ACADEMIC AND NURSING APTITUDE AND THE NCLEX-RN

IN BACCALAUREATE PROGRAMS

by

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Abstract

Predicting NCLEX-RN success has a positive impact on all stakeholders of nursing education. The focus of this study is on the ability to predict NCLEX-RN pass rates based on prenursing academic aptitude variables and the Assessment Technologies Institute (ATI) nursing aptitude program. The prenursing variables consisted of the prenursing GPA, a prerequisite communication course, and the ATI Test of Essential Academic Success (TEAS) composite subscores of TEAS Reading, TEAS Math, TEAS Science, and TEAS English. The ATI assessment included Nursing Fundamentals, Medical/Surgical, Pediatrics, Psychology, and Maternal/Child. This study included 794 participants from four baccalaureate nursing programs in the California State University system. Results of canonical correlation, multiple linear regression, and logistic regression revealed a significant correlation between prenursing, ATI scores, and NCLEX-RN first-try pass rates. Prediction of NCLEX-RN success rate using standardized testing data is supported, with the strongest predictors being the ATI Medical/Surgical and ATI Psychology tests.

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CHAPTER 1: INTRODUCTION

In the United States, in order to practice in the profession of registered nursing, a candidate must pass the National Council Licensure Examination Registered Nurses (NCLEX- RN) (Board of Registered Nursing [BRN], 2010a). This exam determines a student's eligibility to practice as a licensed registered nurse (RN). Since the first registered nurse licensing exam, nursing programs and faculty have evaluated student performance on this exam, and the effects of formal education on student preparation and pass rates. Nursing students must successfully complete a nursing education followed by a recommendation to the State BRN from an accredited nursing school to be eligible to take the licensing exam (BRN, 2010a).

A licensing exam for nurses is in place to protect the public and hold a minimum standard of safety and competency on the graduating nursing student entering the nursing profession. In the paragraphs that follow, the constructs included in this study will be introduced along with background information directly related to the profession of registered nursing. These constructs include (a) the nursing shortage crisis; (b) timeline of nursing licensure; (c) the NCLEX-RN, which is the national licensing exam; (d) prenursing program information which includes undergraduate academics and standardized testing prior to admission to a nursing program; (e) standardized testing, available through several test preparation companies, while in the nursing program; and (f) the significance of this research.

Purpose of Study

The importance of this licensing exam raises questions about the content of nursing curriculum, how students are educated, if there are effective measures that

can be used to correlate student NCLEX-RN results, and what early interventions could be implemented to improve the test outcomes. The purpose of this study is to explore whether academic aptitude and nursing aptitude are correlated with each other and with first-attempt pass rates on the NCLEX-RN in baccalaureate nursing programs. This research has the potential to investigate nursing admission criteria and assist in the identification of students who may struggle with the academic rigor of a nursing education. This research also has the potential to assist nursing faculty in determining which students to provide early intervention or academic remediation to help ensure success in nursing education and in passing the NCLEX-RN on the first try. Specifically, this research will do the following:

1. Present correlations between academic aptitude and nursing aptitude.

2. Assess how well preadmission academic aptitude variables correlate with first-try NCLEX-RN pass rates of nursing students in the California State University system.

3. Assess how well in-program nursing aptitude variables correlate with first-try NCLEX-RN pass rates of nursing students in the California State University system.

4. Determine how well academic aptitude variable and nursing aptitude variables correlate with first-try NCLEX-RN pass rates of nursing students in the California State University system.

Nursing Crisis

Experts have been projecting a nursing shortage for many years. The United States is projecting a nursing crisis, a shortage of qualified nurses that could reach the 1 million mark by 2020 (U.S. Department of Health and Human Services [USDHHS], 2000). The timeline projected in the early 2000s marked 2011 as the year expected to initially feel the effects of this shortage. This 2011

projected outcome has not been realized due to the recent downturn of the national economy forcing nurses, who were planning to retire, to continue working to meet unexpected financial needs (Hader, Saver, & Steltzer, 2006).

Nursing Shortage

Projections in labor growth by the Bureau of Labor Statistics (BLS) included new RN positions in excess of 500,000 by the year 2018. This growth is expected to be the fastest growth prediction of any profession (U.S. Department of Labor, 2010). The decline in the economy, which has delayed the onset of the impending crisis, has caused some to believe that the nursing shortage has passed or will not occur. In July of 2010, the Tri-Council for Nursing released a statement cautioning stakeholders against prematurely stating an end to the crisis. The council suggested that the arrest of the predicted nursing shortage is temporary, secondary to the U.S. economy, and although delayed, the crisis will occur with nursing being the profession most affected (Rother & Lavizzo-Mourey, 2009). The BLS reported again in April of 2011 that in spite of significant job losses in almost every other area, health care continued to grow, adding 37,000 new jobs in 1 month and totaling 283,000 new health care positions in the past year (Bureau of Labor Statistics, 2011) (see Figure 1).

