 – 2005, the average cohort size graduating from associate degree programs was 71, compared to baccalaureate cohorts of 58. The NLN study indicates that associate degree programs, which comprised 59% of all RN programs in 2004 – 2005, produced 63% of all RN graduates, while baccalaureate programs comprised 37% of all RN programs and only produced 33% of all graduates.

The supply of registered nurses refers to the number of individuals holding a license to a practice as a registered nurse at any given time in the future (Buerhaus, Staiger, & Auerbach, 2009, p. 143). Research on the projected long-term supply of RNs looks seriously at the trends in registered nurse program enrollment, and the overall time it takes to prepare an entry-level registered nurse. In response to the nursing shortage, accelerated baccalaureate programs are becoming a popular alternative to the traditional four-year approach.

Accelerated Second-degree Nursing Program

Accelerated baccalaureate programs are available at select colleges and universities nationwide, and are intended for individuals already possessing a baccalaureate (or higher) degree in a non-nursing discipline. By building on previous knowledge and life experiences, accelerated programs afford second-degree students an opportunity to accomplish program

objectives rapidly, facilitating individuals' transition into the nursing profession in approximately 11-18 months (AACN, 2008d).

The accelerated baccalaureate model, though innovative, is no longer considered a *new* approach to delivering education. The model was first introduced in 1971 at Saint Louis University where nurse educators realized that college graduates who were enrolled in a baccalaureate nursing program could move at a faster pace than those earning their first degree (Wink, 2003). Several factors have sparked a growing interest in accelerated programs since then, but perhaps most influential is the overwhelming concern regarding the nursing shortage. According to Cangelosi and Whitt (2005) it was the shortage of nurses in the 1980s that prompted American nurse educators to consider new models for the delivery of baccalaureate nursing education. Accelerated programs were not only intended to facilitate a rapid entry of students into the workforce to ease the nursing shortage, but to offset the dwindling numbers of traditional nursing program applicants by attracting an untapped pool of learners (Ouellet & MacIntosh, 2007). Accelerated programs have proven to be attractive to men and women unable to commit time and/or money to a traditional four-year program, especially in light of such economic hardships. There is also the desire to develop approaches to ensure ethnic and racial diversity in the nursing workforce by attracting traditionally underrepresented individuals who were leaving their other professions, including men, minorities, and older Americans (Wink, 2005).

Typically, accelerated programs share identical program goals and clinical hours as their traditional counterparts, but require intense instruction and a year-round curriculum without breaks (Tanner, 2006). Because students with a prior degree are not usually required to take the liberal arts component of a four-year BSN program, the time frame for completion is cut nearly

in half. In addition, those individuals with a previous degree in science may fulfill many of the pre-requisites for the nursing major further reducing the number of terms required for program completion (AACN, 2008d).

Other factors prompting educators to consider an accelerated option were the pressures from potential nursing students who wanted credit for university education they had already completed. At Johns Hopkins University, 25 percent of students entering the nursing program already possess a previous degree (Shiber, 2003). Consistent with other program, Johns Hopkins did not change the required number of credits, number of classes, number of clinical hours, or outcome expectations; however, the pace was accelerated (Shiber, 2003). Accelerated programs may also offer flexibility; many nursing courses are being taught twice a year, affording the second-degree students an opportunity to *decelerate* and join their traditional counterparts if allowed.

Accelerated baccalaureate programs are not nearly as widespread as traditional programs, but the rate of proliferation has been rapid. In 1990, there were 31 accelerated baccalaureate programs in the United States; currently, the American Association of Colleges of Nursing reports 205 accelerated programs in full operation, with 37 new programs in the planning phase (AACN, 2008a). A 2007 survey found the number of accelerated second-degree program graduates has more than doubled over the past three years. In 2004, there were 2,422 accelerated graduates; by 2007, the number of accelerated program graduates increased to 5,881 (AACN, 2008b).

An accelerated program design involves more than simply expediting the educational process. Careful attention needs to be given as to how nursing incorporates and builds on the first degree, enabling qualified individuals to progress and competently enter the profession.

Considering the unique characteristics of accelerated second-degree programs and the diversity of students' enrolled, research is needed to assess program and student characteristics and their influence on outcomes, such as licensure success.

In summary, the three primary educational paths to prepare registered nurses emerged in response to social, political, and educational changes in society. Table 1 illustrates the essential program differences, including length of study (two to four years), institutional setting (hospital-based schools, two-year community colleges, and four-year colleges and universities) and curricular orientation (service-oriented, technical skills, or theory-based). Though the curricula were not perceived as equivalent, graduates from all three programs were eligible for the same registered nurse licensure examination, sparking a debate that continues to the present day.

Table 1 Types of Registered Nurse Education Programs

Type of Program/ Degree Conferred	Setting	Program Length (approx.)	Purpose	*Number of Programs/Graduates
Diploma/No degree conferred	Hospital-based	2-3 years	Emphasizes hands-on clinical experience; for basic RN positions	75 programs/ 3,006 graduates
Associate degree/ ADN (Associate Degree in Nursing)	Community Colleges	2 years	Basic technical care; Hospital and community health settings	1000 programs/ 57,193 graduates
Baccalaureate/ BSN (Bachelor of Science in Nursing)	Colleges and Universities	Traditional: 4 years Accelerated: 11-18 months	Basic professional care; Management and public health settings; prep for graduate school	683 programs/ 34,750 graduates

* Data from National League for Nursing (n.d.b.) Academic Year 2006 – 2007.

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

Before mandatory licensure was required, the only way to know if an individual met the standards for a nursing position was to call the nursing school and inquire as to whether an applicant's name appeared on the official roster, or register; hence the term, registered nurse (Catalano, 2009). Florence Nightingale first started this practice when she created a registry of graduate nurses from St. Thomas School of Nursing. The registry provided a system of identifying graduates of particular programs, and enabling their distinction from lay practitioners, which proved beneficial for both physicians and patients (Goodnow, 1953).

Once the need for licensure became evident, anyone wishing to practice as a registered nurse was mandated to pass a licensure examination and become registered by his/her respective state. Individual State Boards of Nursing (SBN) were established and responsible for establishing rules surrounding the licensure examination; candidates who did not pass the examination were not permitted to use the title of RN (Kalisch & Kalisch, 1995). Major nursing organizations realized that in order to achieve consistency, all nurses would need to pass a uniform examination. In 1945, the American Nurses Association formed the Council of State Boards of Nursing, comprising a representative from each state and jurisdiction to oversee development of a uniform examination that could be used by all state boards of nursing (Catalano, 2009). In 1950, the National League for Nursing Testing Division administered the first State Board Examination, a written examination including separate sections on medical-surgical nursing, maternity nursing, nursing of children, and psychiatric nursing (Cherry & Jacob, 2008). In 1982, the written test was revised to include all nursing content integrated

within one section, and was renamed the National Council Licensure Examination for Registered Nurses (NCLEX-RN) (Catalano, 2009). The paper and pencil version was then replaced with computerized adaptive testing (CAT) in 1994; used to this present day, CAT utilizes computer technology and measurement theory to assemble each candidate's exam as he/she progresses to determine the final pass/fail grade (National Council State Boards of Nursing, n.d.).

As noted earlier, all graduate nurses are required to take the same licensure examination regardless of educational preparation. The longstanding debate as to which program type offers the best preparation for nursing practice continues to the present; hence the lack of a standardized entry-level educational requirement for registered nurses. With regard to program type and licensure performance, only one study emerged from the current literature aimed at determining the influence of educational preparation on entry-level competence; in this study, competence was measured by the pass rate on the NCLEX-RN (Hawkins, 2000).

The Hawkins study examined pass rate data from graduates of diploma, associate-degree, and baccalaureate programs over a five-year period within one state. Hawkins' study findings reported the overall percentage of graduates passing the licensure examination as follows: Diploma graduates (n = 320) at 91.56 percent; associate-degree graduates (n = 963) at 92.2 percent and baccalaureate graduates (n = 2700) at 86.8 per cent. Statistical analysis revealed significant differences among the three programs with associate and diploma programs having higher than expected pass rates, and baccalaureate programs having lower than expected pass rates (Hawkins, 2000, p. 80). Hawkins concluded that a difference in entry level competence existed based on educational preparation; however, causal factors for the differences were not explored or offered.

The NCLEX-RN pass rate data utilized in the Hawkins and similar studies are provided by the National Council of State Boards of Nursing (NCSBN). The NCSBN collects and reports quarterly examination statistics to monitor trends in licensure performance. The candidates' performance on the licensure examination is reported only as a pass-fail decision based on the candidates' first attempt; therefore, the primary statistics presented by the NCSBN are pass rates. Table 2 provides the most recent national NCLEX-RN data (pass rates) by program type over a four-year period.

Table 2 NCLEX-RN Data Based on First-Time Candidates in the United States

Program Type	2008		2007		2006		2005	
	# Taking Exam	% Passing	# Taking Exam	% Passing	# Taking Exam	% Passing	# Taking Exam	% Passing
Diploma	3,666	87.5%	3,688	87.9%	3,810	89.5%	3,540	90.3%
Associate-degree	75,545	86.2%	69,890	84.7%	65,390	88.0%	60,053	87.5%
Baccalaureate	49,739	87.5%	45,781	86.4%	41,349	88.3%	35,496	86.7%
Average		87.0%		86.3%		88.6%		88.2%

Source: National Council State Boards of Nursing, 2005 – 2009

In summary, a registry of nurses initially provided an official system to track nursing program completion, but was eventually no longer sufficient to ensure minimal levels of competency in all nurses. As the number and variations of nursing programs increased, so did the need for standardization and a method to distinguish those sufficiently trained to provide nursing care from those untrained. Each state established a State Board of Nursing to develop and regulate the licensure process in the United States, as well as adopting Nurse Practice Acts to

guide the scope of registered nurse practice. Current practice continues to require all nursing program graduates, regardless of program type, to successfully pass the NCLEX-RN in order to practice as a registered nurse in the United States. Although graduate nurses are permitted to retake the NCLEX-RN if unsuccessful on the first attempt, it should be noted that in nursing education studies, it is the *first-time* pass rate that is used as the “gold standard” and as the benchmark for evaluating program effectiveness and success (Bernier, Helfert, Teich, & Viterito, 2005). The primary purpose of licensure in the past is the same as today – ensuring public safety.

2.3 REVIEW OF NCLEX-RN STUDIES

Predicting success on the nursing licensure exam is an important endeavor, particularly as the nursing shortage escalates. “Overall, success rate prediction is often reported as a multifaceted phenomenon”, making it difficult to determine the variables most often influencing the outcome; nevertheless, trends may emerge when examining both academic and nonacademic variables, which will assist faculty in predicting student outcomes (Barkley, Rhodes, & Dufour, 1998, p. 132).

In order to assemble a current literature review on predictors of licensure success, only research studies performed within the last ten years were included in the review with the exception of the following four studies deemed relevant for this current investigation: (1) Alexander and Brophy’s (1997) five-year study of graduates’ performance, (2) Campbell and Dickson’s (1996) ten-year integrative review of BSN studies, (3) Mills et al., (1992) study specific to the second-degree student population, and (4) Poorman & Martin’s (1991) study

which examined the role of nonacademic variables in passing the NCLEX. The literature review is organized by specific variables; each of the studies reviewed may be addressed multiple times, as their findings are significant for more than one variable.

2.3.1 Academic Variables

Academic variables have historically demonstrated reliability for determining student competence and predicting performance on the licensure examination; the following emerged in the literature as promising predictors of NCLEX-RN performance: Standardized admission tests, individual course grades and grade point averages, and scores earned on standardized nursing content examinations. A discussion of each academic variable and relevant research findings is offered.

2.3.1.1 College Admission Tests

The college admission test scores most commonly used as admission criteria include the SAT examination and the ACT examination scores. Though test scores have been historically useful for predicting achievement of traditional college students, the debate exists as to whether or not college admission test scores should be included as admission criteria for second-degree nursing students. Depending on the length of time separating the SAT exam and the return to college, the scores may be outdated for nontraditional students. Nurse educators do agree, however, that if research supports a significant correlation between college admission test scores and NCLEX-RN performance, then admission criteria can be established and the process for student selection for admission facilitated and strengthened. A discussion of research studies finding a correlation between SAT and/or ACT scores and NCLEX-RN performance follows.

Alexander and Brophy (1997) conducted an investigation of the relationship between admission, progression, and exit variables and NCLEX-RN performance over a five-year period using a retrospective quota sample correlational design. The data for the study were obtained from a unique baccalaureate program that offered the option for students to exit after year two, receive an associate degree, and sit for the licensure examination. Of the 188 study participants, 100 % (n = 188) took advantage of the option and sat for the licensure examination after year two of the program. Alexander & Brophy found the admission SAT scores for those who failed were significantly lower than for those who passed the NCLEX-RN. Those who failed had a mean total SAT score of 785, as compared to those who passed with a mean total score of 884. Of the eight admission variables studied, the SAT verbal score was among the strongest indicators of licensure success.

Campbell & Dickson's (1996) ten-year integrative review of BSN programs (n = 47) included all nursing research conducted from 1981-1990 that related to predicting student success. The goal of the investigation was to describe and evaluate nursing education research on predictors of retention, graduation, and licensure success of baccalaureate students, using the techniques of integrative review and meta-analysis. To meet their goal, the following questions were formulated by the researchers: (1) what are the demographic characteristics of studies on predictors of retention, graduation, and NCLEX success of BSN students for the past ten years? (2) What does the research from the past ten years show regarding the effectiveness of the predictors in forecasting retention, graduation, and NCLEX-RN success of BSN students? and (3) What does the research from the past ten years show regarding the effectiveness of intervention programs on the retention, graduation, and NCLEX-RN success of BSN students?

According to Campbell and Dickson, forty studies included at least one cognitive variable that demonstrated some significance in predicting retention, graduation, and NCLEX-RN success. Of the cognitive variables studied, standardized college entrance examinations were most frequently used to predict retention (n = 6), graduation (n = 3) and NCLEX-RN success (n = 32). The most common standardized entrance examination used in predictor studies included the SAT exam, which was used in twenty-one studies with eight reporting significant results (38%); ACT scores were used in eleven studies with eight reporting significant results (73%). The authors point out that although the SAT examination scores were the most often studied as a predictor variable, it was the ACT scores that most often predicted NCLEX-RN success (Campbell & Dickson, 1996).

Crow, Handley, Morrison, & Shelton (2004) conducted a national study of requirements and interventions used by BSN programs to promote and predict NCLEX-RN success. Using a descriptive correlational design, Crow et al. recruited participants from the 513 BSN programs listed by the National League for Nursing (NLN). Representing thirty-eight states and the District of Columbia, 160 total participants submitted usable data about their respective programs. Measures of association were computed among all combinations of variables to the NCLEX-RN passing rate. The only admission criteria significantly correlated with passing the NCLEX-RN were use of the NLN standardized nursing entrance examination scores ($\chi^2[1, n = 12] = 11.11; P = .00$) and SAT scores ($r = -0.4, p = .03, n = 34$). Surprisingly, an inverse relationship was identified between the SAT scores and passing the NCLEX-RN. Data analysis revealed that the higher the SAT score required for admission to the program, the lower the passing rates for that program. This is not consistent with previous research and could not be

explained by the researchers, except to indicate that for some samples, SAT scores may not be a good predictor for NCLEX-RN success.

Haas, Nugent, & Rule (2004) conducted a retrospective study to predict student success on the NCLEX-RN. The sample consisted of 368 students who had graduated from an upper division nursing program (this type of nursing program only admits students after completion of two years of general education courses and supporting pre-nursing courses). The variables of interest were tested to determine their relationship with students' NCLEX-RN performance, and were identified based on a literature review and the availability of existing data, as well as the importance of these data in the admission process.

Specific to the college entrance examinations, Haas et al. reported that those who passed the NCLEX-RN differed significantly from those who failed, exceeding them in verbal SAT ($p=0.001$) and quantitative SAT ($p = 0.082$) scores. The mean verbal SAT score of the passing group was 512, while the mean verbal SAT score for those who failed was 465. The mean quantitative SAT score for the passers was 529, while those who failed had a mean score of 505. Since the purpose of this study was to predict student success on the NCLEX-RN, the researchers used discriminant function analysis in an effort to correctly identify two groups of students: "true passers" and "true failers" (Haas et al., p. 443). The true passers (those predicted to pass who then went on to pass the NCLEX-RN) were identified correctly 71% of the time, while true failers were correctly identified 61.2% of the time. There was a high correlation between the discriminant function and verbal SAT score (.580). The final results of this study suggest that success on the NCLEX-RN can be predicted with a high level of accuracy using existing student data.

Preston (2007) conducted a quantitative research study using retrospective sampling and logistic regression to explore possible relationships between 27 admission factors and student success in a pre-licensure nursing education program at a two-year college. For the purpose of Preston's study, success was defined as completing the nursing program within the original admission cohort and success on the initial attempt on the NCLEX-RN. The population from which the sample was drawn included individuals admitted over a six-year period to a multi-campus, college-based, pre-licensure two-year nursing education program. Of the 715 potential subjects, 572 cases were available for data analysis. The 27 admission factors (independent variables) used in the study were clustered into six categories: academic, policy, personal and experiential factors, and campus entry, and exit locations. Using logistic regression as the method for data analysis, Preston found six admission factors, including standardized admission tests (SAT, ACT, CQT) to be significant ($p < 0.10$) in predicting first-time success on the licensing examination

College admission test scores are commonly used as criterion for admission decisions for traditional students; however, their value may be questionable for the second-degree population. Of the studies reporting a correlation between SAT scores and NCLEX-RN performance, the majority used the combined SAT (verbal and math) score; one study used the SAT verbal score only. None of the studies published have utilized the new three-score SAT (reading, math, and writing) format as an independent variable

2.3.1.2 Grade Point Averages

Grade point average (GPA) has been frequently examined in the literature for its ability to predict licensure success. Interestingly, many programs use such a variety of GPA combinations, there arises some difficulty in comparing results to other programs. Grade point

averages can be calculated at several points throughout a program, including admission GPA, pre-nursing (or transfer) GPA, end-of-term /year GPA, and cumulative GPA. Other common categories of grade point averages found in the literature included nursing GPA (calculated with nursing theory and/or clinical courses) and science GPA (using only the science courses in the calculation). The categories and combinations of GPA can increase their utility as admission, progression, and graduation criteria, however, it should be noted that due to vast differences in nursing curricula and grading policies, it is difficult to generalize even the most significant of findings.

In the Campbell & Dickson (1996) ten-year integrated review of BSN studies (n =47), all of the GPA categories demonstrated some significant correlation with graduation and NCLEX success. College cumulative GPA (n = 22), pre-nursing GPA (n = 20), and nursing GPA (n = 20) were studied most frequently. GPA from the biological sciences (n = 6), chemistry (n = 5), liberal arts (n = 5), social psychology (n = 3), and math (n = 3) were among the other GPA categories found in their review.

Campbell & Dickson reported that nursing (didactic courses) GPA, nursing (clinical) GPA, and chemistry GPA demonstrated almost equal significance in predicting student success; the percentage of studies with significant results were 83, 78, and 80 respectively ($p < .05$). The least predictive of the GPA variables include the liberal arts GPA and cumulative college GPA. The liberal arts GPA was not frequently included in cognitive predictor studies (n = 5) with only two reporting significant results. The cumulative college GPA, which was most often included in nursing education studies (n = 22), only demonstrated significant results in 9 (41%) of the studies at the $p < .05$ level.

Arathuzik & Aber (1998) used a descriptive correlational research design to conduct a study for the purpose of identifying factors associated with NCLEX-RN success in an urban public university. A convenience sample of 79 was drawn from all of the senior nursing students completing their final semester of course work. This particular study reported significant, although low, correlations between NCLEX-RN success and cumulative GPA ($r_{pb} = .275$, $p = .05$).