Effects of Aging

In spite of this downward economic turn, the Baby Boomer generation continues to age and will require more health care for age and disease related problems in the not-so-distant future. This aging generation also encompasses a large majority of the nursing workforce who are reaching and surpassing retirement age: "The resources of health care organizations will be strained as this
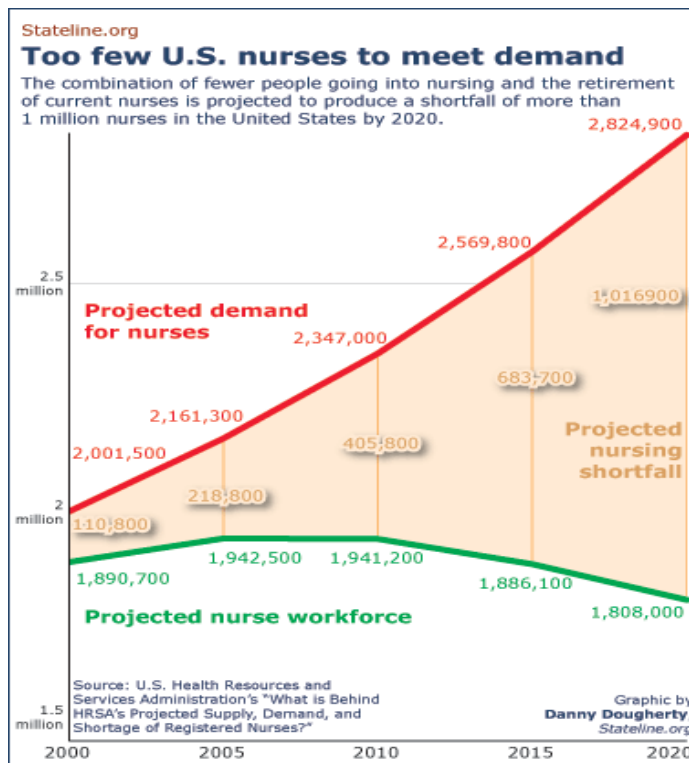
Figure 1. Nursing shortage.
Source: http://www.usnnursing.com/sandiego/San-Diego-Images/Nurshing-Shortage-Graphic.aspx

large demographic cohort moves eventually into old age" (Val Palumbo,

McIntosh, Rambur, & Naud, 2009, p. 229).

In May of 2001, the University of Illinois College of Nursing reported that

there would not be enough caregivers to care for this growing elderly population.

It also suggested that the changes in demographics across America may limit

needed access to health care (Stone & Wiener, 2001). According to a government

report in 2001, a significant nursing shortage, due to an imbalance of supply and

demand, is projected to leave many individuals without adequate available health

care (Government Accountability Office, 2001).

Not only are the clients who need care aging, but so are the current

registered nurses available to care for them. In a 2002 study of nursing faculty, it

was revealed that there are 12% fewer nursing faculty available than the minimum

needed to educate future nurses. The shortage in this study included 16 states and the District of Columbia. This shortage of faculty as a result of retirement is predicted to cause a ripple effect for years to come (Hodges & Williams, 2002). In 2008, the Federal Division of Nursing conducted a survey sampling registered nurses to determine the average age of the current RN population. The survey results indicated that the average age of the RN population had slightly increased from 46.8 in 2004 to 47 in the 2008 survey, an expected trend predicted to continue (USDHHS, 2010).

Nurse Educators

As these nurses and educators retire, the most experienced professionals are leaving a new generation without mentors and teachers. In many areas there is a challenge to find and keep nurse educators when salaries are nearly double if the same nurses work in the clinical setting. New faculty has little to no teaching experience, and the seasoned faculty does not have the time or energy to teach these novice nurse educators. Graduate programs often do not introduce or educate nurses for teaching roles, and few nursing faculty are scholars integrating teaching, learning, and research. Nursing educators are responsible for high quality teaching, which is also the best way to interest students in education, teaching, and scholarship (Benner, Sutphen, Leonard, & Day, 2010).

Nursing Education

The Institute of Medicine (IOM) report regarding the future of nursing called for an increased education level of nurses entering the workforce to meet the needs of society. In order to raise the entry-level of nursing practice, the IOM included the intention to double the number of nurses holding doctoral degrees and expand the nursing workforce of baccalaureate prepared nurses to at least 80%.

Advancing nursing education to these levels would increase the statistics which earlier reported that only 50% of the employed registered nurses hold a baccalaureate or more advanced degree (Robert Wood Johnson Foundation, 2010).

The American Association of Colleges of Nursing (AACN) reported that in 2010 nursing programs in the United States were unable to admit over 67,000 qualified student applicants due to a lack of faculty, resources, clinical space, and budget issues. Of the nursing schools surveyed by the AACN, two-thirds reported a nursing faculty shortage as the number one reason for being unable to accept more students into the nursing program. The AACN also reported an increase in the number of students entering baccalaureate programs in 2010; however, even with this increase the demands for nursing, service will not be met, especially with the *Patient Protection and Affordable Care Act* in place. The Act will allow millions of Americans who did not have access to health care in the past the ability to gain access to healthcare therefore increasing the need for health care workers, especially nurses (Tracy & Fang, 2011). The AACN is working with all stakeholders including colleges, universities, legislators, professional organizations, and the media to bring attention to this issue in hopes of identifying collaborative strategies to address this crisis (AACN, 2011).

Economy

In recent years the downturn of the U.S. economy has wreaked havoc on higher education across the nation. This great recession has resulted in rising unemployment and a drop in real estate values, affecting nearly every population. This situation has also reared its ugly head in the higher education arena, which is where the practice of nursing originates. In a recent statement by the CSU Chancellor's office,

> The $2.1 billion in state funding allocated to the CSU in the 2011-12 budget will be the lowest level of state support the system has received since the 1998-99 fiscal year ($2.16 billion), and the university currently serves an additional 90,000 students. If the system is cut by an additional $100 million, state support would be at its lowest level since 1997-98. (Uhlenkamp & Fallis, 2011, p. 1)

These budgetary decisions mean that all CSU campuses in the system will continue to feel deep cuts in academic services provided and a continued increase in student tuition and fees. With most nursing programs already using waiting lists, and the nursing shortage looming overhead, it is imperative that students know what is expected to enter and succeed in a nursing program. It is also crucial that nursing programs look carefully at admission and promotion policies to ensure that the most qualified students enter nursing school with the potential to survive the program, pass the NCLEX-RN on the first try, and enter the workforce ready to care for the community.