Daley, Kirkpatrick, Frazier, Chung, & Moser (2003) evaluated students' demographic and nursing program variables and standardized test scores to determine whether significant differences existed between students who successfully completed the NCLEX-RN and those who were unsuccessful. The research questions guiding the study included: (1) Are there demographic variables associated with successful completion of the NCLEX-RN? (2) Are there nursing program variables associated with successful completion of the NCLEX-RN? (3) What is the predictive ability of standardized [nursing] tests to identify students in need of remediation prior to the administration of the NCLEX-RN?

Daley et al. selected demographic and nursing program variables based on a review of literature and prior research findings. Data were collected from two cohorts of students (1999 cohort, $n = 121$; 2000 cohort, $n = 103$). Results revealed that students in both cohorts who were successful on the NCLEX-RN earned a higher pre-requisite GPA (3.3 ± 0.4) than those who were unsuccessful (3.1 ± 0.4 , $n = 13$); cumulative GPA was also significantly ($p < .001$) higher for successful students (3.4 ± 0.2) versus unsuccessful students (3.0 ± 0.1).

Matos (2007) utilized Stufflebeam's CIPP model to determine the relationship between selected cognitive predictor variables and successful passage of the NCLEX-RN for a convenience sample of 291 participants from a baccalaureate nursing program. A *t*-test

comparison between those who passed the NCLEX-RN ($n = 273$) and those who did not pass ($n = 18$) found students who passed ($M = 3.15$) had significantly higher cumulative GPAs than those who did not pass ($M = 2.88$, $p = .001$). The overall pass rate for the participants was 93.8%. A chi-square comparison for pass rate and cumulative GPA demonstrated that only 85.5% of students with an overall GPA less than 3.0 passed the NCLEX-RN on the first attempt, while 100% of students with an overall GPA of 3.5 and higher passed the licensure exam.

Mills, Becker, Sampel & Pohlman (1992) studied accelerated baccalaureate students ($n = 328$) over a nine year period. The purpose of the study was twofold: First, to identify predictors of success, or conversely, predictors that would place students at risk on the NCLEX-RN. The second purpose was to describe the probability of success on NCLEX-RN as a function of the predicted variables. Of the sample, 89.3 % ($n = 293$) passed the NCLEX-RN after completing the accelerated three semester program. The independent variables that achieved statistical significance ($p < .05$) in building a predictor model included admission (transfer) GPA and cumulative GPAs at the end of the first, second, and third semesters. The mean transfer GPA for those who passed was 3.17; the mean for those who failed was 2.99. Mills et al. reported that for each full letter grade increase on transfer GPA, for example, from 2.0 (C) to 3.0 (B) to 4.0 (A), the nurse candidate had a nearly five times better chance of passing the NCLEX-RN. Cumulative grade point averages were also significant predictors of success throughout the three-semester curriculum; the likelihood of GPAs being strong predictors increased during the consecutive semesters (Mills et al., 1992).

Seldomridge and DiBartolo (2005) collected data from 71 student records between the years of 1998- 2003 for the purpose of learning more about students enrolled in an accelerated second bachelor's degree nursing program. The following research questions were developed to

guide the investigation: (1) Are there any differences in the demographic characteristics of students enrolled in second degree program and students enrolled in the traditional program? (2) Are there any differences in the academic performance of students in the two programs? (3) Which variables are most strongly associated with NCLEX-RN success for second-degree students?

The researchers found the NCLEX-RN pass rate of second-degree graduates (84.2%) to be slightly higher than the pass rate of the traditional students (80.6%). There was no statistically significant differences between the two groups on preadmission GPA ($t = 0.179(123)$, $P = .858$); however, when compared on several academic variables (test averages in four nursing courses, final GPA, and nursing achievement test scores) the second-degree students outperformed the traditional group on every measure. One of the variables significantly associated with NCLEX-RN success included academic performance measured by GPA, with the second highest correlation being GPA after one semester of nursing courses ($r = .466$, $p = .000$) (Seldomridge & DiBartolo, 2005).

The following discussion will be specific to *nursing* grade point average (NGPA). Six studies from the literature review reported findings of NGPA being significantly correlated with NCLEX-RN success.

Alexander & Brophy's (1997) five-year study of student performance on NCLEX-RN was introduced earlier in this section (see College Admission Tests). The study also found nursing GPA to be significant in predicting success on the NCLEX-RN. When reviewing total nursing GPA (calculation of all nursing courses taken in the program), t values increased in magnitude, with a mean of 3.33 for those who passed the NCLEX-RN ($n=94$) and 2.70 for those who failed ($n=94$) the exam.

The study by Haas et al. was also previously mentioned with the unique finding of SAT scores being inversely related to NCLEX-RN success. The researchers were also interested in determining whether cumulative undergraduate GPA (calculated from all grades earned prior to enrollment in the nursing program) or cumulative nursing GPA (calculated from all grades earned and reflecting total undergraduate GPA) was predictive of NCLEX-RN success. The only statistical difference ($p < .000$) found was in the nursing cumulative GPA, with NCLEX passers earning 0.3 points higher than those who failed the exam.

Jeffreys (2007), introduced in section two as the creator of the NURS Model, collected data on culturally diverse associate degree nursing students to assess entry, progression, graduation, and licensure characteristics of nursing students. The sample for the study was a group of students beginning their first entry-level clinical nursing course ($n=112$). Licensure examination data were available for 69 students, 80% of whom passed ($n = 55$). Nursing course grade averages (NCGA) were calculated for all licensed students; descriptive analyses indicated that all students who attained at least a “B” NCGA passed the licensing examination. As the NCGA declined, the first time pass rates declined to 82% (NCGA = 2.75 – 2.99), 73% (NCGA = 2.50 – 2.74), and 57% (NCGA = 2.25 – 2.49). Half-point categories were used, resulting in statistically significant findings (Pearson’s $r = .345$, $p = 0.004$)

Marshall (1999) examined the extent selected sociodemographic, experiential, and performance variables predicted performance on a nursing assessment test (Mosby Test) and the NCLEX-RN. The researcher developed a conceptual model with twelve independent variables selected to assess the potentially significant sources of variance in the two aforementioned dependent variables. The primary research questions were (1) what independent variables, singularly or in combination, best predicted academic outcomes as assessed by the Mosby Test?

(2) What independent variables, singularly or in combination, best predicted academic outcomes as assessed by the NCLEX-RN? Data were collected from the records of all 160 baccalaureate students who graduated between 1987 and 1993. Results revealed the “best predictive” model for the NCLEX-RN was the nursing GPA, which was calculated by taking the total number of quality points for nursing coursework (defined as nursing theory and clinical courses required in the nursing major) and dividing by the total number of credits (64).

Sayles, Shelton, and Powell (2003) also found GPA for courses toward the nursing degree to be a statistically significant predictor of success in nursing education. The study was designed to determine if successful completion of the associate degree in nursing program and NCLEX-RN success were correlated to scores on the Educational Resources, Inc. NET (Nurse Entrance Test) and Pre-RN examinations. In addition, data were collected from existing educational records of 68 graduates of the program who went on to pass the NCLEX-RN, including sociodemographic data, GPA, SAT scores, grades in nursing courses, and the number of nursing courses repeated. Among the variables in the study statistically significant at was GPA for courses toward the nursing degree ($r = 0.285$, $p = 0.02$). The data analysis revealed that as the GPA improved, so did the likelihood of passing the NCLEX-RN.

Uyehara, Magnussen, Itano, & Zhang (2007) conducted a study at the University of Hawaii that focused on predictors of NCLEX-RN passing and program success and withdrawal in the baccalaureate nursing program. The sample consisted of 280 baccalaureate nursing students admitted to the three-year (six-semester) curriculum over a five-year period after a new curriculum was implemented. The independent variables included pre-admission, within program, and end of program predictors. Of the 218 subjects with reported NCLEX-RN results, 97.25% ($n=212$) reported passing the licensing examination. Significant correlations were

identified between NCLEX-RN success and several variables, including the nursing GPA (n = 218, r = .186, p = .0059). Based on the results of this study, a new strategy to facilitate students' success has been implemented at the university. Students are now notified of being at risk for failing the licensure exam based on four criteria, one being nursing GPA, and encouraged to prepare sufficiently before taking the NCLEX-RN.

Continuing with the examination of studies demonstrating GPA as a predictor of success, the following three studies have reported the *science* grade point average (SGPA) to be significantly correlated with NCLEX-RN performance.

Beeson & Kissling (2001) conducted a retrospective study to identify predictors of success for baccalaureate nursing graduates (n= 505) on the NCLEX-RN. Predictor variables included demographic information, course grades, eight GPA categories, and scores on a standardized nursing test (Mosby Test). Data were obtained from official academic records and NCLEX-RN score reports, and logistic regression was selected to combine continuous and categorical predictor variables into a model to predict the outcome on the licensure exam. In this study, students who passed the NCLEX-RN (n =463) had significantly higher biology GPAs (mean = 3.21) than those who failed (mean = 2.71).

Bentley (2004) found the science GPA to among variables that contributed significantly toward the predication of success on the NCLEX-RN. Data were collected from 139 students (115 traditional and 24 accelerated) and examined for a relationship among selected factors (science GPA, four standardized specialty nursing exams, and nursing clinical course grades) and passage of the NCLEX-RN. This study was unique in that it also compared the traditional students to the accelerated students to determine any differences in achievement. The research questions were: (1) what, if any, is the relationship among selected factors and passage of the

NCLEX-RN of all nursing students at one southeaster university? (2) What, if any, is the difference in the academic achievement of students from an accelerated baccalaureate nursing program and students from a traditional nursing program at one southeastern university? (3) What, if any is the difference in the NCLEX-RN passing rate of graduates of the accelerated baccalaureate nursing program and the traditional nursing program at one southeaster university?

The results from Bentley's (2004) retrospective analysis indicated a statistical significance between science GPA of the traditional students who passed the NCLEX-RN ($n=105$) and those who did not pass ($n=10$). The science GPA (SGPA) is calculated from five science courses required of every student before being admitted into the nursing program. The mean SGPA for traditional students who passed was 3.08 (SD of .46) while the mean for those (traditional students) who failed was 2.53 (SD of .29). There was a statistically significant difference in traditional students' SGPA between those who passed and those who failed ($t = 3.703$, $p = 0.000$). Correlational analysis was used to measure the strength of association between the predictor variables and the outcome. SGPA significantly correlated with NCLEX-RN results for traditional students ($r = .329$, $p < .001$), but not for the accelerated students. The researcher summarized that science GPA was the best predictor for NCLEX-RN success for the traditional students.

Bentley (2006) conducted a follow-up study comparing traditional and accelerated baccalaureate students. Data from 224 participants were included and grouped into one of four categories: (1) Traditional students who passed the NCLEX-RN ($n = 154$); (2) traditional students who failed the NCLEX-RN ($n = 18$); (3) Accelerated students who passed the NCLEX-RN ($n = 4$); and (4) accelerated students who failed the NCLEX-RN ($n = 4$).

Prior to admission, all students completed biology, anatomy and physiology I and II, microbiology, and chemistry. The grades of these courses were used to calculate the science GPA. Additional independent variables included scores on standardized specialty nursing exams, the standardized nursing exit exam, and the number of Cs in nursing clinical courses. Although the students in the accelerated program had a higher passing rate (92.3%) than the traditional students (89.5%), there was no statistically significant difference in the NCLEX-RN pass rates for the two groups ($\chi^2 = 0.347$, $p = .388$). Similar to her initial study, Bentley found that for traditional students, the SGPA was significantly correlated with the NCLEX-RN results ($r = 0.183$, $p = .016$). The findings indicate that when selecting students into nursing programs, admission committees should look closely at the science GPA (Bentley, 2006).

Finally, one remaining study is worth including with regard to grade point average as a predictor for licensure success. Washington & Perkel (2001) collected data from 67 nursing students (47 basic option and 20 accelerated option) and found *transfer* GPA (calculated from all college-level courses taken prior to transferring into the nursing program) to be significant for accelerated nursing graduates ($r = .289$, $p < .049$).

Grade point average affords educators great utility, as it can be calculated at different points throughout the curriculum, using variations of course to assess student performance from admission through graduation. With regard to NCLEX-RN performance, GPA was found to be a significant factor in sixteen of the studies; nursing GPA and cumulative GPA most often demonstrated a correlation, followed by science GPA. Considering the large variation in programs and grading procedures, however, it may be difficult to generalize even the most significant of findings.

2.3.1.3 Course Grades

Several studies have indicated the importance of individual course grades as predictive of NCLEX-RN success. Course grades indicative of student success are typically clustered as progression variables in the literature and most commonly include nursing theory courses, nursing clinical courses, and pre-requisite science courses. The literature review resulted in the discovery of thirteen studies reporting specific nursing course grades as a variable strongly correlated with NCLEX-RN success. Many of the studies have already been introduced and discussed in previous sections of the paper, in which case only a brief overview of the significant findings related to course grades will be provided.

Abbott, Schwartz, Hercinger, Miller & Foyt (2008) conducted a retrospective study of predictors of success on the NCLEX-RN for graduates of an accelerated nursing curricula (ANC) in an effort to evaluate a newly revised curriculum and address declining NCLEX-RN pass rates. The independent variables examined included admission GPA, previous degree (science or non-science), course grades, and standardized nursing exam scores. A convenience sample of 127 ANC graduates who completed the program between 1999 and 2002 and whose NCLEX-RN results were available were included in the study. Abbott et al. reported statistically significant findings with the grades in the senior complex care (SCC) course and NCLEX-RN results ($p = .02$), which, according to the researchers, validates the senior complex care course as preparing students for the licensure exam.

Alexander & Brophy (1997) were introduced earlier as having conducted a five-year study of graduates' ($n = 188$) performance on the NCLEX-RN. The researchers investigated the relationship of admission, progression, and exit variables with NCLEX-RN performance. Data analyses revealed statistically significant differences in course grades between those who passed

and those who failed the exam. Of the 94 students who failed the NCLEX-RN, 19 failed nursing and cognate courses, 26 failed nursing courses, 18 failed cognates, and 31 had no course failures. A logistic regression model using two significant progression variables (Nursing Adult I and Sociology grades) predicted correctly with 88.24%. Another model tested the fit of nursing course grades - Childbearing, Nursing Adult I, and Mental Health predicting accurately 80.63%.

Barkley, Rhodes, & Dufour (1998) hypothesized that achievement in particular nursing courses could predict performance on the NCLEX-RN. The researchers examined the relationship between the letter grades in six nursing courses (Adult Health I and II, Psychiatric/Mental Health, Obstetric Nursing, Pediatric Nursing, and Care of the Critically Ill) and NCLEX-RN performance. It was also predicted that significant relationships could be found between failing the NCLEX-RN and earning Cs in theory courses and earning a C in any clinical course. Data were collected from 81 students in a BSN program and analyzed using descriptive statistics, the Mann-Whitney U technique the chi-square technique, and Pearson Product-Moment correlations. Significant positive correlations were found between performance on the NCLEX-RN and performance in the Pediatric Nursing course ($r = .5873$, $p = 0.000$) and Psychiatric/Mental Health Nursing course ($r = .5825$, $p = 0.000$). In addition, the probability of NCLEX-RN failure increases when a student earns a C in any clinical course or nursing theory course.

Beeson & Kissling's (2001) five-year study of BSN graduates ($n=505$) reported a significant relationship between the number of Cs, Ds, and Fs in nursing courses and the NCLEX-RN results. Independent variables included performance (recorded as a letter grade) in the following pre-nursing courses: Anatomy, physiology, microbiology, psychology, sociology, lifespan development, and developmental patterns of the family. The most significant predictor

of NCLEX-RN success in this study was the number of Cs, Ds, and Fs earned in nursing courses through the junior year ($p = .0038$). Students with no Cs or lower had an NCLEX-RN pass rate of 94%. Those with one grade of C or below had a pass rate of 84%. Students with three or more Cs or lower had a pass rate of 51%. The study also indicated that when selecting students during the sophomore year for upper division, admissions committees should look closely at sophomore nursing course grades and grades in biology courses (p. 126).

Beeman & Waterhouse (2001) used discriminant analysis to identify which of 21 variables could be significant predictors of NCLEX-RN success. The convenience sample consisted of 289 graduates of a nursing program, in either the traditional or accelerated option, from 1995 through 1998. Similar to the Beeson & Kissling study, findings reported the number of C+ or lower grades received in nursing theory courses had the highest correlation with NCLEX performance ($r = -.394$, $p < .001$); the second-highest correlation were course grades in Restorative Nursing I and II ($r = .381$, $p < .0001$; $r = .379$, $p < .0001$). Grades in the introductory nursing foundations course and pathophysiology II were also highly correlated ($r = .367$, $p < .0001$; $r = .349$, $p < .0001$). The discriminant analysis developed in this study was highly accurate, correctly identifying 94% of the students who passed the NCLEX-RN and 92% of those who failed.

Bentley (2004) collected data from 115 traditional and 24 accelerated students, finding that students in both groups who passed the NCLEX-RN made fewer Cs in nursing clinical courses than those who failed the exam. The number of Cs earned in clinical courses was statistically significantly correlated with NCLEX results for accelerated students ($r = -.525$, $p = 0.001$) and traditional students ($r = .363$, $p = 0.001$) in the study. In 2006, Bentley repeated her study, using correlation analysis to measure the strength of association between NCLEX results

and predictor variables for traditional and accelerated students. The number of Cs in clinical courses was again significantly correlated with NCLEX results for both groups of students (accelerated: $r = -0.346$, $p = .012$; traditional: $r = 0.197$, $p = .009$).

Daley et al. (2003) were introduced earlier in the paper with the finding that cumulative GPA as a program variable consistently associated with NCLEX-RN success. In addition, students who were successful on the NCLEX-RN achieved higher final grades for anatomy ($3.2 \pm .6$ versus $2.7 \pm .4$, $p = .009$), pathophysiology ($3.3 \pm .5$ versus $2.5 \pm .5$, $p < .001$), and both the didactic and clinical senior medical-surgical nursing courses (didactic: $3.4 \pm .4$ versus $2.8 \pm .6$, $p < .001$; clinical: $3.5 \pm .5$ versus $2.9 \pm .5$, $p < .001$). These findings are similar to other studies finding higher grades in science and nursing courses are predictive of NCLEX-RN success.

As noted earlier, Jeffreys (2007) studied entry, progression, graduation, and licensure characteristics of 112 associate degree students. Among the variables that influenced first-time pass rate on the nurse licensing exam were grades in specific nursing courses and the number of course withdrawals and failures. A *t*-test for equality of means was statistically significant for the following courses: Medical-surgical nursing 1 ($p = 0.000$); pediatric nursing ($p = .04$); and maternity nursing ($p = 0.005$). An examination of nursing course withdrawals and/or failures revealed that 94% of the students who had no withdrawal and/or failure in nursing courses passed the NCLEX-RN on the first attempt. In contrast, only 50% of students with two withdrawals and/or failures passed on the first attempt. The analysis indicated that the number of nursing course withdrawals and/or failures was inversely correlated with the first time pass rate (Pearson's $r = -0.339$; $p = 0.004$).

Matos (2007) was mentioned earlier, reporting a high correlation with NCLEX-RN success and cumulative GPA who passed. The study also reported that nursing graduates who passed the NCLEX-RN had higher grades in nursing theory courses. A *t*-test comparison was performed between those who did not pass the NCLEX-RN ($n = 18$) and those who passed ($n = 272$) for the 13 nursing course grades included in the study. Seven of those comparisons were significant ($p = .05$), with the strongest associations in Pharmacology (.06), Nursing Competencies (.05), and Issues in Professional Practice (.05).