Licensing Timeline

National League for Nursing

Licensure to practice in the profession of nursing came about in the early 19th century. Before 1944, each state took responsibility to establish its own rules, regulations, and licensing exam requirements. The state exams were typically essay questions one of which was answered orally by the candidates (Iowa Board of Nursing, 2003). As interstate travel became more common, this licensing process became a concern for nurses attempting to move and work in other states. To address the issue of licensure recognition in all states, the National League for Nursing (NLN) began a program to establish a nation-wide testing system (Matassarin-Jacobs, 1989).

By 1949, most states had converted to a multiple-choice version of the exam and by 1952 all states were using the national multiple-choice state board

test but still imposed a state-determined passing score (Iowa Board of Nursing, 2003). The NLN continued to administer the five subjects: (a) medical, (b) surgical, (c) obstetrics, (d) pediatrics and (e) psychiatry, paper and pencil test (Damgaard, Hohman, & Karpiuk, 2000).

American Nurses Association

In 1955, the American Nurses Association (ANA) took control of managing the test in its original format, while the NLN continued administration. In 1978, the ANA gave the responsibility of test development and administration to the National Council of State Boards of Nursing (NCSBN). This transfer of the testing process was done to give state boards autonomy over the process of licensure within the state and allow for more effective regulation of nursing practice to protect nurses and the public (NCSBN, 2010). The test remained relatively unchanged until 1982. At this time the test changed from a five part subject related test (geriatrics, medical surgical, obstetrics, pediatrics, and psychology) to encompass an overall nursing approach crossing and integrating these topics using the nursing process: assessment, diagnosis, planning, implementation, and evaluation. The reason behind this change was to ensure that minimal standards required for entry-level into the profession were being upheld (Matassarin-Jacobs, 1989).

NCLEX-RN

In 1986, a new graduate job analysis survey completed by the NCSBN was used to assess whether the licensing exam was consistently evaluating the responsibilities of entry-level nursing practice. Following this study, the test focus changed again, this time to focus on the health needs of the client. The four categories of health needs that new nurses were most expected to perform in were

(a) safe, effective care environment, (b) physiological integrity, (c) psychosocial integrity, and (d) health promotion (Matassarin-Jacobs, 1989).

In 1988, the numeric scoring system of the exam was replaced by pass/fail results because all candidates who achieved a passing score earned a license to practice nursing regardless of the actual numerical value. The biggest change came in 1991, when the NCLEX-RN was reformatted from the traditional paper and pencil exam to a computer adaptive testing (CAT) model (NCSBN, 2010; Wall, Miller, & Widerquist, 1993). The NCSBN became the first organization in the nation to use this technological adaptive test format in order to further individualize the test in relationship to the standards of nursing practice (NCSBN, 2010).

Throughout the history of nursing practice, the licensing exam has evolved to meet the changing dynamics of the nursing profession in order to protect those individuals who use the medical system in the United States. As medical research advances the care and treatment of individuals in the healthcare system and the face of the health consumers continue to evolve with global travel and cultural diversity, the nursing profession must keep pace (Potter & Perry, 2009). Job performance analysis surveys, completed every 3 years by nurses who are in the first 5 years of nursing practice, keep the NCLEX-RN focus up to date on what knowledge and skills novice nurses are using most in the nursing profession.

The importance of this licensing exam raises the question of how students are educated, if valid measures can be used to correlate students' data, and how early interventions may improve program and test outcomes. Consequences ride on this high-stakes exam not only for nursing programs, but candidates as well. Nursing students must pass the NCLEX-RN to obtain a license to practice and nursing programs cannot stay in business without successful graduates. Nursing

program accreditation is in jeopardy if first-time success rates do not remain above 75%, adding pressure to the faculty, department, and institution. Students who have invested many years of hard work and financial resources yet still fail, have a loss of income because they cannot be employed as a RN, and also experience added physical and psychological stress. The gravity of professional licensing is extensive with strong regulation by legislature.

> State professional licensing agencies are charged with protecting consumers from harm resulting from illegal or incompetent practitioner's acts. They carry out their mission by ensuring that candidates for professional and occupational licensure, certification or registration meet all criteria mandated through statutes and regulations. Licensure, the most restrictive form of state regulation specifies that it is illegal to practice a state-licensed profession without meeting state-defined standards, usually consisting of at least educational and additional examination requirements. No one without a license may practice the profession as defined in a scope of practice act. (Brinegar, 2005, p. 495)

National Council of State Boards of Nursing

The NCSBN is the governing board for the NCLEX-RN as well as an advocate, liaison, and consultant to the individual state boards in 50 states, the District of Columbia, and four U.S. territories. It is made up of an executive director, support staff, and a representative from each of the individual state boards. This group is responsible for writing, managing, and administering the NCLEX-RN and to provide test research and statistical information to its nursing program members. The NCSBN is also a resource for policy makers and the general public for educational nursing information (NCSBN, 2010). The mission of the NCSBN is "to provide leadership to advance regulatory excellence by assisting member boards, collectively and individually, and to promote safe and effective nursing practice in the interest of protecting public health and welfare" (Kenward, Woo, Gross, & Lui, 2010, p. 1).

Computerized Adaptive Testing

Computerized adaptive testing (CAT) is an innovative way to administer high stakes testing using modern theories of measurement and sophisticated computer technology. The use of CAT is unlike other forms of testing because each test is individualized to the student taking the exam. The CAT interacts specifically with the candidate through recording answers and adapting future questions to past responses (Kenward et al., 2010).

The NCLEX-RN, the national licensing exam for registered nurses, uses this testing format. Each student test begins with a baseline question at or around the line of minimal safety and competence. Then, as the individual answers correctly, the computer displays a more difficult question. When a question is answered incorrectly an easier question follows. The level of difficulty this exam holds is evident in that the NCSBN expects students to answer only half of the questions correctly. The test continues until the student remains above or below the competent and safe level for 95% of the testing time (Kenward et al., 2010).

Once the computer establishes a pattern above or below this minimal level, the test ends. Those above the level of safety and competence pass the exam; those below fail. The minimum number of questions a student must answer is 75, the maximum is 265. Students have 6 hours to complete the test. If a student has not completed the test after the 6-hour mark, the last 60 questions are evaluated to determine if the individual was above or below the safe and competent level to determine a pass or fail result. Nursing students must pass the NCLEX-RN in order to practice nursing in the United States. Ideally, students succeed on the first attempt; however, if first or subsequent attempts fail, there is a 45-day waiting period between tries (Kenward et al., 2010).

Baccalaureate Nursing

The change in health care in recent years has been dramatic, changing the face and role of the nursing profession at almost the same pace. Clients who are hospitalized today are older, sicker, and often have options of being cared for in multiple settings outside routine medical centers. Technology is also expanding at an incredible rate, prolonging life and requiring higher skill levels of nurses at the bedside. Registered nurses are the frontline of the medical profession, often the first health care professional to make contact with the client and the team member to spend the most time caring for them (Campbell, 1997).

Baccalaureate nursing programs provide education and experience for more than bedside practice. A Baccalaureate of Science in Nursing (BSN) degree also aligns nurses for leadership, management, and graduate education in advanced practice. Baccalaureate education will need to continue its hold in nursing, through the foundation of practice and embracing deeper levels of knowledge related to health promotion and disease prevention. In addition, increasing expectations are growing in the areas of genetic counseling and areas related to the dynamic cultural changes of the health care recipient. The possibilities are endless; however, the responsibilities are too. Only this type of preparation will allow nursing to keep up with medicine and technology in the next century (Amos, 2005).

Baccalaureate nursing programs, like all programs educating registered nurses, must meet minimum standards, preparing students with the skill and knowledge needed to take the licensing exam. These programs are also expected to give students experience and knowledge of technology used in the work setting and in computer adaptive testing (BRN, 2009). As students progress through nursing education, it is helpful for them to gain experience taking tests with

questions that resemble those on the licensing exam and computerized tests instead of paper and pencil, again to model the NCLEX-RN. Complex, higher-level thinking skills are required to pass the NCLEX-RN (Oermann & Gaberson, 2009). This higher-level thinking is explained by the difficulty of the NCLEX-RN. This exam is based on Bloom's taxonomy for the cognitive domain (Wendt, Kenny, & Schultz, 2010). The six learning categories are to remember, understand, apply, analyze, evaluate, and create. Bloom's model appears as a triangle, beginning at the base with knowledge which includes remembering and understanding cognitive skills (see Figure 2).
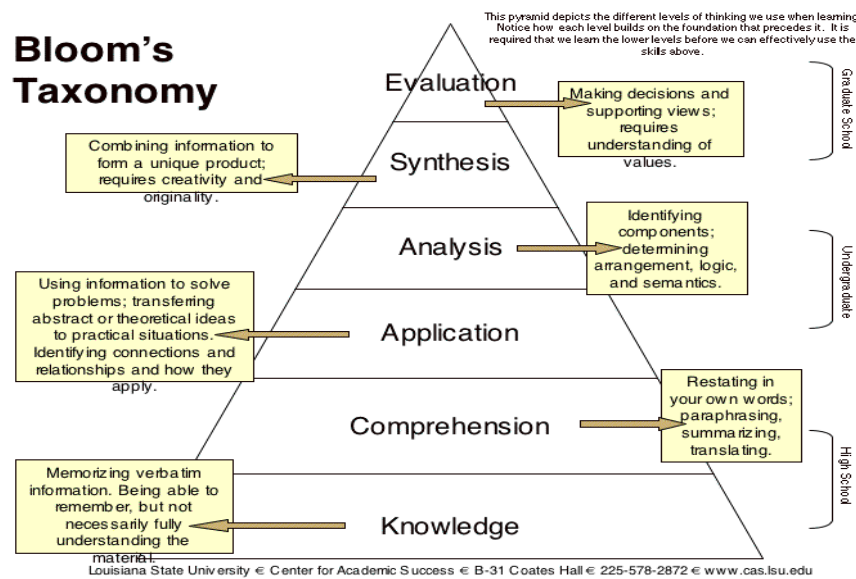
Figure 2. Bloom's Taxonomy.
Source: http://4.bp.blogspot.com/_zSktzKGEi4g/TTM337JfAuI/AAAAAAAABMs/3D1aGWKMKEo/s1600/bltax.gif

As student learning moves upward, the level of thinking becomes more complex, progressing to comprehension, application, analysis, synthesis, and finally, evaluation. Since nursing programs do not typically test at this level, standardized testing is frequently used to guide admission and provide this kind of testing experience throughout the education process. Graduating more nurses to

meet the increased needs, while maintaining the safety of society is a delicate balance (Allen, Higgs, & Holloway, 1988):