Seldomridge and DiBartolo (2004) conducted a retrospective descriptive study at a rural, public baccalaureate nursing program to determine variables that best predict NCLEX-RN success and failure. The following five research questions were developed to guide the study: (1) which prerequisites to the nursing major are the best predictors of success/failure on the NCLEX-RN? (2) Which variables occurring after completion of the junior-year nursing courses best predict success/failure on the NCLEX-RN? (3) Which variables occurring between junior-year nursing courses and graduation best predict success/failure on the NCLEX-RN? (4) Which overall combination of variables best predict success/failure on the NCLEX-RN? (5) Can success or failure on the NCLEX-RN be accurately predicted? Data were collected from traditional program graduates from 1991 through 2002, totaling 186 students (174 women, 12 men). A total of 13 independent variables were selected as predictors of success or failure on the NCLEX-RN based on a thorough review of the literature. Grades in pathophysiology showed a high correlation with NCLEX-RN success ($r = .303$, $p = .000$), as did test average in the advanced medical/surgical nursing course ($r = .307$, $p = .000$) and introductory medical/surgical course ($r = .303$, $p = .000$). Patterns of low grades in pre-requisites ($r = -.245$, $p = .000$) and nursing courses ($r = -.342$, $p = .000$) were negatively correlated with NCLEX-RN success.

Logistic regression analysis revealed that a combination of test averages in medical/surgical courses and the score on a standardized nursing test predicted 94.7% of passers and 33.3% of failures. A second model, combining the grade in pathophysiology with the score on the standardized nursing test, predicted 93.35 of the passers and 50% of the failures. The researchers noted that success could be accurately predicted across all models, yet predicting failure was more difficult.

Another study conducted by Seldomridge and DiBartolo (2005) was designed to learn more about accelerated second-degree nursing students and how they differed from their traditional counterparts. The researchers were particularly interested in discovering which variables were strongly associated with NCLEX-RN success for second-degree students. Of the 71 students in the sample, 87% were women and 13% were men; the NCLEX-RN pass rate for the sample was 84.2% (slightly higher than the 80.6% pass rate for the traditional students). Variables significantly associated with NCLEX-RN success included test averages from research ($r = .420, p = .001$), psychiatric/mental health nursing ($r = .411, p = .001$), and both medical/surgical nursing courses (Adult Health I: $r = .398, p = .001$; Adult Health II: $r = .404, p = .001$). Similar to other studies, the researchers found that performance in nursing coursework was strongly associated with NCLEX-RN success.

Uyehara et al. (2007) collected data over a five-year period ($n = 217$) after a new curriculum was implemented in a generic baccalaureate nursing program. The independent variables included pre-admission, within program, and end of program predictors. The NCLEX-RN pass rate for the sample was 97.25% on the first attempt. Significant correlations were identified between NCLEX-RN success and six variables, including course grade in the Nursing Fundamentals course ($r = .195, p = .0038$).

Course grades were reported as a significant finding in fourteen of the thirty-eight studies reviewed, with twelve different courses being identified overall. The course most often associated with passing the NCLEX-RN was medical-surgical nursing, followed by pathophysiology, psychiatric nursing, and fundamentals. Also of interest were three studies finding the total number of Cs or lower correlating with unsuccessful performance on the licensure examination.

2.3.1.4 Standardized Nursing Content Examinations

The relationship between licensure performance and scores earned on standardized nursing examinations was the most commonly investigated. The standardized exams are commercially-prepared and often used as “mock” nursing licensure exams. Exams are available for specialty courses to assess nursing knowledge in relation to a specific patient population (i.e., pediatrics), as well as comprehensive exams which are cumulative in nature. The exams serve to better prepare students for NCLEX-type questions and to evaluate their readiness for the actual licensure examination. A study by Crow et al. found 90% of the baccalaureate programs studied (n = 160) to be using some type of comprehensive examination to predict NCLEX-RN success.

Studies in the current literature found standardized exams in use to be distributed by the following: HESI (Health Education Systems, Inc.), NLN (National League for Nursing), ERI (Education Resources, Inc.), Mosby Assess Test and the Arnett Pre-RN Readiness Exam. The following section will discuss the studies’ results related to standardized nursing examinations as a correlate to NCLEX-RN performance.

HESI

Health Education Systems Incorporated (HESI) examinations increased in popularity when the NCLEX-RN moved to computerized adaptive testing (CAT) format. HESI offers

computer-based specialty examinations for specialty nursing courses, as well as comprehensive exit examinations. The HESI Exit Examination (E²) is constructed by following the test blueprint for the NCLEX-RN, and is typically administered in the last term of a nursing curriculum, (Nibert, Young, & Adamson, 2002). Beginning in 1999, a series of four annual studies examined the predictive ability of the HESI Exit Exam within a single academic year. Findings indicated that in year one (1996 – 1997) the predictive accuracy of the HESI Exit Exam was 97.41% (n = 2,725); in year two (1997 - 1998) 96.49% (n = 3,752); in year three (1998 – 1999); 97.78% (n = 6, 277); and in year four (1999 – 2000) 98.46% (n = 5,903) (Lauchner, Newman, & Britt, 2005; Nibert, Young, & Adamson, 2002). In all four studies, there is no significant difference found in the predictive accuracy regardless of type of nursing program administering the exam, including baccalaureate, associate, or diploma (Lauchner, Newman, & Britt, 2005; Nibert, Young, & Adamson, 2002) As a result of these findings, many programs have incorporated HESI exams into the nursing curricula.

The study conducted by Abbott et al. (2008) was introduced earlier, having collected data on 127 accelerated nursing students, including their scores on the HESI pre-RN examination. The researchers reported statistically significant findings with the HESI scores and NCLEX-RN results ($p = .03$). HESI scores of students who passed the NCLEX-RN were 10% higher than those who failed. Bentley conducted two studies (2004, 2006) comparing the performance of traditional students to accelerated students in a baccalaureate program. In the 2004 study, two HESI exams were found to be statistically significant for traditional students ($n=115$), the maternity specialty exam ($r = .187, p = .001$) and the exit exam ($r = .246, p = .001$); however, for the accelerated students ($n=24$), only the exit exam ($r = .550, p = .001$) was significant for students who passed the NCLEX-RN. In the 2006 study, Bentley reported significant

correlations with HESI exams for both groups as well. For the traditional students ($n = 172$), the highest correlation was the HESI Exit exam ($r = .274$, $p = .006$); in addition, all of the HESI specialty exams (maternity, medical-surgical, psychiatric, and pediatric) were correlated to success on the NCLEX-RN. For the accelerated students ($n = 52$), the highest correlation was the HESI Exit exam ($r = .419$, $p = .002$). The medical-surgical HESI specialty exam ($r = .292$, $p = .036$) was also highly correlated with success for accelerated students.

The study conducted by Daley et al. (2003) was previously introduced. Two cohorts of senior students were studied and two program variables were consistently associated with NCLEX-RN success: final course grade in a senior level course and cumulative GPA. Interestingly, the two cohorts took two different standardized exams. The first cohort ($n = 121$) of students were required to take the Mosby Assess Test; the second cohort ($n = 103$) took the HESI Exit exam. In both cohorts, students who were successful on the NCLEX had significantly higher raw scores, higher percentages of items correct, and higher percentile ranking on their respective standardized examinations. The researchers also reported that the HESI Exit exam demonstrated greater sensitivity, specificity, positive and negative predictive value, and test efficiency compared to the Mosby Assess Test.

NLN

The National League for Nursing (NLN) provides several types of standardized examinations for use throughout nursing curricula, many of which have been utilized to predict NCLEX-RN performance (Tinkelenberg, 2006). In addition to specialty course examinations (i.e., maternity, pediatrics) often used to determine student readiness for progression, the NLN produces three comprehensive examinations: Comprehensive Achievement Test (CAT), Diagnostic Readiness Test (DRT), and Baccalaureate Achievement Test (BAT).

Two studies found the NLN Comprehensive Achievement Test (CAT) to correlate highly with NCLEX-RN success. Alexander and Brophy (1997) included the NLNCAT as one of the strongest indicators of NCLEX success ($p < 0.0001$), along with the SAT verbal score and nursing GPA noted previously. Seldomridge and DiBartolo (2004) reported that for baccalaureate students in the study ($n = 186$) the percentile score on the NLNCAT showed the highest correlation with NCLEX-RN success ($r = .452, p = .000$).

Crow et al. (2004) reported 25% of nursing programs surveyed ($n = 513$) were using the NLN Diagnostic Readiness Test (DRT), which is based on the NCLEX-RN test plan and assesses students' knowledge and nursing abilities required for entry-level practice. In my literature review, Siktberg (1998) was the only researcher to report a correlation between NCLEX-RN success and the NLN DRT. As noted previously, Siktberg collected data on 586 baccalaureate graduates to examine the relationship between thirty-three independent variables and NCLEX-RN performance. Discriminant analysis revealed that the most significant academic variable in predicting NCLEX-RN performance was the NLN Diagnostic Readiness Test. The total score reliability was reported as $r = .88$.

Another comprehensive exam distributed by the NLN is the Baccalaureate Achievement Test (BAT). One study in my literature review profiled accelerated second-degree students, examining variables associated with NCLEX-RN success. In the study, Seldomridge and DiBartolo (2005) found the percentile score on the standardized NLNBAT had the highest correlation ($r = .521, p = .000$) with NCLEX-RN success.

Similar to the aforementioned HESI specialty exams, the National League for Nursing also develops standardized examinations for maternity, pediatrics, adult health, community health, and psychiatric nursing. Several studies have indicated a correlation between specialty

examinations and NCLEX-RN performance and are worthy of discussion at this point. Crow et al. (2004) examined predictors of NCLEX-RN success used by BSN nursing programs. For studies using NLN specialty exams, two examinations were significantly correlated with NCLEX-RN success. The mental health nursing exam ($r = .55$, $p = .02$, $n = 18$) and community health nursing exam ($r = .76$, $p = .02$, $n = 9$).

Stuenkel (2006) explored the predictive value of various standardized tests and achievement measures for NCLEX performance with a focus on those students who were likely to fail. The research questions guiding the study were: (1) to what extent do standardized tests predict NCLEX success for baccalaureate students? And (2) at what point in the curriculum can NCLEX success be predicted for baccalaureate nursing students? Data were collected on 312 baccalaureate students; the overall pass rate for this sample was 77% ($n = 241$). Sixteen independent variables (including five NLN standardized exams) were grouped into three predictor sets based on their relationship to the curriculum. Discriminant analysis revealed that of the five NLN exams administered, the single best predictor of NCLEX-RN success was the community health nursing exam (Wilk's $A = .87$, $p < .05$, $n = 309$).

Barkley et al. (1998) found strong correlations between performance on the NCEX-RN and course grades (as noted earlier); however, one of the strongest correlations with NCLEX-RN success was performance on the NLN Adult Health test ($r = .585$, $p = .000$, $n = 88$). Similarly, Uyehara et al. (2007) also identified significant correlations between NLCEX-RN success and the NLN Adult Health test ($r = .41$, $p < .0001$, $n = 217$), as well as the NLN Maternity test ($r = .16$, $p = .0179$, $n = 217$) and the NLN Pediatric test ($r = .20$, $p = .0025$, $n = 217$).

ERI

Educational Resources Incorporated (ERI) develops and markets a total testing package to track critical thinking and nursing process throughout the nursing program (Sayles et al., 2003). Three of the studies reviewed in the literature found one or more of the examinations offered by ERI (Education Resources, Incorporated) to correlate with NCLEX-RN performance. Matos (2007) determined the relationship between cumulative GPA, nursing course failures, and ERI test scores with successful passage of the NCLEX-RN. Data from 291 students showed that those who passed the NCLEX-RN had significantly higher ERI RN Assessment test scores ($M = 59.03$) than those who failed ($M = 54.89$).

Sayles, Shelton, and Powell (2003) found standardized measures to be useful screening tools for admission to the nursing program and to later predict program and licensure success. The sample included 68 students who graduated and then went on to pass the licensure examination. Analysis of the data revealed variables six variables that correlated with passing the NCLEX-RN. In general, as scores on the NET Math ($r = .311, p = .05$), NET Reading ($r = .351, p = .05$), and NET Composite ($r = .405, p = .05$) improved, so did the likelihood for passing the NCLEX-RN. The Pre-RN Overall exam score also positively correlated with passing the NCLEX-RN ($r = .383, p = .05$).

Sutton (2004) tested a model using prerequisite course grades, nursing course grades, and standardized test scores for associate degree students ($n = 235$). To guide and implement the study, the primary research question was “Is there a relationship between first-attempt NCLEX-RN results and prerequisite course grades, nursing course grades, and standardized examination scores on the RN Assessment test?” (p. 11). Correlations among variables were significant and the model accounted for 66% of variance in graduates’ success on the NCLEX-RN with 98%

prediction accuracy. Higher scores on the RN Assessment test correlated with success on the NCLEX-RN ($r = .633, p < .001$).

Mosby

The Mosby Assess Test was addressed briefly in an earlier section (see HESI) as part of the study conducted by Daley et al. (2003) where data from two cohorts of students were examined. The first cohort of senior students took the Mosby Assess test, while the second cohort took the HESI exam. In the Mosby Assess Test cohort, significant differences existed in the Mosby test scores. Students who were successful on the NCLEX-RN earned significantly higher raw scores (93.8 +/- 10.7 versus 77.5 +/- 11.6, $p < .001$), had higher percentages of items correct (62.5 +/- 7.1 versus 51.5 +/- 7.7, $p < .001$), and a higher percentile rank (55.2 +/- 28.2 versus 19.7 +/- 19.3, $p < .001$).

Beeson and Kissling (2001) also reported that the baccalaureate students in their study ($n = 505$) who passed the NCLEX-RN had higher scores on the Mosby Assess Test ($M = 222.7$) than those who failed ($M = 184.6$). Mosby Assess Test scores and course grades at the end of the junior year were the best combination of variables for predicting whether a student would fail the NCLEX-RN. The analysis also indicated that for each increase of 10 percentage points on the Mosby Assess Test, the odds of failing decreased by 150 per cent (p. 124).

Uyehara et al. (2007) included both NLN and Mosby exams as independent variables in their study of nursing program and NCLEX-RN success. Significant correlations were identified between NCLEX-RN success and the Mosby Assess Test ($r = .240, p = .0003, n = 217$). The NLN exams also correlated significantly, however, that information was reported earlier (see NLN).

Arnett

One study in the review of literature studied the Arnett Pre-RN Readiness Examination test scores as a predictor of success on the NCLEX-RN (Washington & Perkel, 2001). In this study, data were collected from 67 graduates (47 basic option and 20 accelerated option) completing graduation requirements in 1998. Using logistic regression techniques, the Arnett test significantly correlated with NCLEX-RN ($p = .012$).

2.3.1.5 Method and Extent of NCLEX-RN Preparation

Upon graduating from any type of nursing program, new graduates are commonly encouraged to prepare for the licensure examination. A large number of commercially-available preparation courses, review books, and online materials are becoming increasingly available, yet very few studies have explored the effect of NCLEX-RN preparation on exam results. In the review of literature, three studies indicated a significant correlation between the method and extent of preparation and NCLEX-RN performance.

Crow et al. (2004) surveyed 513 BSN programs to determine specific interventions used to assist in preparing graduates for success on the NCLEX-RN. The most frequently used interventions included academic referral (82.5 percent, $n = 132$), commercial review course (52.5 percent, $n = 92$), social support referrals (56.7 percent, $n = 91$), and computerized (online) reviews (53.8 percent, $n = 86$). Slightly more than one-fourth used faculty-led reviews (26.3 percent, $n = 42$). Some of the commercial review courses identified by the respondents included ERI, Kaplan, HESI, and American Nurses' Review.

Beeman and Waterhouse (2003) conducted a qualitative study to explore post-graduation factors that might predict student performance on the NCLEX-RN. These factors may include, but are not limited to, participating in a review course, work experience, extent and type of individual study, and major life events. The convenience sample included 30 students

who graduated from a baccalaureate nursing program, twenty-nine of the students completed the accelerated program and one completed the traditional program. Three variables were significantly correlated with having passed the NCLEX-RN. The total number of hours studied ($\rho = .648, p < .022$), the number of hours studied the week before taking the NCLEX ($\rho = .585, p < .045$), and having studied new nursing-related material ($\rho = -.769; p < .005$). Interestingly, studying new material demonstrated the strongest correlation, but it was negative, which may suggest that studying new material is associated with failing the licensure exam.

The availability of commercial review courses is expanding, and as such, their affect on licensure pass rates should be examined. Schools of nursing take different approaches to offering review courses, such as integrating faculty-led NCLEX review sessions throughout the program, while others arrange for commercial review courses to be delivered at the end of the nursing program. Though faculty may recommend a review course to graduates, it is often the students' personal decision to take a review course or not. Findings from qualitative interviews with baccalaureate graduates found that although 18 out of 19 study participants completed a commercial review course, only one participant felt that it helped (Eddy & Epeneter, 2002). Crow et al. (2004) reported the use of a commercial review course as a significant intervention, correlating with NCLEX-RN success; while Beeman and Waterhouse (2003) found no relationship between taking a review course and NCLEX-RN success.

Beeman and Waterhouse (2003) examined the element of time as a variable; more specifically, the number of weeks that pass between the students' graduation and taking the licensure examination, which may represent preparation time. The participants in the study ($n = 12$) averaged nine weeks between graduation and taking the NCLEX-RN, and revealed no significant relationship to pass/fail examination status. Similarly, Eddy and Epeneter (2002)

interviewed graduates of a baccalaureate program regarding the time frame from graduation to exam. The mean number of weeks was 3.77 (SD = 1.79) for participants who failed the exam; students in this group also reported feeling pressured by family, peers and employers to take the exam earlier than they would have liked. The mean number of weeks for the passing group was 5.55 (SD = 1.79). Although an association between graduation and taking the exam seemed apparent, it was not significant.

There also exists a general perception that students who work full-time after graduation will have less time to prepare for NCLEX, which potentially results in a higher incidence of licensure failure. Two studies examined this particular relationship but neither found the number of hours worked to significantly correlate with performance on the NCLEX-RN (Beeman & Waterhouse, 2003; Tinkelenberg, 2006).

In summary, academic predictors were successfully identified by some studies, though the unique characteristics of program tracks, curricula, faculty, and the student population make even the most significant of findings difficult to generalize. The variables demonstrating the most significance include standardized nursing examinations, nursing course grades (with the medical-surgical nursing course being cited most often) and grade point average (with nursing GPA and cumulative GPA being reported as most predictive of licensure performance).

2.3.2 Nonacademic Variables

Nonacademic variables can include demographic, personal, and social factors that alone, or in combination, can influence student motivation and achievement. Studies are limited with regard to the predictive ability of nonacademic factors on NCLEX-RN success, particularly with

the second-degree student population. A discussion of studies finding a significant correlation between non-academic variables and performance on the licensure examination is offered.

2.3.2.1 Demographic Variables

Campbell and Dickson's (1996) integrative review of BSN studies (n = 47) revealed 19 studies to have examined the role of non-academic factors in retention, graduation, or NCLEX success. Studies of specific demographic characteristics that most often demonstrated significance in predicting NCLEX-RN success included age (n = 5), race/ethnicity (n = 2), finances (n = 2), and educational level of parents (n = 2). Self-enhancement variables most often demonstrating significance in predicting NCLEX-RN success included test anxiety (n = 2) and self-esteem (n = 1). Overall, the researchers found non-cognitive factors to be weak predictors of student success. Studies addressing specific demographic variables are discussed further.