> Society has the right to expect that each professional nurse will be a safe, competent practitioner. Baccalaureate programs that accept a large number of at-risk students may unintentionally lower their internal standards and thus the quality of their product. (p. 113)

California State University

The California State University (CSU) system is the largest of its kind in the United States. It comprises 23 campuses and educates more than 400,000 students yearly. Campuses stretch as far north as Chico and as far south as San Diego, employing over 40,000 faculty and staff. In 1960, under the state of California Master Plan for Higher Education, the CSU system was created and today draws university admission from the top third of California High Schools. CSU leads the state in baccalaureate graduates, preparing California communities with 95,000 job-ready graduates each year. The system also reaches out to underserved communities, enabling all students to succeed in gaining access to education. A 25-member Board of Trustees, most of whom are appointed by the governor, hold responsibility for the system (CSU, 2011).

Nursing Programs

The CSU system is made up of 23 campuses statewide. Of those 23 campuses, 18 of them offer baccalaureate nursing programs. Two campuses are on the quarter system, with the remainder on a semester plan. CSU Channel Islands is the newest program, graduating its first nursing class in 2011. Thirteen of the programs are considered to be at impacted status, meaning there are far more students who apply to enter the program than there are seats to fill. All programs consider college and prerequisite grade point average (GPA) during the admission process. All programs use the ATI system with the TEAS in some manner before

or in the program (CSU, 2011). For example, all schools require students to take the TEAS test; however, they may or may not use the results to determine admission to the program. They may use the results as a precursor to determine areas of academic weakness.

Standardized Assessment

Over the years, many standardized testing models have been introduced into the academic arena of nursing in an attempt to determine student standing and progress in programs as well as determine preparedness for taking the NCLEX-RN. This area of interest and research is yet to unveil which of these tests is the best predictor of nursing program and NCLEX-RN success. Standardized tests have been researched frequently for accuracy in predicting NCLEX-RN success. This type of testing, before and throughout the nursing program, is another way to monitor progress in the program and identify students at risk of NCLEX-RN failure. Identification of these students prior to admission and early in the curriculum enables nursing faculty to offer and encourage remediation and intervention to improve chances of NCLEX-RN success (Daley, Kirkpatrick, Frazier, Chung, & Moser, 2003). The following paragraphs list and describe the standardized assessments available to nursing programs and students.

National League Readiness Examination

There are several preadmission and pregraduation tests available in the United States that nursing programs may require students to take as a prerequisite to admission to, or graduation from, an academic nursing education. One such exam, the National League Readiness Examination, is produced and given by the NLN. The NLN is a professional organization for nursing faculty and other professionals involved in nursing education. This test is designed to assess student

knowledge in academic areas that are essential to nursing education. It is a 75-question online or paper/pencil exam that is available to the general public. Due to the nonrestrictive availability, reliability and validity are considered low. The purpose of this test is to measure entry-level professional nursing knowledge; therefore, it is recommended that this exam be given at the end of a student's nursing education (NLN, 2004).

Assessment Technologies Institute

ATI offers packages to nursing schools only for student purchase. Each student ATI box includes a complete content book set, online access, and standardized testing from preadmission through postprogram NCLEX-RN preparation. The book set, which is in hard copy and fully available online, covers the subject areas of nursing education: (a) adult medical surgical nursing, (b) community health, (c) fundamentals, (d) leadership, (e) maternal newborn, (f) mental health, (g) pediatrics, (h) pharmacology, and (i) nutrition. Each ATI box also comes with a full online access code and proctored exam access in each content area. ATI also offers a prenursing skills exam (ATI, 2007b).

Test of Essential Academic Skills. The preadmission test, the TEAS, is designed to measure entry-level skills in (a) math, (b) verbal reading, (c) written reading, and (d) science. The test has 179 questions, is computer-based, and multiple choice. It is formulated by experts in nursing curriculum to help programs identify the readiness of student nurse candidates to enter a nursing program. Internal consistency, computed by Cronbach's alpha, estimated TEAS reliability of all four test scores totaled above 0.90 for the 2007 ATI sample (ATI, 2007b).

Benchmark Evaluations. The ATI package also offers eight content-based proctored tests to assess nursing content knowledge during progression through a

nursing program. All exams are secured multiple choice and come in two different forms. The Adult Medical-Surgical exam consists of 95 questions; and the remainder, Fundamentals, Pharmacology, Nutrition, Maternal Newborn, Leadership, Mental Health, and Pediatrics, all have 65 questions. Through ongoing research, ATI establishes benchmark scores that are suggested to nursing programs to determine student proficiency. These score ranges are placed into levels from level 1 to level 3, lowest to highest, respectively. Program faculty are then able to decide what benchmark scores and level of achievement are required for intervention, remediation, and progression from a nursing program. Nursing programs that purchase the package can use any or all the tests, benchmarks, and levels in ways that meet the needs of the program. Updates are made corresponding to NCLEX-RN test plan updates with the latest updates beginning in 2010 with the April 2010 NCLEX-RN changes (ATI, 2007b).

RN Comprehensive. Completing the ATI package is the 3-hour, 180-question, RN Comprehensive Assessment test, also available in two proctored formats that are most like the NCLEX-RN. This test integrates all content areas into this culminating exam to assess content knowledge, clinical reasoning, and NCLEX-RN readiness. This test is not leveled in the same way that the other benchmark tests are because of its close relationship to the NCLEX-RN. The RN comprehensive does provide benchmarks to the percentage of probable licensing exam success. The RN Comprehensive is available, from a password protected site, for nursing programs in paper/pencil or online format. Online formats are encouraged due to the similarity to the NCLEX-RN (ATI, 2007a).

Entrance Examination for Schools of Nursing

The Psychological Corporation (TPC) offers the Entrance Examination for Schools of Nursing (RNEE). Predicative validity of this test, when measured against grades in high school was found to be predictive of success. This screening tool assesses numerical and verbal ability, physical and life science, and reading comprehension (Gallagher, Bomba, & Crane, 2001).

Nursing School Aptitude Examination RN

Psychological Services Bureau (PBS), a private testing organization for multiple health related fields, offers the Nursing School Aptitude Examination RN. This preadmission evaluation is designed to measure a student's potential capability of success in a nursing program (Evangelist, Orr, & Unrein, 2009).

Health Education Systems Incorporated

The Health Education Systems Incorporated (HESI) organization, an examination product by the Elsevier book company, has also developed diagnostic and summative evaluation tests for nursing students and students of other health fields. The diagnostic preadmission test evaluates (a) English grammar, (b) English vocabulary; the sciences of (c) anatomy, (d) physiology, (e) chemistry, (f) biology; and (g) math, considered academic factors and two nonacademic factors; including (a) motivation and (b) learning styles. The HESI exit exam offers a 160-question computerized exam that follows the NCLEX-RN test plan. Upper level thinking questions are formulated by educators in the nursing profession from across the nation. It is a secure test only available for purchase by nursing programs (Morrison, Free, & Newman, 2002). Validity of the content, construct, and criterion referenced validity are assessed to determine the exit exam, and the Kuder Richardson formula 20 (KR-20) is used to measure reliability. This test

averages a KR-20 of 0.79 (Nibert, Young, & Adamson, 2008). In the same manner as the other testing options, the HESI measures basic knowledge levels to provide feedback to students and faculty regarding preparedness for the rigor of a nursing program (Westra, 2006).

Mosby Assess Test

The Mosby Assess Test is another computerized study tool which allows a nursing student to evaluate knowledge and skill. This 300-question exam is comparable to the NCLEX-RN content and is often given near the end of nursing school to help determine student readiness to take the licensing exam. Questions are designed to resemble situations in nursing practice, assessing students' abilities to manage clients with multiple health issues (Saxton, Pelikan, & Green, 1999).

Significance of the Study

The findings of this study will have a broad impact on all stakeholders of the nursing profession. First, for students and the parents of those students, solid evidence-based research to outline a significant roadmap on what is needed to prepare and be admitted to a nursing program would be extremely helpful. With the rising cost of higher education and the competitive admission process, the more informed and prepared students and parents are, the more cost and time effective it would be. For example, in Fresno, tuition has increased from $3,687 in 2008-2009 to $5,089 in 2010-2011 (see Table 1).

Second, nursing programs will be more prepared to admit the students who will be most likely to succeed in a nursing program, graduate from it, pass the NCLEX-RN, and enter the nursing workforce. Many publically-funded baccalaureate programs have been pressured and given financial resources to market and enroll a greater number of nursing students in an attempt to graduate

Table 1

California State University Basic Undergraduate Tuition Fees

Program	2008/09	2009/10	2010/11	2011/12
Bakersfield	$4,077	$5,091	$5,524	$6,682
Fresno	3,687	4,673	5,089	6,263
Fullerton	3,682	4,662	5,076	6,120
Sacramento	3,854	4,901	5,405	6,573

more nurses (Seldomridge & DiBartolo, 2004; Symes, Tart, & Travis, 2005).
Increased enrollment is counterproductive if student quality and faculty
effectiveness is lost. Another value to these rigorous programs will be the
experience of less attrition by students ignorant of the expectations and rigor of the
nursing profession, failing out of the nursing program, or dropping from the
program due to failing grades. Nursing programs strive to admit, retain, and
graduate all accepted students. Attrition and retention data allow programs to
visualize those students who might leave the program or fall behind (see Table 2).

Third, nursing educators will find significance in this study. Educators are
in a position to assist colleges and universities in the education of potential
students, parents, high schools, and the communities. Offering a clear framework
for admittance and success into a nursing program, candidates hold the
information needed to reach career goals. Nursing faculty will also be acutely
aware of those students who are in need of intervention and remediation early and
throughout the program since it will be mandatory to insure the success of at-risk
students (Crow, Handley, Shawmorrison, & Shelton, 2004; Symes et al., 2005).
The nursing workforce and community at large will be impacted in a positive way
as well. With a nursing shortage on the horizon, the changing demographics in the

Table 2

California State University Nursing Completion and Retention Data for All Campuses

	Academic Years		
Variable	2007/08	2008/09	2009/10
Students	1051	1056	850
Completed	804	803	745
Still enrolled	96	138	30
Attrition	151	115	75
Retention rate (%)	76.5	76.0	87.6
Attrition rate (%)	14.4	10.9	8.8
% Still enrolled	9.1	13.1	3.5

United States related to the growing population of Americans over the age of 65, and the condition of the state and national economy, it is essential that students be prepared to enter a nursing program, be successful in the program of choice, and pass the NCLEX-RN on the first try. Advances in medicine and the expanding role of the baccalaureate prepared registered nurse no longer allows for careless admission or the social promotion and graduation of students who are unable to pass the licensing exam and enter a chosen profession. The challenge is to graduate NLCEX-RN-prepared students and not simply admit a greater number of students into nursing programs (Sayles, Shelton, & Powell, 2003). Standardized testing of academic and nursing aptitude as admission and progression criteria are solid variables that could predict outcomes in nursing education.