Age, Ethnicity, and Gender

Beeson and Kissling (2001) also identified age among the demographic predictor variables for NCLEX-RN success. Several academic predictors were also identified in this study, but were discussed earlier. Data from 505 students revealed that students of nontraditional age (23 years and older) tended to have a higher passing rate (95.7%) than those of traditional age (88.3%). Consistent with these findings, other studies of second-degree programs found the more mature, non-traditional students to have higher pass rates on the licensure exam than the younger, traditional students (Bentley, 2006; Seldomridge & DiBartolo, 2005).

Crow et al. (2004) analyzed data from baccalaureate programs nationwide to determine data used to predict NCLEX-RN success. Ethnicity was the only demographic variable significantly correlated to NCLEX-RN success. The percentage of white students was positively

correlated ($r = .19$, $p = .02$, $n = 143$) with passing the NCLEX-RN; the percentage of Hispanic students was negatively correlated ($r = -.25$, $p = .01$, $n = 105$).

Haas et al. (2004) analyzed data from 351 students and reported that first-time success on the NCLEX-RN can be predicted with a high level of accuracy using existing student data. The academic predictors were discussed in a previous section of this paper. The non-academic predictor variables used for the discriminant function included age, gender, race, and campus location (main or outlying). The function created through the use of the variables was significant (chi square 28.946, $p < .000$). Chi square analysis was also used to determine the relationship between NCLEX-RN success and gender or race. Men failed the licensure examination at a significantly higher rate than women ($p = .064$). The failure of African American students was significantly higher than that of Caucasian students ($p = .056$). Independent *t*-tests used to compare NCLEX-RN passers to those who failed indicated that passers were significantly younger than those who failed ($p = .097$).

Mills et al. (1992) studied accelerated second-degree student success and failure on the NCLEX-RN. Nine years of data were examined ($n = 328$) to determine predictors of successful performance. Significant variables placing students at risk included GPA, gender, and whether or not they were foreign-educated. By the end of the first semester, foreign-educated and male students had a lower probability of passing the NCLEX-RN based on cumulative GPAs. By the end of the second semester, gender was not significant in predicting NCLEX success, but the probability remained low for candidates whose prior education was in a foreign country than for those who had been American-educated.

Sayles, Shelton, and Powell's (2003) study of predictors of success in nursing education reported several academic variables of significance which were previously discussed. Similar to

Crow et al., the one demographic variable achieving statistical significance in this study was ethnicity. Minority students were less likely than their white counterparts to pass the NCLEX-RN ($r = .263$, $p = .03$, $n = 83$).

2.3.2.2 Other Nonacademic Variables

Self-reported Anxiety, Emotions, Role Strain and/or Stress

Arathuzik and Aber (1998) found significant, although low, correlations between specific demographic and personal variables and success on the NCLEX-RN. The seventy-nine students participating in the study were asked to report on a scale from one to ten (“very little” to “quite a lot”) the blocks, or difficulties, they experienced during the undergraduate nursing program. Family demands ($r = -.293$, $p = .05$) and emotions (anxiety, anger, guilt, and loneliness) ($r = -.240$, $p = .05$) both negatively correlated to NCLEX-RN success. A sense of competency in taking tests that require critical thinking and evaluation ($r = .245$, $p = .05$) and English as the primary language spoken at home ($r = .253$, $p = .05$) both positively correlated.

Eddy and Epeneter (2002) conducted a qualitative study designed to identify themes to help faculty understand the NCLEX-RN experience from the students’ perspectives. Nineteen baccalaureate graduates were selected, ten of whom were successful on the NCLEX-RN on the first attempt and nine who were unsuccessful. Though this study was not intended to predict NCLEX-RN success, findings indicated that those who passed the NCLEX-RN took responsibility for their own learning, were proactive in test preparation, and utilized stress management techniques. Conversely, those who failed tended to attribute their shortcomings to someone else (such as the school), reported being pressured to take the exam before they were ready, and demonstrated less ability to manage stress.

A study conducted by Poorman and Martin (1992), which has not been discussed to this point, examined the role of nonacademic variables in passing the NCLEX-RN. The following research question guided the study: Which of the following variables are the best predictors of NCLEX performance: QPA, SAT, Test Anxiety Inventory (TAI) total score, TAI (Emotionality and Worry subscales), self-perceived student grades, self-predicted NCLEX scores, concentration, negative and positive cognitions, physical symptoms, biggest worry related to NCLEX, and actual NCLEX scores? The sample consisted of 102 senior bachelor's degree nursing students in western Pennsylvania, divided into two groups: those who passed the NCLEX (n = 92) and those who failed (n = 10). Results of the study revealed test anxiety was inversely related to passing the NCLEX ($r = -.31, p < .05$) and the t -tests performed on the two groups (TAI total $t = 3.55$; TAI Emotionality $t = 3.91$; TAI Worry $t = 2.63$) showed a significant difference ($p < .05$) on all three variables, indicating the failing group had higher anxiety. Self-perceived grades (identify the letter grade the best describes your college performance) positively correlated ($r = .43, p < .05$) with NCLEX scores and self-predicted NCLEX score positively correlated with the actual score ($r = .32, p < .05$). In addition, subjects who passed the NCLEX experienced more facilitative thoughts during major nursing exams and were more likely to consider themselves good test-takers than subjects who failed the exam (p. 30).

Experience in Healthcare

Preston (2007) explored the possible relationships between 27 admission factors and student success in a pre-licensure nursing program. Six admission factors were found to positively correlate with first-time NCLEX-RN success; among them were previous CNA (certified nurse assistant) experience (delta – $p = 0.1276, p < 0.10, n = 432$) and years of previous healthcare experience (delta – $p = 0.0364, p < 0.05, n = 432$).

Program-related and Other Variables

Depending on program structure and availability of resources, students may be presented with the option to accelerate if enrolled in a traditional program, or decelerate if enrolled in a second-degree program. Typically, second-degree students are expected to pursue the nursing degree at a full-time pace; however, students experiencing multiple role strain may consider a slower pace more amenable. Conversely, students enrolled in traditional four-year programs may complete coursework in the summer, therefore accelerating their progression for earlier completion. A gap in the literature regarding the overall effects of self-determined program acceleration/deceleration on licensure performance was noted. Preston (2007) reported a negative correlation between additional semesters to complete the educational program and NCLEX-RN success (Delta – $p = -0.0120$, $p < 0.05$, $n = 432$); however, the reason for needing additional semesters was not clear.

In conclusion, the literature does not support one variable, or a specific combination of variables, that can be used to predict performance on the licensure examination with complete accuracy. Variables demonstrating a correlation with NCLEX-RN success were identified; however, the unique characteristics of program, curricula, faculty, and the student population make even the most significant of findings difficult to generalize. Academic variables demonstrating the most significance included standardized nursing examinations, nursing course grades (with the medical-surgical nursing course being cited most often) and grade point average (with nursing GPA and cumulative GPA being reported as most predictive of licensure performance); significant demographic variables include age, gender, and ethnicity. The frequency of the variables studied in the literature is presented in Table 3; the findings of each study reviewed are presented in greater detail in Appendix A.

Table 3 Frequency of Variables Studied to Predict NCLEX-RN Success

	Pre-entry Data	Nursing Course Grades	Science Course Grades	GPA	Standard Nursing Exams	Demographic Data	Other
Abbott et al.	+	+		+	+	+	
Alexander & Brophy	+	+		+	+		
Arathuzik & Aber				+			+
Barkley et al.		+			+		
Beeman et al. (2001)	+/-	+				-	
Beeman et al.(2003)						-	+/-
Beeson & Kissling		+	+	+	+	+	
Bentley (2004)		+		+	+		
Bentley (2006)		+		+	+		
Campbell & Dickson			+	+		+	
Crow et al.	-				+	+	+
Daley et al.		+		+	+	+	
Eddy & Epeneter							+
Haas et al.	+			+		+	
Jeffreys		+	-	+		-	
Lauchner et al.					+		
Marshall		+		+		-	
Matos		+		+	+		
Mills et al.				+		+	
Newman et al.					+		
Nibert et al. (2001)					+		
Nibert et al. (2002)					+		
Poorman & Martin	+			+			+
Preston	+		-			+	
Sayles et al.	+/-	+		+	+	+	
Seldomridge et al. (2004)		+	-	+	+		
Seldomridge et al. (2005)	+	+		+	+	-	
Siktberg	-			+	+	-	
Stuenkel	+			-	+	-	
Sutton		+	+		+		
Uyehara et al.		+		+	+		
Washington & Perkel	+		+	+	+	-	

+ The variable was studied; results were significant

- The variable was studied; results were not significant

+/- The variable was studied and produced mixed results

Other: Variables studied also included test anxiety, emotionality, and positive cognitions

3.0 METHODOLOGY

3.1 PURPOSE

This study was to examine the relationship between selected variables and pass/fail performance on the National Council Licensure Examination for Registered Nurses (NCLEX-RN). The selected variables included HESI test scores, nursing course grades, grade point averages, age, gender, and ethnicity. A secondary aim of the study was to compare traditional and second-degree students with respect to group constitution and performance to determine what, if any, significant differences exist.

3.2 DESIGN

In nonexperimental research, the retrospective design is one type used to explore a correlation, or association, between two variables. Retrospective investigations link a particular outcome with antecedent factors, phenomena that occurred before the study was initiated. (Polit & Beck, 2008). In this study, the outcome being investigated (dependent variable) was performance on the NCLEX-RN licensure examination. The antecedent factors (independent variables) included demographic (age, ethnicity, gender, and program track) and academic variables (GPA,

standardized nursing exam scores, and nursing course grades) which were examined to determine if a relationship to the outcome (NCLEX-RN performance) exists.

The mere existence of a relationship between any two variables does not prove that one variable has caused the other; in fact, it is risky to infer causality in correlational research (Polit & Beck, 2008, p. 272). However, correlational research plays an important role in nursing education, as many of the variables of interest are not amenable to manipulation and experimentation. It is an effective and efficient means of collecting data about a problem (i.e., a nursing program with a declining NCLEX-RN pass rate) and one that is “often strong in realism and has an intrinsic appeal for the solution of practical problems” (Polit & Hungler, 1999, p. 198).

A secondary aim of the study was to compare traditional students to second-degree students in the same baccalaureate nursing program with respect to group constitution and academic performance. This type of comparison is referred to as between-subject designs and was used to illuminate the central issue under investigation, performance on the licensure examination (Polit & Beck, 2008).

3.3 SAMPLE AND SETTING

A total of 120 baccalaureate nursing graduates were selected from the Department of Nursing at a small, private university in southwestern Pennsylvania. For the purpose of this study, the sample included every graduate from the baccalaureate nursing program since its inception in 2005 through December 2008 who completed the NCLEX-RN licensure examination. For comparative purposes, the sample was divided based on pass ($n = 96$) or fail ($n = 24$) NCLEX-

RN performance. To complete an additional component of comparative analysis, the sample was divided based on program track. Students enrolled in the traditional track (n = 62) are high school graduates without a college degree or registered nurse licensure; students can be admitted into the traditional track directly from high school or can transfer in from another college or university. Students enrolled in the second-degree track (n = 58) already possess a baccalaureate (or higher) degree in a non-nursing discipline and do not hold registered nurse licensure.

Pre-requisite science and math courses must be completed before entering the nursing portion of the baccalaureate program. The first semester of nursing courses begins the second term (spring semester) of the sophomore year for traditional students. Second-degree students begin this first nursing semester in the summer. Once enrolled in the nursing curriculum, traditional and second-degree students will complete identical coursework but at a different pace. The second-degree students are offered an accelerated version of the nursing program, which involves summer sessions.

The university serving as the research site for this study was founded in 1921 and is located in a suburban community approximately fifteen miles from the metropolitan area. The university offers over thirty undergraduate programs and eighteen graduate programs over six academic schools. The School of Nursing and Allied Health, which admitted the first cohort of students in 2003, was renamed the School of Nursing and Health Sciences in 2007. The baccalaureate nursing program is approved by the Pennsylvania State Board of Nursing and accredited by the American Association of Colleges of Nursing (AACN).

During academic year 2007 – 2008, two significant changes were made in the study setting. The first was a curricular change which added a stand-alone NCLEX-RN preparation course to the final semester of the nursing program for all students. Prior to 2007, students

received NCLEX-RN test-taking preparation in their senior-level Professional Practice course. The faculty decided to remove this content from the Professional Practice course and create a stand-alone 2-credit *NCLEX-RN Licensure Preparation for Success* course. In this particular study, 74 of the 120 participants completed the new NCLEX-RN Preparation course; the remaining 46 graduated before the course was implemented. The second significant change of was an increase in the passing requirement for each nursing course. Every student was required to achieve a 75% average on test scores in each course in order to receive a passing grade and progress in the program; the previous test requirement was a 70% average on course examinations.

It is also noteworthy to address the increase in the NCLEX-RN passing standard established by the National Council of State boards of Nursing (NCSBN). The higher passing standard was implemented in April 2007; therefore, students taking the licensure examination after this date were subjected to a higher passing standard than those participants completing the examination prior to April 2007. As illustrated in the Table 5, the nursing program experienced a dramatic decrease in the percentage of students passing the licensure examination on the first attempt, prompting changes in the curriculum and progression criteria. The aforementioned changes, as well as other significant program events, are outlined in Table 4.

Table 4 Timeline of Significant Events By Academic Year

<u>2003-2004</u>	<u>2005-2006</u>	<u>2006-2007</u>	<u>2007-2008</u>
<p>BSN Program Opens</p> <p>Students admitted to traditional and second-degree tracks</p>	<p>August 2005 <i>Test for Success Program</i> is implemented at the School of Nursing</p> <p>December 2005 First class of second-degree students graduate from program</p> <p>March 2006 December graduates accomplish 100% pass rate on licensure examination</p>	<p>April 2007 NCLEX-RN passing standard is increased by National Council of State Boards of Nursing</p> <p>May 2007 First class of traditional students graduate</p>	<p>August 2007 Leadership course is separated into two courses: Professional Practice and NCLEX Preparation</p> <p>December 2007 Pass rate falls to lowest point at 67%</p> <p>May 2008 Change in progression criteria to require 75% average on test scores</p>

3.4 VARIABLES OF INTEREST

The variables selected for the study were guided by a thorough review of the literature and concepts of Self-determination Theory (competence, autonomy, and relatedness). The selection process also considered the availability of and accessibility to student data and consideration of appropriate statistical analyses. The literature review revealed the potential use of scores of data, most of which are valuable to the nurse educator; however, institution-specific factors related to NCLEX-RN performance must be considered within the context of one's respective program and account for the unique characteristics of students, faculty, and curriculum. For the purpose of this study, performance on the NCLEX-RN was identified as the dependent variable. The independent variables included factors representing competence,

autonomy, and relatedness. The variables selected for the study are presented in detail in the following section.

3.4.1 Variables Representing Competence

Variables related to competence are those typically referred to as academic variables or cognitive factors. Those chosen for this study were most the commonly cited in NCLEX-RN studies: standardized nursing exam scores, individual nursing course grades, and grade point averages.

3.4.1.1 Standardized Nursing Examinations

In this study, the nursing program utilized the standardized HESI tests. Health Education Systems, Incorporated (HESI) developed and distributed standardized computer-based exams to assess students' knowledge within specific content areas and their preparedness for the actual licensure examination. The literature supports the use of the HESI Exit Exam score as a strong predictor of NCLEX-RN success; therefore, it was included in this study. Every student in this particular nursing program was required to take the comprehensive HESI Exit Examination in the final semester of the program. HESI specialty tests were less often reported as predictors of NCLEX-RN performance; however, these test scores may assist with the identification of students at-risk for failing the licensure exam. The students were also required to complete a HESI specialty test in each of the corresponding specialty courses: Pediatrics, Maternity, Adult Health I, Adult Health II, Psychiatric, and Community Health.

The HESI test score earned by the student reflects an application of a proprietary HESI Predictability Model (HPM) to the student's raw score. The HESI score can range from 0 to over 1,000, and can be as high as 1,500 (depending on the difficulty level of the exam.). The

HESI specialty test scores provide students and faculty with valuable information regarding the students' knowledge of specific content area and the potential need for remediation. The nursing program which served as the setting for this study required a score of 900 on each of the HESI specialty tests; students who did not achieve a 900 were required to complete content-specific remediation. The HESI Exit Exam score is reportedly predictive of NCLEX-RN performance. In this study, students with an Exit Exam score of 900 were expected to pass the licensure examination, scoring at least 850 was considered favorable for passing, and scoring less than 850 was considered a risk for failing the NCLEX-RN.

3.4.1.2 Course Grades

Previous research supports the correlation between grades earned in individual science and/or nursing courses and performance on the licensure examination. The courses varied among the studies; therefore, it was decided that every nursing course (in which a letter grade is earned) would be included in this investigation. The students in both the traditional and second-degree program tracks are required to take the same nursing courses; however, depending on the academic major of their first degree, some of the second-degree students receive credit for courses such as *Nursing Ethics*; when a student transferred in a course grade from different institution, it was not available in the database and therefore not part of the data analysis.

As noted earlier, a change in the progression criteria requires students to achieve a 75% or higher average on test scores to pass the course. The test scores combined with other assignments in the course must average a C or better; students who do not meet the course requirements are required to repeat the course. For the purpose of this study, the course grade earned on the first attempt at the nursing course was used for the data analysis. A student who

does not achieve a passing grade in any two nursing courses (or fails the same nursing course twice) is dismissed from the nursing program.

3.4.1.3 Grade Point Average

Grade point averages (GPAs) were also identified in the literature as factors significantly correlating with NCLEX-RN performance. GPAs can be calculated at various times before, during, and upon completion of a nursing program for a better indication of how admission and/or progression criteria relate to post-graduation outcomes (i.e. passing or failing the licensure examination). The admission GPA is one form of pre-entry data cited in the literature which can reflect the students' most recent academic performance; however, GPA varies greatly depending on the incoming status of the student (entering from high school, transferring from another college, or enrolling in second-degree track). And considering the vast differences in educational preparation, curricula, and geographical nuances, admission GPA was not included as a variable in this study.

Nursing grade point averages (NGPA) were calculated for each student following each semester of nursing course completion using the grade points earned in nursing courses only. There were a total of five end-of-semester NGPAs computed for the data analysis. Nursing education research also supports the use of a cumulative nursing grade point average; this was also included in the study and was calculated upon completion of the baccalaureate program and only included grade points earned in fourteen nursing courses taken at the study institution. Overall cumulative GPA has also been cited in the literature as a strong correlate with NCLEX-RN performance; however, it was difficult to obtain an accurate overall GPA at this institution. Many students (especially those in the second-degree track) transfer in general education courses, pre-requisite science courses, and electives. A transferred grade is assigned the letter

“T” with no grade points in the database; therefore, calculating an accurate overall GPA was difficult. For this reason, overall GPA was not included as a variable in the study.

3.4.2 Variables Representing Autonomy

According to self-determination theory, autonomous decision-making is one of the psychological components necessary to facilitate internalization of goal-directed behavior, where intrinsic factors are more powerful motivators than external regulations of behavior. The student is presented with choices, and as such, regulates autonomous and independent behaviors.

3.4.2.1 Educational Pathway

Career choice is the first of many difficult decisions for any student to consider, but for the student choosing a career as a registered nurse, several other choices are involved. As noted earlier, there are three educational pathways to registered nurse licensure: the diploma school, associate degree programs, and baccalaureate education. Deciding on a particular pathway involves personal and philosophical preferences. Once the pathway is chosen, students face the dilemma of school choice, which in some geographical areas may be limited. The setting for this study, however, is a private university in southwestern Pennsylvania, which competes with fourteen other nursing programs, including six diploma schools, four ADN programs, and four baccalaureate programs. Among the many factors to consider are financial implications, campus location, and travel requirements for clinical sites.