Summary

The primary purpose of this study is to explore whether academic aptitude and nursing aptitude are related to first-attempt pass rates on the NCLEX-RN in

baccalaureate nursing programs. This research has the potential to investigate nursing admission criteria, assist in the identification of struggling students in need of early intervention or remediation, and determine who will be successful nursing graduates who pass the NCLEX-RN on the first try. The findings of this study will have a broad impact on all stakeholders of the nursing profession.

 Chapter 2 reviews literature and includes the NCLEX-RN predictors in nursing research in the categories of the prenursing program, nursing program progression, and those with research inclusive of both prenursing program and progression. This literature review will add depth, illuminate gaps, and assist in the conceptualization of this research.

CHAPTER 2: REVIEW OF THE LITERATURE

Nursing is considered an art and a science. A professional nurse is expected to deliver care "artfully" with compassion and respect for the dignity of all clients. As a science, nursing is based on a foundational body of knowledge that is continually changing as the profession, medicine, and client populations evolve. Nursing education curriculum builds on basic reading, comprehension, math, and sciences. Although education in these areas begins in childhood, the focus converges in higher education as prerequisite courses to further build knowledge in those four key educational areas (Potter & Perry, 2009). With a solid foundation in place, nursing school curriculum builds from that prerequisite base and adds to it with each course and level of development through the program. In nursing education, this includes laboratory and clinical experience as an added component of situational learning theory or "learning by doing" (Lave & Wenger, 2009).

The literature review is made up of the following headings: (a) theoretical framework, (b) predicting NCLEX-RN results, pre and postadmission to a nursing program, and (c) gaps in research. The theoretical framework that follows will form a foundation for this research. It will demonstrate the relationship between situational learning, skills acquisition, and nursing practice. This theoretical framework will progress forward into this research study adding an additional link to nursing education. The section titled predicting NCLEX-RN results will address existing studies in literature that have attempted to predict student results on the licensing exam. Included are those studies that include only preadmission to a nursing program data, only data after admission to a nursing program, during nursing school education, and those that include both. Finally, gaps in these studies that necessitate further research will be addressed.

Theoretical Framework

Dreyfus Model

In 1984, Patricia Benner introduced a nursing theory based on the Dreyfus Model of Skill Acquisition. S.E. Dreyfus, mathematician/engineer and H.L. Dreyfus, philosopher, conducted a study of airline pilots in flight education and training. The study concluded that each pilot in training went through five stages of development from novice to expert. Table 3 depicts the early work of Dreyfus and Dreyfus (1980) as they began the study and progression of the learning outcomes of airline pilots. Figure 3 is the result of years of research where the original concepts, with further study were condensed and streamlined with some refinement of each stage (see Figure 3).

Table 3

A Five-Stage Model of Mental Activities Involved in Directed Skill Acquisition

Mental Function	Skill Level				
	Novice	Competent	Proficient	Expert	Master
Recollection	Non-situational	Situational	Situational	Situational	Situational
Recognition	Decomposed	Decomposed	Holistic	Holistic	Holistic
Decision	Analytical	Analytical	Analytical	Intuitive	Intuitive
Awareness	Monitoring	Monitoring	Monitoring	Monitoring	Absorbed

(Dreyfus & Dreyfus, 1980, p. 15)

Modern Dreyfus Model

In Dreyfus's model the novice stage pilots were found to be strict rule followers with little perception of the actual situation and no discretionary judgment. The progression followed to the advanced beginner stage. Advanced

"Dreyfus Model of Skill Acquisition"

Expert

Proficient

Competent

Advanced Beginner

Novice

Responsibility extends to others and the environment.

Sense of responsibility increases with experience.

Sense of responsibility arises from actively making decisions.

Still does not experience personal responsibility.

Only feels responsible to follow the rules.

Scope of vision & Range of capability

Follows specific rules for specific situations. Rules are not conditional. "Only capable of following the rules"	Begins to create and identify conditional rules. All decisions still follow rules. "Rules have nuance and become conditional in nature"	Learns organizing principals. Information sorting by relevance begins. "Higher order rules shape contexts and conditions"	Uses pattern recognition to assess what to do. Uses rules to determine how to do it. "Intuition aides in identifying the situation; the actions are governed by the principals"	No analysis or planning. Pattern recognition extends to plan as well as action. "Just does what works."

Figure 3. Dreyfus module of skill acquisition.
Source: http://www.coderfriendly.com/wp-content/uploads/2009/05/dreyfus_model.jpg

beginner was added into the newer model when the stages were adjusted to add advanced beginner and eliminate mastery. These researchers determined that the jump from novice to competent was too great and, therefore, added advanced beginner. They also were not convinced that true mastery could be achieved, as the learning process is dynamic. In the advanced beginner stage, the pilots were found to be able to move slightly from strict guidelines with still limited perception of the situation but differentiating between items of equal importance. Third, the learning transferred into what Dreyfus and Dreyfus (1980) referred to as

the competent stage of skill acquisition. Pilots in this stage had the ability to see forward with long-term goals and make conscious deliberate planning. Procedures at this stage were more routine and standardized. Next, in the proficient state the pilots entered a holistic phase including the ability to see complete aspects and importance of some situations over others. Decision making at the proficient stage is much more fluid. As the pilots moved past the proficiency, they entered the final stage of the skill acquisition, expert. The expert does not rely on rules but instead uses intuition and analytical thinking only in new or problem situations (University of Medicine and Dentistry of New Jersey, n.d.). According to Dreyfus & Dreyfus, "The pilot, when he stops concentrating all thoughts on features and rules, at first begins to feel he is flying the plane, and finally comes to feel that he is flying" (1979, p. 73).