3.4.2.2 Program Track

For most students admitted to the baccalaureate program at this university, the program track is less of a decision-making process. The baccalaureate program under study essentially offers two main tracks: the traditional track for students without a baccalaureate degree and the second-degree track offered to students already possessing a baccalaureate (or higher) degree in a non-nursing profession. During the study period, traditional students were afforded an opportunity to accelerate their progression through the four-year program; this track is referred to as the accelerated traditional track. Traditional students interested in accelerating are required to submit an application and gain department approval. During the time period of this study (2005-2008), only one traditional student opted to accelerate; due to this very small sample, the accelerated traditional track was not investigated as a separate component. The one student was included in the traditional track for data analysis.

3.4.3 Variables Representing Relatedness

With regard to self-determination theory, relatedness involves the need to feel connected to others. It is not surprising that students within a particular school or major begin to feel connected, particularly when curricula are prescribed, which leaves little time for coursework and socialization outside of the major. Within the program, students feel connected to others in their particular cohort, or track, as they progress as a unit. And within each cohort, personal characteristics (ethnicity and gender) may contribute to feelings of relatedness. Students pursuing professional degrees may also begin to experience a sense of professional identity (i.e. registered nurses), which can promote the success of graduates in their future careers.

3.4.3.1 Personal Characteristics

The personal variables of interest for this study assisted with determining a student profile for each program track, and determine if a relationship exists between demographic characteristics and NCLEX-RN performance. Changes in nursing student demographics are being reported nationwide; it is essential for programs to establish a baseline profile to monitor enrollment trends and transitions, which may affect student outcomes. For the purpose of this study, variables representing relatedness included age, ethnicity, and gender.

3.5 INSTRUMENTS AND MEASURES

3.5.1 National Council Licensure Examination for Registered Nurses

The National Council Licensure Examination for Registered Nurses (NCLEX-RN) is developed by the National Council of State Boards of Nursing (NCSBN) to be used by state and territorial boards of nursing to assist in making licensure decisions (NCSBN, 2008b). The examination assesses whether a candidate has the ability to provide safe and effective nursing care upon entry into practice (Wendt & Kenney, 2007a). According to the National Council of State Boards of Nursing (2008b):

Entry into the practice of nursing in the United States and its territories is regulated by the licensing authorities within each jurisdiction. To ensure public protection, each jurisdiction requires a candidate for licensure to pass an examination that measures the competencies needed to perform safely and effectively as a newly licensed, entry-level registered nurse. The National Council of State Boards of Nursing (NCSBN) develops

the National Council Licensure Examination for Registered Nurses that is used by state and territorial boards of nursing to assist in making licensure decisions (2008b).

3.5.1.1 Computerized Adaptive Testing (CAT)

Nurse licensure candidates began taking the NCLEX-RN in computer adaptive testing (CAT) format in 1994; currently, the exam is only available in computerized adaptive testing (CAT) format and is administered at test centers located across the United States (NCSBN, n.d.a). According to the NCSBN, computerized adaptive testing merges computer technology with measurement theory and enables each candidate's test to be assembled interactively (depending on item responses) which accounts for each individual test to be unique (NCSBN, n.d.a). As the candidate answers an item, the computer calculates the candidate's level of ability and selects the next question (from available items in the test bank) based on that ability. The process is repeated until a pass or fail decision can be made. According to the NCSBN, the final decision is not based on the total number of questions answered correctly, but on the difficulty of the items the candidate can answer correctly 50% of the time. After a minimum number of questions has been answered, the computer determines if the candidate's ability is clearly above the passing standard (resulting in passing the exam), clearly below the passing standard (resulting in failing the exam), or too close to determine with certainty (examination continues administering additional test items). (NCSBN, n.d.a). Regardless of the number and types of questions administered, the CAT remains fair to all candidates because it must conform to the NCLEX-RN test plan which controls the inclusion of nursing content, therefore maintaining reliability and validity.

3.5.1.2 Reliability

According to Polit and Hungler (1999) the reliability of an instrument (i.e., licensure examination) is the degree of consistency with which it measures the attribute it is supposed to be measuring (i.e., entry-level nursing competency). Reliability of the licensure examination (NCLEX-RN) is determined through the use of a decision consistency statistic. According to the NCSBN, a decision consistency statistic is used instead of a traditional reliability statistic (such as Cronbach's alpha) because it captures the reliability of dichotomous pass/fail decisions (NCSBN, n.d.b). The decision consistency combines the candidate's ability estimate and standard error to obtain two probabilities: the probability that the candidate's actual ability is above passing, and the probability that the candidate's actual ability is below passing (Bentley, 2004). According to the NCSBN report, *Reliability of the NCLEX Examinations* (n.d.) "the decision consistency of the NCLEX examination is psychometrically sound, normally running between .87 and .92". Knowing that the reliability coefficient is a quantitative index, usually ranging from 0.00 to 1.00 (Polit & Hungler, 1999), the coefficient reported by the NCSBN would be considered stable.

3.5.1.3 Validity

In order to address content validity of the NCLEX-RN, a vast number of examination questions are written by panels of volunteers from around the country representing the spectrum of nursing specialties and practice settings (NCSBN, n.d.b). Because the examination is assessing the candidate's readiness for entry-level practice, is essential that this assessment be current and relevant to nursing practice. The NCSBN conducts a practice (job) analysis every three years, and then uses this analysis to assist in the evaluation of the examination content (Wendt & Kenny, 2007a). As noted by Wendt and Kenny (2007a):

According to professional measurement and educational standards, the content on an examination should be based on a practice analysis that addresses the importance and frequency with which (nursing) activities are performed. The methodologies that were used...met and exceeded the professional standards set by the Joint Standards for Educational and Psychological Testing (p. 78).

The practice analysis is one of the major sources of evidence that supports the validity of the licensure examination. In addition to the practice analysis, the NCSBN conducts a procedure called the Face Validity review; during this process, real and simulated examinations are read by experienced test item developers to ensure that a balance of nursing content is on face, representative of the domain of nursing (NCSBN, n.d.b.).

Because the behavior, entry-level nursing practice, is not a concrete variable, it is referred to as a “construct”. The measurement of this behavior, the NCLEX-RN, is constructed to measure entry-level nursing competency. The NCSBN utilizes the Rasch measurement theory to construct the examination scale to produce a valid measure of the entry-level nursing competency (NCSBN Reliability and Validity, n.d.).

The pass/fail decision validity is also addressed using Rasch’s model for dichotomous items. This model, which uses logits (abbreviation for log odds units) as the term of measurement, takes into consideration a person’s ability, item difficulty, and passing standards (O’Neill, 2005). Every three years, the NCSBN board of directors evaluates the passing standard for the NCLEX-RN and determines the need for change. The most recent change in the passing standard occurred on April 1, 2007, when the passing standard was increased from -0.2800 to -0.2100 logits based on the need for entry-level nurses to have a greater level of knowledge, skills, and abilities to practice safely and effectively (Wendt & Kenny, 2007b). Scoring validity

(passing standard) is addressed by implementing pilot questions during the administration of the NCLEX-RN. Each examinee receives at least fifteen “tryout” items which do not factor into the examinee’s score (NCSBN, n.d.b). The responses to the pilot questions are tracked allowing a difficulty level to be assigned before the item becomes an actual NCLEX-RN test question (Bentley, 2004).

The National Council of State Boards of Nursing employs various procedures to ensure that the NCLEX-RN examination is a reliable and valid instrument. This section offered a review of procedures implemented by the Council with regard to reliability assessed through a decision consistency statistic and content validity, construct validity, face validity, pass/fail and scoring validity (passing standard).

3.5.2 HESI Examinations

Included in the set of academic variables selected for this study will be the students’ scores earned on computerized exams originally developed by Health Education Systems, Inc. (HESI). Acquired by Elsevier in 2006, HESI exams are used to assess student competency and evaluate achievement of curricular outcomes (Morrison, Adamson, Nibert, & Hsia, 2005). As previously noted, the review of literature revealed the popularity of computerized testing in nursing programs; in particular, studies in the review reported significant relationships between HESI exam scores and licensure success.

HESI specialty examinations were developed to assess each student’s knowledge of a specific nursing content area, whereas the HESI exit examination was developed to assess the student’s preparedness for the licensure examination. Test items on all HESI exams are written and reviewed by nurse educators and clinicians who evaluate the merit of the items as current

measures of nursing practice (Morrison et al., 2005). The scoring of HESI exams is based on the application of the HESI Predictability Model to the raw score, which produces the HESI score. The HESI score is not a percentage score; it is used to predict the likelihood of student success of the licensure exam (Evolve Learning System, Exam Scoring, 2008).

3.5.2.1 Reliability

With reported decreases in the licensure pass rate, faculty value a valid and reliable predictive measure of licensure success. Such a measure can provide a benchmark for establishing progression criteria and for initiating early remediation strategies to improve overall licensure exam success rates (Newman, Britt, & Lauchner, 2000). According to Morrison et al. (2005):

HESI determines the reliability of the exams by conducting an item analysis on each exam administered and returned to the company for a composite report of aggregate data. Discrimination data are obtained for each test item by calculating a point biserial correlation coefficient. As a measure of the test's overall reliability, a Kuder Richardson Formula 20 is calculated for every exam administered...and recalculated every time a HESI exam is scored. The estimated reliability coefficients for HESI exams ranged from 0.86 to 0.99 (p. 42S).

HESI uses item analysis data from all previous test administrations to ensure that reliability estimates are updated continually.

3.5.2.2 Validity

The methods for determining the validity of the HESI specialty and exit examinations are grounded in classical test theory. Similar to the NCLEX-RN examination process, expert nurse

educators and clinicians establish content validity by evaluating the relevance of content to entry-level nursing practice. Course syllabi from nursing programs are reviewed when developing the specialty course exams, while the NCLEX-RN test blueprint is utilized to define the content for the comprehensive exit examination (Morrison et al., 2005).

The HESI specialty and exit examinations also measure constructs essential to entry-level nursing practice. These constructs, reflected in the NCLEX-RN test blueprint, are defined by nursing faculties and the practice analyses conducted by the National Council of State Boards of Nursing (Morrison et al., 2005; NCSBN National Council Test Plan for NCLEX-RN, 2001). It is also noted by Morrison et al. that the increased use of HESI exams indicate that faculties trust the data reported by the exams; such confidence provides an additional indication of construct validity.

Criterion-related validity refers to the degree to which scores on an instrument correlate with some external criterion (Polit & Hungler, 1999). This type of validity can be used to make inferences from analyses of test scores for the purpose of predicting outcomes on another criterion, such as performance on the NCLEX-RN exam; therefore, HESI scores provide inferences about students' ability to succeed on the licensure examination (Morrison et al., 2005). Four annual validity studies were conducted in consecutive years to determine the accuracy of the HESI exit examination. The aggregate data collected from 19,554 subjects was found to be 96.36% to 98.46% accurate in predicting success on the licensure examination (Lauchner, Newman, & Britt, 1999; Newman, Britt, & Lauchner, 2000; Nibert & Young, 2001; and Nibert, Young & Adamson, 2002). In two different studies, the HESI exit examination was described as 96.42% (Hanks, 1999, p. 12S) and 100% (Daley et al., 2003, p. 395) accurate in predicting NCLEX failures.

According to Nibert, Young, & Britt (2003), published findings indicating the HESI exit examination as a valid and reliable measure for determining students' NCLEX preparedness has led to an increase in the number of nurse educators using the scores as a benchmark for progression. Study findings also reveal that HESI examination scores enable faculty to better assist students to become successful NCLEX candidates (Nibert, Young, & Adamson, 2003; Nibert, Young, & Britt, 2003; Lauchner et al., 1999; Newman et al, 2000).

3.6 DATA COLLECTION PROCEDURES

Approval was obtained from the Institutional Review Boards at both the researcher's educational institution and the university serving as the research site. According to the guidelines set forth by the Code of Federal Regulations (CFR), this study falls into a category of research exempted from federal regulatory requirements. According to information from the University's Institutional Review Board (IRB), the following category is exempt:

Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects Institutional Review Board (Robert Morris University, 2009).

Informed consent was not required from study participants, as the data for the study was limited to existing academic records maintained by the University and no names were included. University and departmental admission records provided demographic information for every student admitted to the baccalaureate nursing program, including program track, date of birth

(optional for the student to supply date of birth), ethnicity, and gender. Program track, gender, and ethnicity were coded categorically and entered into SPSS; age was entered as the number (in years) at the point of program completion.

With regard to the HESI test scores, the researcher was afforded access to the HESI scores as an active member of the Test for Success Committee; this committee oversees the coordination of HESI test administration and maintains the HESI database. The researcher was granted permission to use the HESI scores by the Dean of the School of Nursing and Health Sciences, the Chair of the Test for Success Committee, and the University IRB Committee.

With regard to the collection of nursing course grades, the Director of Institutional Research (DIR) provided de-identified academic records to the researcher. To initiate the data collection process, the researcher provided the DIR with a spreadsheet listing each study participant and corresponding HESI test scores and pass/fail NCLEX-RN results. The DIR added the nursing course grades, replacing each study participant's name with a random subject identification number. This process of de-identifying the data was deemed necessary by the host institution to comply with FERPA regulations.

All earned letter grades were converted to a number from 0.0 to 4.0 based on the standardized University four-point grading scale. Nursing grade point averages (NGPA) were calculated at the end of each semester of nursing course completion. A cumulative NGPA was computed for each participant using the grade points earned in nursing courses.

Individual results of pass/fail performance on the National Council Licensure Examination for Registered nurses (NCLEX-RN) are distributed by the National Council of State Boards of Nursing and maintained by the Dean of the School of Nursing. The results were coded as either pass (1) or fail (0) in SPSS. Permission to access the results was obtained from the

Dean of the School of Nursing at the research site and the IRB; however, it should be noted that licensure verification (passing the NCLEX-RN) is publically available on the State Board of Nursing websites. All of the data was entered into SPSS for analysis.

3.7 DATA ANALYSIS

Data analysis included an examination of the relationship between selected variables and performance on the NCLEX-RN using bivariate descriptive statistics. Inferential statistics were used for between-subjects comparisons of participants based on pass/fail NCLEX performance and comparisons based on program track.

To determine the relationship between the selected variables and NCLEX-RN performance, a point-biserial correlation coefficient was computed for each independent variable. The point-biserial correlation coefficient was used because the dependent variable in this study (pass/fail performance) is dichotomous. The NCLEX-RN result for each student was converted to a numerical measure and then the Pearson correlation formula was used with the converted data.

To examine the differences between the students who passed the NCLEX-RN and those who failed, measures of central tendency and variability were compared for the HESI test scores, course grades, and grade point averages. The parametric procedure for testing differences in group means is the *t*-test. The Independent samples *t*-test was performed on HESI test scores, course grades, and grade point averages to determine if differences between the groups were significant. The same statistical analyses were applied to the between-subjects comparison of traditional students to the second-degree students. Case analysis was conducted to examine

specific cases (students who failed the NCLEX-RN) to determine which variables were most predictive of failure.

In addition to the Pearson correlation, the chi-square test for independence was used to evaluate the relationship between the certain variables and NCLEX-RN performance. Categories of HESI scores and grade point averages were created; the chi-square test was appropriate for categorical frequencies, not the numerical scores. With respect to the demographic variables, and determining their relationship with the NCLEX-RN, different statistical analyses were deemed appropriate. The Pearson point-biserial coefficient was computed for age. Due to the categorical nature of gender and ethnicity, the chi-square test for independence was computed.

4.0 FINDINGS

The primary purpose of the study was to determine the relationship between selected variables and performance (pass or fail) on the National Council Licensure Examination for Registered Nurses (NCLEX-RN). The study participants included 120 graduates from a baccalaureate nursing program in southwestern Pennsylvania. The study variables were selected after a thorough review of the literature and in consideration of the three inherent components of Self-determination Theory: Competence, autonomy, and relatedness.

The independent variables selected for the study included standardized nursing test scores, nursing course grades and grade point averages (GPAs) calculated at various points throughout the program. Age, gender, and ethnicity were also examined. Study participants completed either the traditional (n = 62) or the second-degree (n = 58) track of the baccalaureate nursing program based on previous academic experience. The two tracks were compared for significant differences in constitution and performance.

The dependent variable for this study was pass/fail performance on the National Council Licensure Examination for Registered Nurses (NCLEX-RN). Of the 120 study participants who took the licensure examination, 96 (80%) passed on the first attempt. The participants were compared based on pass or fail performance to determine if significant differences existed between the groups with respect to the selected independent variables.

4.1 SAMPLE DEMOGRAPHICS

The study sample consisted of 120 baccalaureate nursing graduates who completed National Council Licensure Examination for Registered Nurses (NCLEX-RN) between 2005 and 2008. The pass rate for the sample was 80%, with 96 candidates passing the NCLEX-RN on the first attempt. While enrolled in the baccalaureate nursing program, 62 of the study participants (51.7%) were enrolled in the traditional track, which is a four-year program intended for students who do not possess a college degree or registered nurse licensure. The remaining 58(48.3%) completed the second-degree track, which is intended for students who already possess a baccalaureate (or higher) degree in a non-nursing discipline, but do not hold a registered nurse license.

With regard to gender, the study sample included 36 males and 84 females. The male students comprised 30% of the total participant group (n = 120) which is substantially larger than the average male nursing student population; during the period of this study, males students comprised 11.6% – 12.1% of total nursing graduates nationwide (National League for Nursing, n.d.a). With respect to ethnicity, 111 (92.5%) were categorized as white, seven (5.8%) were of African American descent and two (1.7%) were Asian. The study participants ranged in age from 22 to 53 years, with a mean age of 27.54. The number of participants provided an adequate data pool for analysis in this study.

4.2 RESEARCH QUESTION ONE

This section provides the findings related to research question one: *Which, if any, of the selected study variables significantly correlate with performance on the NCLEX-RN?* The selection of study variables for this investigation was guided by a thorough review of relevant literature and the theoretical framework presented earlier in Section 1.5, particularly the concepts of competence and relatedness from Self-Determination Theory. The variables selected to reflect competence were standardized nursing examinations, nursing course grades, and grade point averages. The variables selected to represent relatedness were age, gender, and ethnicity.

4.2.1 Standardized Nursing Examinations

In this particular study, the participants were required to take a total of seven computer-based standardized nursing examinations referred to as HESI tests. Six of the HESI tests are utilized within the curriculum to assess a student's knowledge of specialty nursing content area. Each specialty test consisted of 75 questions and was administered at the end of the corresponding specialty nursing course under proctored conditions. The HESI specialty tests included medical-surgical I and II, pediatrics, maternity, psychiatric/mental health, and community health. The HESI Exit Exam is cumulative in nature and designed to assess the student's readiness for the actual licensure examination. The computer-based Exit Exam consisted of 165 questions and was also administered under proctored conditions at the end of the nursing program.

To determine if any of the HESI tests significantly correlated with NCLEX-RN performance, a point-biserial correlation coefficient (*rpb*) was computed. Table 5 depicts the

results of this analysis, revealing a significant positive relationship ($p < .01$) between each of the seven HESI tests and passing the NCLEX-RN examination. The degree of relationship to NCLEX-RN was strongest among the HESI Exit Exam ($r_{pb} = .568, p < 0.01, n = 120$) and the HESI Maternity exam ($r_{pb} = .506, p < 0.01, n = 120$).

Table 5 Correlation Between HESI Examinations and NCLEX-RN Performance

HESI EXAM	r_{pb}
Exit Examination	.568**
Maternity	.506**
Medical Surgical II	.473**
Community Health	.403**
Medical Surgical I	.327**
Psychiatric/Mental Health	.320**
Pediatrics	.387**

** $p < 0.01$

4.2.2 Nursing Course Grades

The nursing curriculum includes fifteen core courses; students earn a letter grade in fourteen of the courses. Students earning less than the required “C” grade in any NURS course are required to repeat the course. For the purpose of this study, the grade earned on the first attempt at each nursing course was used for the data analysis. Before the correlation coefficient was computed, the letter grade earned by each study participant was converted to a numerical equivalent using a 4.0 scale.

The results of the statistical analysis between nursing course grades and NCLEX-RN performance are presented in Table 6. Using point-biserial correlation, eleven of the fourteen

nursing courses analyzed were determined to have a statistically significant relationship with passing the NCLEX-RN. The number of students enrolled in each course differed and is represented by the column. The courses demonstrating the strongest correlation with passing the NCLEX-RN were NURS4025 Nursing Care of Psychiatric Clients ($r_{pb} .469$, $p < 0.01$, $n = 120$) and NURS4035 NCLEX Licensure Preparation course ($r_{pb} .466$, $p < 0.01$, $n = 74$).

Table 6 Correlation Between Nursing Course Grades and NCLEX-RN Performance

Nursing Courses	Enrollment	r_{pb}
NURS2020 Introduction to Professional Nursing	116	.344**
NURS2015 Pathophysiology	111	.312**
NURS3010 Foundations of Nursing Practice	119	.459**
NURS3020 Management of Adult I	120	.064
NURS3030 Pharmacodynamics	115	.406**
NURS3040 Nursing Research	119	.172
NURS3050 Nursing Care of Mothers and Newborns	120	.433**
NURS3055 Nursing Care of Children and Families	120	.435**
NURS3060 Nursing Ethics	114	.186*
NURS 4015 Community Health Nursing	120	.295**
NURS4020 Management of Adult II	120	.396**
NURS4025 Nursing Care of Psychiatric Clients	120	.469**
NURS3025 NCLEX Licensure Preparation	74	.466**
NURS4040 Preparation for Professional Practice	120	.179

** $p < 0.01$

* $p < 0.05$

4.2.3 Grade Point Averages

Nursing grade point averages (NGPA) were calculated for each participant at various points throughout the nursing curriculum. The grade points earned in each nursing course were used to calculate the NGPA at the end of each semester and at the end of the program. Findings of the point-biserial correlation coefficient are reported in Table 7. All of the computed NGPAs demonstrated a significant positive correlation with passing the NCLEX-RN, with the cumulative NGPA demonstrating the strongest correlation ($r_{pb} = .516$, $p < 0.01$, $n=120$).

Table 7 Correlation Between Nursing Grade Point Average (GPA) and NCLEX-RN Performance

Nursing GPA	r_{pb}
Semester One NGPA	.396**
Semester Two NGPA	.469**
Semester Three NGPA	.442**
Semester Four NGPA	.476**
Semester Five NGPA	.293**
Cumulative NGPA	.523**

** $p < 0.01$

4.2.4 Age, Gender, and Ethnicity

The variables selected to represent the concept of relatedness were age, gender, and ethnicity. Each variable was evaluated separately to determine the association with performance on the NCLEX-RN. A point-biserial correlation coefficient was computed for age. The age of the study participants was recorded at the point of program completion and did not significantly correlate with NCLEX performance ($r_{pb} = .068$, $p = .461$). Gender and ethnicity were evaluated

using chi-square test. The relationship between gender and NCLEX-RN performance was nonsignificant ($\chi^2[1, n = 120] = .357, p = .550$). The relationship between ethnicity and NCLEX-RN performance was determined to be statistically significant ($\chi^2[2, n = 120] = 7.74, p = .021$).

4.3 RESEARCH QUESTION TWO

This section provides the findings related to the second research question: *With respect to the study variables, what differences exist between students who pass the NCLEX-RN and those who fail?* The study variables were analyzed further to determine significant differences between those who passed the NCLEX-RN and those who failed the examination.

4.3.1 Standardized Nursing Examinations

The study participants who passed the NCLEX-RN posted mean HESI test scores between 124 – 203 points higher than those who failed (see Table 8). The Independent samples t-test was computed and determined the difference between the two groups to be statistically significant on all seven examinations ($p < 0.001$). The mean scores of those students who passed the NCLEX-RN were above the acceptable benchmark of 850 on five of the seven HESI tests, and near the 850 benchmark on the remaining two tests. The mean scores of the students who failed the NCLEX-RN were well below the acceptable level of 850 on all seven HESI tests.

Table 8 Comparison of Mean HESI Test Scores Based on Pass/Fail NCLEX Performance

HESI Tests	Passed NCLEX (n = 96)		Failed NCLEX (n = 24)		T
	M	SD	M	SD	
Medical-surgical I	840.17	185.6	689.54	126.2	- 3.759**
Medical-surgical II	854.56	161.7	651.21	107.5	- 5.837**
Pediatrics	895.67	157.2	739.75	115.0	- 4.557**
Maternity	954.54	127.2	767.00	135.3	- 6.378**
Psychiatric	915.30	149.2	790.71	147.2	- 3.670**
Community	835.64	153.2	678.25	98.7	- 4.782**
Exit Exam	882.16	97.6	729.42	72.9	- 7.173**

**p < .001

To further explore the relationship between HESI test scores and NCLEX-RN performance, three scoring categories were created. For each category, frequencies and percentages were computed and categorized in relation to NCLEX-RN performance (see Table 9). Chi-square analysis was computed to determine if HESI performance and NCLEX-RN performance are independent variables, or if a relationship exists. All seven HESI tests revealed a significant relationship to the NCLEX-RN ($p < 0.01$). A case analysis revealed fifteen of twenty-four students (63%) who failed the NCLEX-RN had previously scored less than 850 on all seven HESI tests when enrolled in the program; twenty of twenty-four (83%) scored less than 850 on six of the seven HESI tests. In comparison, of the 96 students who went on to pass the NCLEX-RN, nine (9%) scored less than 850 on all seven HESI tests.

Table 9 Comparison of HESI Test Score Categories Based on NCLEX-RN Performance

HESI Test Scores		NCLEX Performance		Total	χ^2
		Passed (n =96)	Failed (n=24)		
Medical-Surgical I	900+	37 (95%)	2	39	12.08**
	850 – 899	8 (100%)	0	8	
	< 850	51	22 (30%)	73	
Medical-Surgical II	900+	38 (100%)	0	38	22.94**
	850 – 899	14 (100%)	0	14	
	< 850	44	24 (35%)	68	
Pediatrics	900+	46 (96%)	2	48	18.54**
	850 – 899	9 (100%)	0	9	
	< 850	63	22 (26%)	85	
Maternity	900+	68 (96%)	3	71	29.54**
	850 – 899	10 (71%)	4	14	
	< 850	18	17 (49%)	35	
Psychiatric	900+	52 (93%)	4	56	16.51**
	850 – 899	12 (92%)	1	13	
	< 850	32	19 (37%)	51	
Community	900+	34 (100%)	0	34	20.00**
	850 – 899	14 (100%)	0	14	
	< 850	48	24 (33%)	72	
HESI Exit Exam	900+	51 (100%)	0	51	31.02**
	850 – 899	10 (100%)	0	10	
	< 850	35	24 (41%)	59	

**p < 0.01

4.3.2 Nursing Course Grades

Grades earned by study participants who passed the NCLEX-RN were compared to those who failed the exam (Table 10). Those who passed the exam earned higher mean course grades in all of the nursing courses. The differences in the means for each course were analyzed using the Independent samples *t*-test. Differences in the mean scores were found to be statistically significant for eleven of the fourteen nursing courses.

Table 10 Comparison of Mean Nursing Course Grades Based on NCLEX-RN Performance

Nursing Courses	Passed NCLEX			Failed NCLEX			<i>t</i>
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	
NURS2010 Intro to Nursing	93	3.71	.3198	23	3.38	.5171	-3.193**
NURS2015 Pathophysiology	87	3.10	.7866	24	2.51	.5649	-3.429**
NURS3010 Foundations	95	3.62	.3690	24	3.09	.5683	-5.585**
NURS3020 Adult I	96	3.64	.3849	24	3.56	.5536	0.822
NURS3030 Pharmacology	92	3.63	.4236	23	3.14	.5106	-4.728**
NURS3040 Nursing Research	92	3.30	.6161	23	3.03	.6657	1.892
NURS3050 Maternity/OB	96	3.71	.4459	24	3.14	.5812	-5.220**
NURS3055 Pediatrics	96	3.42	.5811	24	2.74	.5737	-5.255**
NURS3060 Nursing Ethics	90	3.76	.5040	24	3.50	.7160	-2.001*
NURS 4015 Community	96	3.56	.5221	24	3.11	.8024	-3.358**
NURS4020 Adult II	96	3.23	.3988	24	2.68	.5371	-4.690**
NURS4025 Psychiatric	96	3.48	.4535	24	2.90	.3869	-5.767**
NURS4035 NCLEX Prep	59	2.78	.8723	15	1.67	.8165	-4.466**
NURS4040 Professional Practice	96	3.83	.3060	24	3.68	.4225	1.973

***p* < 0.01

**p* < 0.05

To further examine the grades earned by study participants in relation to NCLEX-RN performance, two grading categories were created: (1) Greater than or equal to a B- and (2) less than or equal to a C+. Frequencies and percentages were computed for each category in relation to pass or fail NCLEX-RN performance. Based on the literature, students earning higher grades would be expected to pass the licensure examination. The actual number and percentage of students in the higher grade category that went on to pass the licensure examination is provided in Table 11. Similarly, students earning a C+ grade or lower would be expected to fail; the actual number and percentage of students in the lower grade category who went on to fail the NCLEX-RN is also included in Table 11. Chi-square analysis was computed to determine the significance of the observed and expected differences; the results reveal a statistically significant relationship between course grade categories and NCLEX-RN performance in the following nine nursing courses: Introduction to Nursing, Pathophysiology, Pharmacology, Maternity, Pediatrics, Community Health, Management of the Adult II, Care of the Psychiatric Client, and the NCLEX Licensure Preparation course.

A closer examination of the data reveal the Psychiatric course as a promising predictor of NCLEX-RN performance with 83% of those earning the higher grade going on to pass the licensure exam and 83% of those earning lower grades going on to fail. The Maternity course also captured 83% of those earning higher grades passing the NCLEX-RN, and 80% of those earning at or below the C+ level failing the exam. A large majority (93%) of those earning higher than a C+ in the NCLEX Preparation course went on to pass the actual examination; 65% of the students earning less than a C+ in the course (and expected to fail) passed the actual licensure examination. This phenomenon could be a reflection of the intensive remediation required of students who earn less than a C+ in the course

Table 11 Comparison of Nursing Course Grades Categories Based on NCLEX-RN Performance

Course Grade		Passed	Failed	Total	χ^2
NURS2010 Intro to Nursing	\geq B-	93 (82%)	20	113	12.45**
	\leq C+	0	3 (100%)	3	
NURS2015 Pathophysiology	\geq B-	63 (84%)	12	75	4.31*
	\leq C+	24	12 (33%)	36	
NURS3010 Foundations	\geq B-	94 (80%)	23	117	1.124
	\leq C+	1	1 (50%)	2	
NURS3020 Adult I	\geq B-	94 (81%)	22	116	2.33
	\leq C+	3	2 (40%)	5	
NURS3030 Pharmacology	\geq B-	91 (82%)	20	111	7.84**
	\leq C+	1	3 (75%)	4	
NURS3040 Nursing Research	\geq B-	88 (81%)	21	109	0.66
	\leq C+	7	3 (30%)	10	
NURS3050 Maternity	\geq B-	95 (83%)	20	115	11.74**
	\leq C+	1	4 (80%)	5	
NURS3055 Pediatrics	\geq B-	88 (80%)	15	110	16.73**
	\leq C+	8	10 (56%)	18	
NURS3060 Nursing Ethics	\geq B-	88 (80%)	22	110	2.090
	\leq C+	2	2 (50%)	4	
NURS4015 Community Health	\geq B-	92 (82%)	20	112	4.82*
	\leq C+	4	4 (50%)	8	
NURS4020 Adult II	\geq B-	89 (85%)	16	105	11.91*
	\leq C+	7	8 (53%)	15	
NURS4025 Psychiatric	\geq B-	95 (83%)	19	114	15.83**
	\leq C+	1	5(83%)	6	
NURS4035 NCLEX Prep	\geq B-	37 (93%)	3	40	8.79**
	\leq C+	22	12 (35%)	34	
NURS4040 Professional Practice	\geq B-	95 (80%)	24	119	0.252
	\leq C+	1	0 (0%)	1	

**p < 0.01, *p < 0.05

4.3.3 Grade Point Averages

Nursing grade point averages (NGPAs) were calculated at the end of each semester of nursing course enrollment and at the end of the program. The mean NGPAs for the study participants who passed the NCLEX-RN were 0.44 to 0.54 points higher than the mean NGPAs of those who failed (Table 12). The Independent samples t-test was computed and the results determined the differences in the mean NGPAs to be statistically significant ($p < 0.01$).

Table 12 Comparison of Mean Nursing Grade Point Averages (NGPA) Based on NCLEX-RN Performance

Nursing GPA	Passed NCLEX (n = 96)		Failed NCLEX (n = 24)		<i>t</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Semester One	3.45	.4919	2.93	.3844	4.827**
Semester Two	3.45	.4142	2.98	.4171	4.965**
Semester Three	3.59	.3926	3.05	.4829	5.662**
Semester Four	3.46	.3729	2.94	.3034	6.317**
Semester Five	3.53	.5201	3.09	.8074	3.326**
Cumulative	3.49	.3186	3.05	.3174	6.002**

** $p < 0.01$

To further examine the relationship of NGPA and NCLEX, the students were compared using a nursing grade point average above or below a 3.00 as the point of separation into two categories. The number and percentage of students in each category was computed and cross-tabulated with performance on the NCLEX-RN; chi-square analysis determined the relationship to be statistically significant ($p < 0.01$) for all five end-of-semester NGPAs and the cumulative NGPA (See Table 13). At least 80% of the students with computed end-of-semester and

cumulative NGPAs of 3.00 and higher went on to pass the NCLEX-RN; semester four yielded the highest percentage with 95% of the students earning 3.00 or higher NGPA achieving success on the licensure examination. The percentage of students earning less than a 3.0 NGPA and subsequently failing the NCLEX-RN was determined; between 37.5% (NGPA5) and 58% (NGPA4) of the students earning less than a 3.00 NGPA went on to fail the examination.

Table 13 Comparison of Nursing GPA Categories Based on NCLEX-RN Performance

NGPA		NCLEX Performance			χ^2
		Passed	Failed	Total	
Semester One	≥ 3.00	77 (87.5%)	11	88	11.60**
	< 3.00	19	13 (41%)	32	
Semester Two	≥ 3.00	83 (86%)	14	97	9.80**
	< 3.00	13	10 (43%)	23	
Semester Three	≥ 3.00	91 (86%)	15	106	19.43**
	< 3.00	5	9 (64%)	14	
Semester Four	≥ 3.00	84 (89%)	10	94	23.76**
	< 3.00	12	14 (54%)	26	
Semester Five	≥ 3.00	82 (85%)	15	97	6.51**
	< 3.00	14	9 (39%)	23	
Cumulative NGPA	≥ 3.00	89 (87%)	13	102	22.37**
	< 3.00	7	11 (61%)	18	

**p < 0.01

4.3.4 Age, Gender, and Ethnicity

For this study, the participants' ages (in years) were determined at the time of program completion. The mean age of participants who passed the NCLEX-RN ($M = 27.3$) was compared to the mean age of those who failed the exam ($M = 28.4$). Using the Independent samples t-test, the difference in the mean ages for the two groups was not statistically significant ($t(118) = 0.739, p = .461$). To further explore the difference between the pass/fail groups with respect to age, a cross-tabulation of age categories and NCLEX-RN performance is presented in Table 14. As noted in the table, the category demonstrating the highest fail rate was the age 40 and over; however, the data should be interpreted cautiously due to the small number of participants in this category ($n = 8$). A chi-square test for independence was computed and the difference between those who passed and those who failed the NCLEX-RN. The difference between the groups with respect to age was determined to be statistically nonsignificant ($\chi^2 [6, n=120] = 10.31, p = .112$).

Table 14 Comparison of Age Categories and NCLEX-RN Performance

	Pass	Fail	TOTAL
20-29	72 (80%)	18 (20%)	90
30-39	20 (91%)	2 (9%)	22
40+	4 (50%)	4 (50%)	8
TOTAL	96	24	120

The findings with respect to gender are presented in Table 15. Using the chi-square analysis, the differences between the pass and fail groups with respect to gender the relationship were determined not to be statistically significant ($\chi^2[1, n = 120] = .357, p = .550$).

Table 15 Comparison of Gender and NCLEX-RN Performance

	Pass	Fail	Total
Female	66 (78.5%)	18 (21.5%)	84
Male	30 (83.3%)	6 (16.7%)	36
Total	96	24	120

The sample for this study was predominantly comprised of Caucasian participants representing 92.5% of the sample; African American (5.8%) and Asian (1.7%) participants represented the minority groups. Table 16 illustrates the NCLEX-RN performance based on ethnicity. A chi-square analysis was computed and determined the relationship between ethnicity and NCLEX-RN performance to be statistically significant ($\chi^2[2, n = 120] = 7.737, p = .021$). These data must be interpreted cautiously due to the small number of participants in the minority categories.

Table 16 Comparison of Ethnicity and NCLEX-RN Performance

	Passed	Failed	Total
Caucasian	92 (83%)	19 (17%)	111
African American	3 (43%)	4 (57%)	7
Asian	1 (50%)	1 (50%)	2
	96	24	120

4.4 RESEARCH QUESTION THREE

This section presents the findings related to the third research question: *With respect to the study variables, what differences exist between traditional students and second-degree students?* A group comparison based on program track was completed to determine significant differences between traditional and second-degree students.

4.4.1 NCLEX-RN Performance

The dependent variable in this study was pass/fail performance on the licensure examination for registered nurses. A comparison of performance based on program track is presented in Table 17. The second-degree students achieved a higher pass rate (88%) than their traditional counterparts (72.5%). the differences between the groups was determined to be significant ($\chi^2[1, n=120] = 4.41, p=.036$).

Table 17 Comparison of NCLEX-RN Performance by Program Track

	Traditional	Second-degree	Total
Pass	45 (72.5%)	51 (88%)	96
Fail	17 (27.5%)	7 (12%)	24
Total	62 (100%)	58 (100%)	120

4.4.2 Standardized Nursing Exams

Using a point-biserial correlation coefficient, the relationship between the HESI tests and NCLEX-RN performance was determined for each program track (Table 18). For the traditional students, all seven HESI test scores significantly correlated with NCLEX-RN performance. For the second-degree participants, five of the seven HESI tests demonstrated a significant relationship with the NCLEX-RN. For both groups, the HESI Exit Exam demonstrated the strongest positive correlation with passing the NCLEX-RN.

Table 18 Correlation Between HESI Tests and NCLEX-RN Performance Based on Program Track

HESI Tests	Traditional	Second-degree
Medical-Surgical I	.327**	.236
Medical-Surgical II	.460**	.425**
Maternity	.550**	.362**
Pediatrics	.399**	.302*
Psychiatric	.344**	.229
Community	.388**	.386**
Exit Exam	.561**	.535**

**p < 0.01

* p < 0.05

The mean scores for each of the seven HESI tests were calculated and are presented in Table 19 in relation to program track. The mean scores for the second-degree students ranged from 50 to 170 points higher than the mean scores for the traditional students. The second-degree students achieved a mean HESI test score above the acceptable 850 benchmark on every

HESI test except Community health; the traditional students achieved the 850 mean score on two of the seven HESI tests. The Independent samples t-test was computed; the differences in the mean scores between the second-degree and traditional students were statistically significant ($p < 0.01$) for all of the HESI tests except the Community Health exam.

Table 19 Comparison of Mean HESI Exam Scores Based on Program Track

HESI EXAM	Traditional (n = 62)		Second-degree (n = 58)		T
	M	SD	M	SD	
Medical-surgical I	728.08	144.60	897.66	184.29	-5.627**
Medical-surgical II	761.13	169.47	870.29	158.68	-3.636**
Pediatrics	793.94	129.66	939.90	159.76	-5.511**
Maternity	867.60	149.07	969.88	130.11	-3.993**
Psychiatric	851.26	139.61	932.21	163.53	-2.922**
Community	779.98	160.18	830.00	150.38	-1.760
Exit Exam	818.02	108.45	887.52	103.71	-3.583**

** $p < 0.01$

4.4.3 Nursing Course Grades

To determine if nursing course grades correlate with NCLEX-RN for each program track, a point-biserial correlation was computed for the fourteen nursing courses in the curriculum (see Table 20). For the traditional students, the relationship between ten of the nursing courses and the NCLEX-RN was determined to be statistically significant, with NURS4055 Nursing Care of Mothers and Newborns having the strongest correlation ($r_{pb} = .638$, $p < 0.01$, $n = 62$). For the second-degree group, five of the nursing courses were revealed to have a significant relationship

with the NCLEX-RN, the strongest being NURS4035 NCLEX Licensure Preparation course ($r_{pb} = .437, p < 0.01, n = 31$).

Table 20 Correlation Between Nursing Course Grades and the NCLEX-RN Based on Program track

Nursing Courses	Traditional		Second-degree	
	N	r_{pb}	N	r_{pb}
NURS2020 Introduction to Professional Nursing	59	.375**	57	.135
NURS2015 Pathophysiology	62	.208	49	.384**
NURS3010 Foundations of Nursing Practice	62	.517**	57	.231
NURS3020 Management of Adult I	62	.109	58	.036
NURS3030 Pharmacodynamics	62	.452**	53	.317**
NURS3040 Nursing Research	62	.158	57	-.022
NURS3050 Nursing Care of Mothers and Newborns	62	.638**	58	.096
NURS3055 Nursing Care of Children and Families	62	.452**	58	.308**
NURS3060 Nursing Ethics	62	.273*	58	-.068
NURS 4015 Community Health Nursing	62	.347**	58	.113
NURS4020 Management of Adult II	62	.501**	58	.166
NURS4025 Nursing Care of Psychiatric Clients	62	.462**	58	.415**
NURS3025 NCLEX Licensure Preparation	43	.455**	31	.437**
NURS4040 Preparation for Professional Practice	62	.212	58	-.087

** $p < 0.01$

* $p < 0.05$

To continue with the comparison of student performance by program track, mean course grades are presented in Table 21. The second-degree students posted mean grades ranging from 0.12 to 0.76 points higher than their traditional counterparts in every course except Management

of Adult I. The Independent samples t-test for equality of means determined the differences in the course grades to be significant for eleven of the fourteen courses.

Table 21 Comparison of Nursing Course Grades Based on Program Track

Nursing Courses	Traditional			Second-degree			<i>t</i>
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	
NURS2010 Intro to Nursing	59	3.48	.4132	57	3.81	.2753	-5.077**
NURS2015 Pathophysiology	62	2.70	.6964	49	3.32	.7512	-4.461**
NURS3010 Foundations	62	3.39	.5373	57	3.64	.7512	-3.051**
NURS3020 Adult I	62	3.64	.4348	58	3.61	.3915	.346
NURS3030 Pharmacology	62	3.48	.4702	53	3.60	.4911	-1.326
NURS3040 Nursing Research	62	2.97	.6434	57	3.54	.4657	-5.560**
NURS3050 Maternity	62	3.48	.5080	58	3.71	.5225	-2.381*
NURS3055 Pediatrics	62	2.95	.6064	58	3.63	.4785	-6.800**
NURS3060 Nursing Ethics	62	3.56	.5682	52	3.87	.5123	-2.943*
NURS 4015 Community	62	3.37	.7017	58	3.58	.4831	-1.846
NURS4020 Adult II	62	2.97	.5426	58	3.28	.5289	-3.205**
NURS4025 Psychiatric	62	3.24	.8954	58	3.50	.4519	-2.929*
NURS4035 NCLEX Prep	43	2.24	.8954	31	3.00	.8944	-3.639**
NURS4040 Prof Practice	62	3.70	.3967	58	3.90	.2157	-3.371**

**p < .01

*p < .05

4.4.4 Grade Point Average

To determine if grade point averages correlated with NCLEX-RN for each program track, a point-biserial correlation was computed for the six computed grade point averages; the results

of this correlation analysis are presented in Table 22. For the traditional students, the relationship between nursing grade point averages and the NCLEX-RN was determined to be statistically significant for all of the computed NGPAs except semester five ($p = .050$). The cumulative NGPA demonstrated the strongest correlation with the NCLEX-RN for the traditional group ($r_{pb} = .582$, $p < 0.01$, $n = 62$). For the second-degree participants, the NGPAs computed for semesters one, two, four, and cumulative were determined to be statistically significant. The NGPA computed after semester one revealed the strongest correlation with the NCLEX-RN for the second-degree group ($r_{pb} = .394$, $p < 0.01$, $n = 58$).

Table 22 Correlation Between Nursing Grade Point Average and NCLEX-RN Based on Program Track

	Traditional	Second-degree
Semester One	.331**	.394**
Semester Two	.494**	.334*
Semester Three	.533**	.151.
Semester Four	.531**	.295*
Semester Five	.250	.228
Cumulative	.582**	.333*

** $p < 0.01$

* $p < 0.05$

To further explore the differences between the groups, the mean NGPAs were compared with respect to program track (see Table 23). The second-degree students earned grade point averages ranging 0.26 to 0.53 points higher than their traditional counterparts. The Independent samples t-test was computed; the difference in the mean NGPAs between the two programs was significant for all of the computed nursing grade point averages.

Table 23 Comparison of Mean Nursing Grade Point Averages Based on Program Track

	Traditional		Second-degree		<i>T</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Semester One	3.09	.4785	3.62	.4252	-6.332**
Semester Two	3.19	.4316	3.58	.3446	-5.418**
Semester Three	3.35	.4597	3.75	.3357	-5.393**
Semester Four	3.19	.4710	3.45	.3743	-3.312**
Semester Five	3.22	.6617	3.68	.4486	-4.422**
Cumulative	3.26	.3649	3.59	.2736	-5.475**

**p < 0.01

4.4.5 Age, Gender and Ethnicity

The age range of the traditional students enrolled in the program was 22 to 46 years, while second-degree students ranged in age from 30 to 53 years. The mean age of the traditional student at the time of program completion was 24.84 years (*SD* 4.983); the mean age of the second-degree student was 30.41 years (*SD* 6.683). The Independent samples t-test was computed and the difference in age between the groups was determined to be significant $t(118) = 5.203, p = 0.00$.

The second-degree student group ($n = 58$) was comprised of 35 (60%) females and 23 (40%) males. The traditional group ($n = 62$) consisted of 49 (79%) females and 13 (21%) males. Chi-square analysis revealed significant differences between the two program tracks with respect to gender ($\chi^2[1, n = 120] = 4.983, p = .026$)

Traditional and second-degree student groups were compared with respect to ethnic representation. Chi-square analysis revealed the differences between the groups with respect to ethnicity were not statistically significant (see Table 24).

Table 24 Comparison of Traditional and Second-degree Students in Relation to Ethnicity

	Traditional	Second-degree	Total
Caucasian	58 (93.5%)	53 (91.4%)	111
African American	4 (6.5%)	3 (5.2%)	7
Asian	0 (0%)	2 (3.4%)	2
	62 (100%)	58 (100%)	120
	$\chi^2 = 2.237, p = .327$		

5.0 DISCUSSION AND CONCLUSIONS

5.1 INTRODUCTION

This study was primarily initiated following a decline in the pass rate on the National Council Licensure Examination for Registered Nurses (NCLEX-RN) by graduates of a baccalaureate nursing program, and the growing interest in determining factors related to NCLEX-RN performance. Also of interest was determining what, if any, differences existed between the traditional and second-degree students enrolled in the same baccalaureate program. The selection of study variables was guided by self-determination and future-oriented motivation theories, as well as a thorough review of relevant literature. Data for the study were obtained from databases within the selected School of Nursing and with assistance from the Director of Institutional Research. The independent variables included standardized HESI test scores in six specialty areas and one cumulative HESI exit examination; grades earned in fourteen nursing courses; and six grade point averages (GPA) calculated at various points throughout the program. Demographic variables were examined, including age, gender, and ethnicity. The dependent variable was pass/fail performance on the NCLEX-RN. The sample included 120 graduates from a baccalaureate nursing program who had taken the NCLEX-RN; 96 of the graduates passed the licensure examination and 24 were unsuccessful. Data analysis included comparisons of groups based on NCLEX-RN performance (pass or fail) as well as program track (traditional

or second-degree). This chapter includes a discussion of the findings in relation to each research question, implications for nursing education and practice, and recommendations for future inquiry.

5.2 THEORETICAL FRAMEWORK

The selection of study variables was guided by a review of the literature and the concepts inherent in self-determination and future-oriented motivation theories. In essence, the theories posit that through the achievement of proximal goals, an individual becomes more motivated to attain future-oriented (distal) goals. With respect to this study, individuals who achieve proximal sub-goals (i.e., succeeding in nursing courses) are thought to be energized to achieve a distal goal (i.e., passing the NCLEX-RN); the underlying motivation is the future-oriented goal, the intrinsic desire to become a registered nurse.

According to Ryan and Deci, (2000a, 2000b), motivation is stronger if the individual values the outcome, and the force to achieve the outcome is intrinsic (as opposed to externally regulated motivation). The process by which one becomes intrinsically motivated can be energized by fulfilling three psychological needs: competence, relatedness, and autonomy. For this study, factors from the literature were selected to represent the three psychological needs. According to self-determination theory, competence refers to performing actions necessary to achieve an outcome; for the purpose of this study, competence was represented by achievement factors: HESI test scores, grades, and GPA. Relatedness involves the need to feel connected to others within a particular group; variables selected to reflect relatedness included age, gender, ethnicity, and program track. Autonomy refers to initiating and regulating one's own choices

and actions; autonomy was not represented by a particular variable in the study, but was captured in the processes of choosing a career as a registered nurse, choosing a baccalaureate program as the educational pathway, and choosing to persist to the point of program completion. Graduation from the nursing program represents achievement of a distal goal, which motivates the individual to meet the next distal goal, passing the licensure examination. Motivation includes all aspects of activation and intention; this study supports the essence of future-oriented goal attainment as a component of achievement motivation.

5.3 DISCUSSION OF RESEARCH QUESTIONS

5.3.1 Research Question One

Which, if any, of the selected study variables significantly correlate with performance on the NCLEX-RN examination?

To answer this question, the relationship between the selected independent variables and the dependent variables were examined using a point-biserial correlation computation for the entire sample (n = 120). All six of the specialty nursing HESI tests (medical-surgical I and II, maternity, pediatrics, psychiatric, and community nursing) and the cumulative HESI Exit Exam were determined to significantly correlate with passing the NCLEX-RN. Consistent with other findings, the HESI Exit Exam was found to have the strongest correlation with passing the NCLEX-RN (Bentley, 2004, 2006; Daley, 2003; Nibert, Young, & Adamson, 2002).

Grades earned in eleven nursing courses were determined to have significant relationship with passing the NCLEX-RN. The courses included NURS 4025 Care of the Psychiatric Client,

NURS 4035 NCLEX-RN Licensure Preparation, NURS3010 Foundations of Nursing Practice, NURS3055 Nursing Care of Children and Families, NURS 3050 Nursing care of Mothers and Newborns, NURS 3030 Pharmacology, NURS 4020 Management of the Adult Health II, NURS 2020 Introduction to Professional Nursing, NURS 2015 Pathophysiology, NURS 4015 Community Health Nursing, and NURS 3060 Nursing Ethics. Two of the fourteen courses were determined not to have a significant relationship with NCLEX-RN performance: NURS 3040 Nursing Research and NURS 4040 Preparation for Professional Practice.

It is unknown if the relationship of the individual nursing courses and NCLEX-RN performance is influenced by the course content, the faculty delivering the content, and/or the degree of higher level thinking required in the course (which would affect one's ability to process higher-level questions on the NCLEX-RN). In this study, the content remained consistent in all of the nursing courses throughout the study period, with the exception of the change in Professional Practice and the stand-alone NCLEX Licensure Preparation course which was addressed earlier. The primary faculty remained consistent throughout the study period in the following courses: NURS3010 Foundations of Nursing Practice, NURS3055 Nursing Care of Children and Families, NURS4020 Management of the Adult II, and NURS 3025 NCLEX Licensure Preparation. The consistent faculty throughout the study period allowed for continuity of content delivery, but may also limit the generalizability of the findings. The course demonstrating the strongest with passing the NCLEX-RN was NURS4025 Care of the Psychiatric Client, which is consistent with other studies (Alexander & Brophy, 1997; Barkley, Rhodes, & Dufour, 1998; and Seldonridge & DiBartolo, 2005).

Using the grade points earned in each nursing course, six grade point averages were calculated at various points throughout the program. Five end-of-semester and a cumulative

NGPAs were calculated for each study participant. All six of the nursing grade point averages correlated significantly with NCLEX-RN performance. The cumulative NGPA was determined to have the strongest relationship, which is consistent with other research findings (Arathuzik & Aber, 1998; Alexander & Brophy, 1997; Marshall, 1999; Sayles, Shelton & Powel, 2003; and Uyehara et al., 2007); however, even within the same baccalaureate program, it is difficult to generalize these findings. Depending on previous academic credits transferred into the program, students may not have completed all of the same nursing courses; therefore grade points earned each semester would differ from student to student. Additionally, during the study period, the NCLEX-RN Licensure Preparation course was added to the curriculum which would have affected the grade points earned for students beginning in the fall term of the 2007 academic year.

The demographic variables examined for this study included age, gender, and ethnicity. Age and gender were not found to have a significant relationship with the NCLEX-RN, but the relationship between ethnicity and NCLEX was statistically significant. This is consistent with the findings of other studies where ethnicity was determined to be associated with performance (Crow et al., 2002; Haas, 2004; and Sayles et al., 2003). In this study, the minority students had a lower pass rate than those students representing the majority culture; however, the minority student population was small and should be interpreted cautiously.

5.3.2 Research Question Two

With respect to the study variables, what differences exist between students who pass the NCLEX-RN and those who fail?

The study participants (n = 120) were separated into two groups based on pass (n = 96) or fail (n = 24) performance on the NCLEX-RN to determine if significant differences existed between the groups. Differences were determined to be significant on all seven HESI tests; students who passed the NCLEX-RN earned higher mean scores than those who failed, which is consistent with the study conducted by Abbot et al. (2008). The HESI Exit Exam was examined for its predictive ability. All of the students scoring at least 850 on the HESI Exit Exam (n =61) went on to pass the actual licensure exam, which supports the predictive ability of the HESI Exit Exam as reported in several studies (Lauchman, Neuman, & Britt, 2005; Nibert, Young & Adamson, 2002). However, the HESI Exit Exam was not as accurate with respect to predicting failure; of the 59 students who scored less than 850, twenty-four (41%) failed the actual licensure examination. Reasons for the subsequent success of those who performed poorly on the HESI Exit Exam could be the intensive remediation and additional NCLEX preparation required of students scoring below the 850 benchmark in this particular nursing program. A case analysis of HESI test scores also revealed that of the 24 students who failed the NCLEX-RN, 63% had scored less than 850 on all seven HESI tests; 71% scored less than 850 on six of seven HESI tests.

Students who passed the NCLEX-RN earned significantly higher mean course grades in every nursing course when compared to those who failed. Individual course grades were categorized as either above or below a C+ and cross-tabulated with NCLEX-RN performance. Differences were determined to be significant for nine nursing courses. Similar to the study conducted by Barkley, Rhodes, and Dufour (1998) the Psychiatric Nursing course was determined to be strongly associated NCLEX-RN performance. A closer examination of student performance in the NURS 4025 Care of Psychiatric Clients course revealed 83% of students

earning greater than a B- went on to pass the NCLEX-RN, while 83% of students earning less than a B- went on to fail. These findings indicate the ability of this course to passers and those who fail, which may prove useful when determining a student's risk for failing the NCLEX-RN. Other nursing courses demonstrating a relationship to the NCLEX-RN included NURS3050 Nursing Care of Mothers and Newborns, NURS2020 Introduction to Professional Nursing, NURS2015 Pathophysiology, and NURS3055 Nursing Care of Children and Families, these findings are consistent with similar studies (Daley et al., 2003; Jeffreys, 2007; Matos, 2007; Seldonridge & DiBartolo, 2004, 2005; Uyehara et al., 2007).

Nursing grade point averages (NGPAs) were calculated at the end of five semesters and at the end of the nursing program. Students who passed the licensure examination had significantly higher mean end-of-semester and cumulative nursing grade point averages than those who failed, which is consistent with other study findings (Alexander & Brophy, 1997; Haas et al., 2004; Jeffreys, 2007; Marshall, 1999; Sayles et al., 2003; and Uyehara et al., 2007). Students were then separated into two NGPA categories, above or below 3.00, to determine the pass and fail rate for students based on NGPA. The percentage of students earning a 3.00 and higher that went on to pass the NCLEX-RN ranged from 80% (semester one) to 95% (semester two). The number of students earning less than a 3.00 who then went on to fail the licensure examination ranged from 37.5% (semester five) to 46% (Cumulative NGPA). Grade point averages can be calculated at different points throughout the curriculum and offer great utility as a predictor variable; however, due to the differences in nursing curricula across schools, it is difficult to generalize even the most significant of findings. Even within this one study, changes in the curriculum, grading policies, and teaching faculty could affect the study outcomes; therefore, the study findings should be interpreted cautiously.

Differences between the participants who passed the NCLEX-RN and those who failed were examined with respect to age, gender, and ethnicity. The mean age of those who passed the NCLEX-RN was 27.3 years, comparable to the mean age of those who failed ($M = 28.4$). An examination of age categories revealed students older than 40 years ($n = 8$) experienced a higher fail rate (50%) compared to their younger counterparts. Similar to other studies, however, the findings with respect to age were not statistically significant (Crow et al., 2004; Sayles et al., 2003). The relationship between gender and NCLEX-RN performance was also found to be nonsignificant, with 78.5% of female participants passing the exam compared to 83.3% of male participants. Ethnicity was determined to be a significant factor in relation to NCLEX-RN performance, with the African American and Asian students having a lower pass rate, 43% and 50% respectively, than the 83% pass rate of the Caucasian students. The small number of minority students in the sample warrant cautious interpretation of the data.

5.3.3 Research Question Three

With respect to the study variables, what differences exist between the traditional students and the second-degree students?

Study participants were separated into two groups by program track: traditional ($n = 62$) and second-degree ($n=58$) for a between-subjects comparison. The second-degree students achieved a significantly higher NCLEX-RN pass rate (88%) than their traditional counterparts (77.5%), which is consistent with the findings in other studies (Beeson & Kissling, 2001; Bentley, 2006; Seldomridge & DiBartolo, 2006). During the research study period (2005 –

2008), the national pass rate averaged 87.5% and the state pass rate averaged 85%; the second-degree students were above both the national and state averages.

The two groups were compared with respect to HESI tests and their relationship to NCLEX-RN performance. As noted in the previous section, all seven HESI tests correlated with NCLEX-RN performance for the sample as a whole ($n = 120$); however, when analyzed as two separate groups, the findings were different. For the traditional students, all seven HESI tests correlated with NCLEX-RN, but for the second-degree students, only five of the tests were correlates. The HESI tests significantly correlating with NCLEX-RN success for the second-degree students included the medical-surgical II, maternity, pediatrics, community and the Exit Exam. For both the traditional and second-degree students, the HESI Exit Exam had the strongest correlation with success on the NCLEX.-RN, which was reported earlier as consistent with other studies. Similar to the findings in Bentley (2004, 2006), second-degree students achieved higher mean scores than the traditional students on all seven HESI tests, achieving the acceptable 850 score on six of seven exams (the mean score on the Community Health HESI test was 830). In comparison, the traditional students achieved the mean 850 benchmark on only two of the HESI tests (Maternity and Psychiatric Nursing). The difference in performance between the two groups was determined to be significant on all of the HESI tests except Community Health. Overall, the second-degree students scored higher on the HESI tests than the traditional students.

Ten of the fourteen nursing courses significantly correlated with NCLEX-RN performance for the traditional students; NURS3050 Nursing Care of Mothers and Newborns demonstrated the strongest correlation with NCLEX-RN success. Comparatively, only five of the fourteen courses correlated significantly for the second-degree students. The strongest

correlation for the second-degree students was NURS4035 NCLEX Licensure. A comparison of performance in the nursing courses, reflected by course grades, found the second-degree students to earn higher mean grades in thirteen of fourteen nursing courses; the differences between the groups was determined to be significant in eleven of the courses. In addition to individual course grades, nursing grade point averages (NGPAs) were calculated at six points in the curriculum. Second-degree students earned high grade point averages than the traditional students; the differences between the means were statistically significant for all six NGPA calculations. Overall, the second-degree students outperformed the traditional students when compared on HESI tests, nursing course grades and grade point averages.

The two groups were compared with respect to age, gender, and ethnicity. The second-degree students were older ($M = 30.41$) than their traditional counterparts ($M = 24.84$). Males comprised 40% of the second-degree cohort, compared to 21% of the traditional group. The differences between the groups with respect to age and gender were determined to be significant. The ethnic constitution of the groups was similar, with Caucasian students representing 91% of the second-degree group and 93.5% of the traditional group. African American students represented 5.2% of the second-degree cohort and 6.4% of the traditional group. The two Asian students were both enrolled in the second-degree track. Differences with respect to ethnic constitution were not statistically significant.

5.4 CONCLUSIONS

Overall, the findings of this study were consistent with previous NCLEX-RN studies where an examination of the relationship between selected variables and NCLEX-RN performance was

conducted. The results of the comparative analysis of traditional and second-degree students yielded interesting findings unique to programs with both types of students enrolled.

Consistent with other NCLEX-RN studies, this study found several factors to significantly correlate with NCLEX-RN performance, including HESI tests, individual nursing course grades, and nursing grade point averages. Data analyses were performed on the sample as a whole, comparatively based on NCLEX-RN performance (pass or fail), and comparatively based on program track (traditional or second-degree). Overall, the HESI Exit Exam was determined to have the most significant relationship with NCLEX-RN performance for both the traditional and second-degree student population. Further examination of HESI Exit Exam scores found the 850 benchmark score to accurately predict (100%) those who passed the NCLEX-RN. Students scoring less than 850 on the HESI specialty tests and the Exit Exam should be offered remedial support to improve knowledge of content areas, gain exposure to higher level NCELX-type questions, and learn test-taking strategies.

Individual nursing courses found to significantly correlate with NCLEX-RN performance differed depending on the type of track in which the student is enrolled (traditional or second-degree track). This finding supports the need for track-specific considerations when establishing progression policies. For the traditional students, NURS 3050 Nursing Care of Mothers and Newborns and NURS3010 Foundations of Nursing Practice were found to correlate with NCLEX-RN performance. Progression guidelines can be established to monitor students earning grades below the level of B- in these courses. Both of these courses are offered early enough in the program to afford timely interventions, including remediation. For the second-degree students, the grades earned in NURS3035 NCLEX Licensure Preparation and NURS4025 Care of the Psychiatric Client correlated with NCLEX-performance. The NCLEX Preparation

course was recently added to the curriculum and, based on the results of this study, should continue to be offered. Unfortunately, this course is offered during the final semester of the term and leaves minimal time for interventions, such as content-specific remediation and test-taking support. Poor performance in the NCLEX Preparation course may warrant repeating the course to improve the students' chance of passing the actual licensure examination. .

A cumulative nursing grade point average of greater than or equal to 3.00 was determined to be a strong predictor of NCLEX-RN success for the traditional students; however, this is calculated just days before graduation and allows for minimal time to offer student support. Graduates can be encouraged to remediate on their own, but ideally, early identification of at-risk students is essential for adequate intervention. The NGPA calculated at the end of the third semester of nursing courses was also found to significantly correlate with NCLEX-RN for the traditional group and would allow for faculty intervention. With respect to the second-degree students, the NGPA calculated after the very first semester of nursing demonstrated the strongest significance, followed by the semester two NGPA. Due to the accelerated nature of the second-degree program, these findings are ideal and would enable faculty to identify students experiencing difficulties at the very beginning of the program. Continuous monitoring of progression and targeted remediation could occur throughout the entire program if deemed necessary.

Overall, the students who passed the NCLEX-RN on the first attempt achieved significantly higher mean scores on all seven HESI tests, higher mean course grades on all fourteen nursing courses, and higher GPAs overall than their counterparts who were unsuccessful on the exam. There was not a significant difference in the age of those who passed versus those who failed; however, of the eight students over the age of 40 who took the NCLEX-

RN, four (50%) failed the first time. This may indicate a greater need for support for individuals in this age group. Previous studies revealed significant differences in the pass rates of female versus male candidates; this study did not find a significant difference in the NCLEX-RN pass rate with respect to gender. Though the number of minority students was small in this study (n = 9) the pass rate of the African American (57%) and Asian (50%) students was significantly lower than the pass rate of the Caucasian (83%) students. Efforts aimed at supporting minority students should be implemented upon admission and can include peer and/or faculty mentoring and support groups; these efforts should continue through to graduation.

The comparison of traditional and second-degree students revealed significant differences in nearly every outcome variable. Second-degree students had a significantly higher NCLEX-RN pass rate (88%) than the traditional students (72.5%). The second-degree students also earned higher scores on HESI tests, as well as higher individual course grades and higher GPAs in comparison to the traditional students. Measures to recruit and retain second-degree students should be implemented as this student population is proving to be successful.

5.4.1 Implications

5.4.1.1 Implications for Nursing Education and Policy

In order to practice as a registered nurse in the United States, nursing graduates must successfully pass the National Council Examination for Registered Nurses (NCLEX-RN). In the midst of a nursing shortage, therefore, a program that produces graduate nurses able to succeed on the licensure examination is essential. Graduate nurses who fail the NCLEX-RN suffer emotionally and financially, due to the loss of gainful employment as a registered nurse.

Educational institutions also suffer when graduates are unsuccessful on the NCLEX-RN; poor

pass rates can lead to withdrawal of state board approval and loss of nationally-recognized accreditation. Considering the impact of licensure failure, an investigation of program-specific factors contributing to the success of program graduates is warranted.

Among the factors found to correlate with NCLEX-RN success include achieving a HESI Exit Exam score of 850 or higher, earning a B+ or higher in the Psychiatric Nursing course and a cumulative nursing grade point average of 3.00 or above. Students who do not achieve the benchmark criteria could be identified as a potential risk for failing the NCLEX-RN. A committee could be formed and policies implemented to monitor student progress, plan and implement remediation activities, provide individualized support, and evaluate student outcomes. All of these efforts have considerable implications for faculty workload; time must be allowed for establishing and monitoring progression criteria, planning and implementing remedial interventions, and program evaluation.

The study identified minority students to be at risk for NCLEX-RN failure; with this knowledge, minority students should also be monitored and perhaps assigned a peer counselor for ongoing academic and emotional support throughout the curriculum. Age and gender were not found to correlate with licensure performance; therefore, those factors should not be considered deterrents for recruitment efforts. In fact, the second-degree students in this study performed significantly better than their traditional counterparts, supporting the need for additional recruitment efforts targeted to this population. Considering their accelerated pace and proven success, second-degree students have enormous potential to improve the nursing shortage.

5.4.1.2 Implications for Nursing Practice

The delivery of care to patients in various healthcare settings is stressed due to the current nursing shortage. The shortage is predicted to affect all 50 states to some degree by 2015, and will last well through the year 2020. The inability of newly hired graduates to pass the NCLEX-RN and function as a registered nurse is an additional stressor on the healthcare system-at-large. Practice settings (i.e. hospitals, long-term care settings, ambulatory facilities) hire new graduate nurses (GNs) under the assumption that the educational institution has prepared the GN to pass the licensure examination and function as an entry-level nurse. The cost to orient a new graduate nurse is approximately \$15,000; the cost to replace the GN who has failed the licensure exam is estimated to range from \$39,000 to \$65,000 (Reiter, Young, & Adamson, 2007). Considering the impact of the cost, unit managers should consider factors related to NCLEX-RN performance when recruiting GNs to secure those demonstrating the best potential for licensure success. This could include evidence of NCLEX-RN readiness; applicants could be asked to disclose Exit Exam scores from their education institution or be required to take some form of a readiness exam as part of the clinical agency's application process. Practice managers should be encouraged by the success of second-degree graduates and focus recruiting efforts on this population.

5.4.1.3 Recommendations for Future Research

The variables examined in this particular study were shown to account for some degree of student success; however, performance on the NCLEX-RN is a multi-dimensional phenomenon. Additional variables related to admission and progression criteria could be examined. For example, admission GPA from high school, transfer GPA from another college, or science GPA to reflect performance in the pre-requisite biological, physical, and social sciences. Standardized

admission test scores (i.e., SAT, ACT) and nursing-specific test scores (i.e., Pre-RN Readiness Test) may prove valuable for admission decisions. Progression criteria could include test averages in nursing courses (instead of the overall course grade) and inclusion of liberal arts courses to the end-of-semester and cumulative GPAs.

Post-graduation factors may also account for student performance on the NCLEX-RN. Students in this particular study were encouraged to take the NCLEX-RN within three months following graduation. An examination of the elapsed time between graduation and taking the exam should be investigated, along with the method and extent of exam preparation after graduation. Researchers should also be encouraged to investigate non-academic variables such as test anxiety, self-perceived test-taking abilities, and stress management. Information regarding external factors should be collected, such as the type of employment and number of hours worked per week, family responsibilities, and previous healthcare experience. Qualitative methods are also encouraged as a means of exploring personal, social, and motivating factors that affect students as they progress through the program and enter the professional culture of nursing.

This study is one of the few to compare traditional and second-degree students. Researchers are encouraged to conduct larger studies with more diverse samples to facilitate the generalization of findings. Overall, research should continue in the area of program evaluation to enable faculty to measure the effectiveness of graduate nurse preparation.

APPENDIX A

REVIEW OF NCLEX-RN STUDIES

Table 25 Summary of NCLEX-RN Studies

Author(s)/Year	Sample	Strongest Correlates with NCLEX-RN Success
Abbott, Schwartz, Hercinger, Miller, & Foyt (2008)	Second-degree BSN (n=127)	Previous degree in science; performance on the HESI exam and performance in senior level nursing course
Alexander & Brophy (1997)	ADN (n=188)	SAT verbal scores, Nursing GPA, NLN Comprehensive Achievement Test Scores. Also significant: Combining NLN Comprehensive Achievement Test scores with course grades in Childbearing, Adult I, and Mental Health
Arathuzik & Aber (1998)	BSN (n=79)	Cumulative nursing GPA, English as primary language, lack of family responsibilities (external block), lack of emotional distress (internal block), and perception of competency in critical thinking
Barkley, Rhodes, & Dufour (1998)	BSN (n=81)	Performance in pediatric and psychiatric/mental health nursing courses, and Adult NLN Achievement Test
Beeman & Waterhouse (2001)	BSN (n=289)	Total number of C+ or lower course grades; individual course grades in selected courses: Wellness, Pathophysiology, Foundations, and Restorative Nursing

Beeman & Waterhouse (2002)	BSN (n=30)	Total number of hours studied for NCLEX-RN and number of hours studied one week prior to taking the examination
/Beeson & Kissling (2001)	BSN (n=505)	Number of Cs, Ds, and Fs in nursing courses; Biology GPA; higher scores on Mosby Assess Test; Age
Bentley (2004)	Traditional (n=115) Second-degree (n=24)	Traditional student indicators: Science GPA, Maternity HESI score, HESI Exit Exam score, and fewer Cs in nursing courses; second-degree student indicators: HESI Exit Exam scores and fewer Cs in nursing courses
Bentley (2006)	Traditional (n=172) Second-degree (n=52)	Traditional Student indicators: Science GPA on admission, HESI Specialty Exam scores (medical/surgical and maternity), HESI Exit Exam scores, and fewer Cs in clinical courses. Second-degree Student indicators: HESI med/surg exam scores, HESI Exit Exam scores, and fewer Cs in clinical courses
Campbell & Dickson (1996)	Review of BSN Studies (n=47)	Best cognitive predictors: GPAs and science course grades; standardized tests (ACT); and demographic variables (age and educational level of parents; and support group
Crow, Handley Morrison, & Shelton (2004)	BSN Programs (n=513)	Admission criteria: Standardized entrance exams Progression criteria: NLN exam scores on Community Health and Mental Health nursing exams Graduation requirements: Exit examination scores and clinical proficiency Intervention: Commercial review course Demographics: Ethnicity

Daley, Kirkpatrick, Frazier, Chung & Moser (2003)	BSN (n=224)	Final course grade for senior-level medical-surgical nursing course and cumulative GPA. Scores on standardized exams (Mosby and HESI)
Eddy & Epeneter (2002)	BSN (n=19)	Qualitative findings: NCLEX “passers” accepted responsibility for their own learning; those who failed attributed others. Passers were reportedly more proactive with test preparation; those who failed reported feeling pressured to take the exam before felt ready and were reportedly less able to manage stress
Haas, Nugent, & Rule (2004)	BSN (n=368)	Ethnicity, age, gender, nursing GPA, and standardized examinations
Jeffreys (2007)	ADN (n=112)	Course grades in MS1 [med/surg nursing], pediatric nursing, and maternity nursing; nursing course grade average of B or higher; and number of nursing course withdrawals or failures
Lauchner, Newman, & Britt (1999)	BSN (n=563) ADN (n=1991) Diploma (n=59)	HESI Exit Examination was found to be an accurate predictor for all programs tested; significantly more accurate when exam is monitored versus unmonitored
Marshall (1999)	BSN (n=160)	NGPA (nursing grade point average)
Matos (2007)	BSN (n=291)	Theory course grades – strongest association in Pharmacology, Issues in Professional Practice and Nursing Competencies; cumulative GPA and ERI RN Assessment scores
Mills, Becker, Sampel, & Pohlman (1992)	Accelerated (n=328)	Cumulative GPA

Newman, Britt, & Lauchner (2000)	BSN (n=796) ADN (n=2,456) Diploma (n=44)	HESI Exit Exam found to be highly predictive; significantly more accurate when administration of exam is monitored than when it is not monitored
Nibert & Young (2001)	BSN (n=1,921) ADN (n=3,651) Diploma (n=16)	HESI Exit Exam found to be highly predictive regardless of program type; however, monitoring the administration of the exam was not a significant factor as it was in previous studies
Nibert, Young, & Adamson (2001)	BSN (n=2,346) ADN (n=3,459) Diploma (n=98)	HESI Exit Exam found to be a highly accurate predictor of NCLEX success
Poorman & Martin (1991)	BSN (n=102)	College GPA and Admission SAT. Test anxiety inversely correlated to passing NCLEX. Strongest correlates: self-predicted NCLEX scores, self-perceived grades, facilitative thoughts during major nursing exams and considering oneself to be a good test-taker
Preston (2007)	ADN (n=572)	Standardized admission tests, years of healthcare experience, AND(certified nurse aide) experience, and entry campus location
Sayles, Shelton & Powell (2003)	ADN (n=83)	Nursing GPA, ERI Nurse Entrance Test (NET) math, reading and composite scores; ERI pre-RN Examination composite score (exit exam), and nursing course grade. Demographic variable of significance was ethnicity
Seldomridge & DiBartolo (2004)	BSN (n=186)	NLN Comprehensive Achievement Test, grade in Pathophysiology, test averages in med/surg nursing courses, nursing course grades

Seldomridge & DiBartolo (2005)	Traditional (n=224) Second-degree (n=71)	Both Groups: Test averages from nursing courses, GPA after 1 semester of nursing and overall GPA, and percentile score on the NLN Baccalaureate Achievement Test. Traditional students only: Preadmission GPA
Siktberg (1998)	BSN (n=586)	NLN Diagnostic Readiness Test score; semester 7 GPA
Stuenkel (2006)	BSN (n=312)	NLN Community Health Achievement Test; NLN Pre-admission exam score and entry GPA
Sutton (2004)	ADN (n=235)	ERI RN Assessment Test; science course grades (A&P, microbiology); and nursing course grades
Uyehara, Magnussen, Itano, & Zhang (2007)	BSN (n=280)	Mosby Assess Test, NLN Adult Health Test, NLN Maternal Newborn Test, NLN Pediatric Test; Nursing GPA; and course grade in Nursing Fundamentals
Washington & Perkel (2001)	Basic BSN (n=47) Accelerated (n=20)	Basic BSN: Arnett Pre-RN Readiness Examination. Accelerated BSN: Arnett Pre-RN Readiness Examination and repeated science courses.

APPENDIX B

IRB APPROVAL



University of Pittsburgh
Institutional Review Board

3500 Fifth Avenue
Pittsburgh, PA 15213
(412) 383-1480
(412) 383-1508 (fax)
<http://www.irb.pitt.edu>

Memorandum

To: Nadine Englert

From: Sue Beers PhD, Vice Chair

Date: 6/24/2009

IRB#: [PRO09040176](#)

Subject: Examination of the Relationship between Selected Variables and Performance on the National Council Licensure Examination for Registered Nurses for Traditional and Accelerated Second-degree Baccalaureate Students at a Private Institution

The above-referenced project has been reviewed by the Institutional Review Board. Based on the information provided, this project meets all the necessary criteria for an exemption, and is hereby designated as "exempt" under section 45 CFR 46.101(b)(4)

Please note the following information:

- If any modifications are made to this project, use the " **Send Comments to IRB Staff**" process from the project workspace to request a review to ensure it continues to meet the exempt category.
- Upon completion of your project, be sure to finalize the project by submitting a "**Study Completed**" report from the project workspace.

Please be advised that your research study may be audited periodically by the University of Pittsburgh Research Conduct and Compliance Office.



M E M O R A N D U M

TO: Nadine Englert
School of Nursing
Robert Morris University
210 John Jay

FROM: Frederick Kohun, Ph.D.
Chair, Institutional Review board
Robert Morris University

DATE: April 15, 2009

SUBJECT: #090402: Examination of the Relationship between Selected Variables and
Performance on the National Council Licensure Examination for Registered
Nurses for Traditional and Accelerated Second-Degree Baccalaureate Students at
a Private Institution

We received your application for consideration of the above referenced study. After receiving additional information concerning your study it has been concluded that there is no interaction with human subjects. Since this protocol does not involve primary research and human subjects, it is exempt from review by the Institutional Review Board.

Your application and additional information will be kept on file.

/ylm

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