These researchers arrived at this theory model by first taking a look at the work of several other researchers in behavioral, cognitive, psychology, philosophy, situational, and nonsituational learning environments. These included stages of improvised jazz performance by David Sudnow (1978), whose ideas the Dreyfus brothers used to look at the learning of a second language. Work by psychologist Adriaan de Groot (1978), who studied how chess players learn the game of chess, suggested that they go from following the rules of the game strictly, to the ability to look multiple moves ahead and anticipate possible future moves in the game. The chess playing study most resembles the study of the airline pilots and the explanation of the progression process in leaning used in the Dreyfus model. Dreyfus and Dreyfus (1980) also referred to legal psychology work by Konečni and Ebbesen (1979), who studied judges inside the courtroom and out. The differences they observed were that outside the courtroom judges were guided by rules, whereas in the courtroom they were guided more by

intuition (Dreyfus & Dreyfus, 1980). In the article about the five-stage model,

Dreyfus and Dreyfus, (1980) made a summation as follows:

> Our approach is to take the reliance on everyday familiarity in problem solving not as an anomaly, but as a pervasive and essential feature of human intelligent behavior… in skills acquisition concrete experience play a paramount role… we argue that skill in its minimal form is produced by following abstract formal rules, but that only experience with concrete cases can account for higher levels of performance. (p. 5)

Benner Theory

Benner (2001) visualized this model in the nursing world. From novice to expert, Benner's nursing theory model described the same stages of growth in a new, novice nurse beginning a nursing career all the way to becoming a seasoned, expert nurse with years of experience and training in the nursing profession. In the same manner as the Dreyfus and Dreyfus (1980) model, beginners or novice nurses have limited or no work experience in the profession, and learning is by memorization of a set of rules that have no meaning. Advanced beginner nurses demonstrate marginally with limited experience, mostly recognized only after a mentor calls attention to it. Competence, according to Benner (2001), comes into existence after a nurse has worked consistently in a similar job for a period of time enabling speed, flexibility, and deliberate long-term planning to begin to form. Proficient nurses see and understand the situation as a whole, and decision making come easier and with more confidence. Finally, the expert nurse no longer relies on the original information that allowed entry into the profession, but instead has become one with the information gained from extensive practice (see Figure 4).

Adaptation of Dreyfus/Benner Model/Theory

This nursing theory can also be applied to students entering and progressing through a nursing program. Students are admitted into a program as novices of
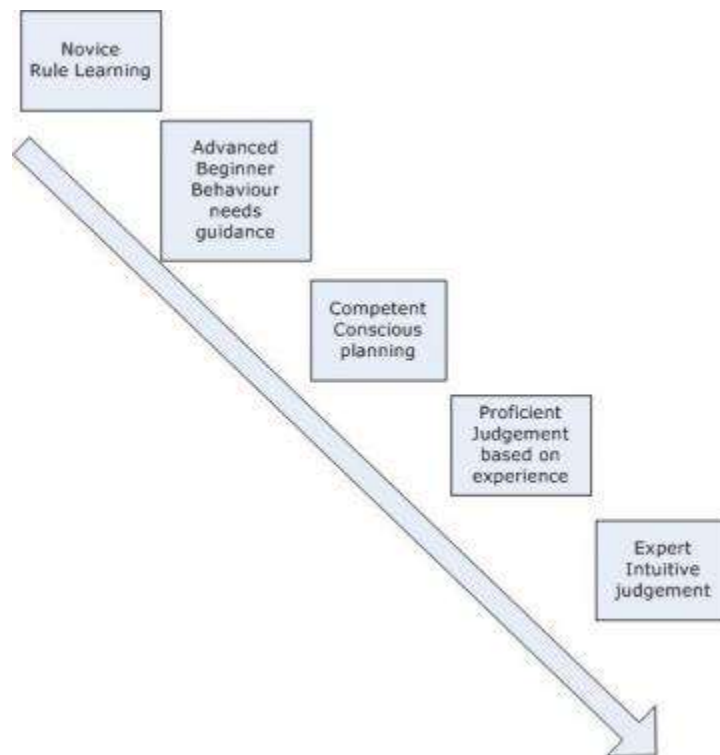
Figure 4. Theory Novice to Expert.
Source: Benner (1984), http://pd.nottingham.ac.uk/var/ezwebin_site/storage/images/media/images/benners-reflective-model/28891-1-eng-GB/Benners-reflective-model_large.jpg

nursing education. Most students have little or no experience in the field and minimal understanding of what the profession itself involves. From day one of nursing education, each course or set of courses build on prior courses on a stair step path from novice nursing student to expert nursing student ready to graduate and take the NCLEX-RN (see Figure 5, Dreyfus/Benner Theory, 1984).

Dreyfus would recognize this progression through the nursing program in three major steps that encompass the theory model. The first step involves a movement from reliance on the abstract, bookwork, or "know it" phase, to the use of concrete experience which adds the "do it" phase. In the second step, the learning is less fragmented and takes on a more holistic approach, with the ability to pull out the most relevant experience for each setting. Finally, in step 3 the

NURSING STUDENT PROGRESSION THROUGH DREYFUS/BENNER THEORY MODEL

Novice → Advanced Beginner → Competent → Proficient → Expert

Pre Admit→Admission → End of 1st year → End of 2nd year → End of 3rd year →Graduation
    (1st Nursing Courses)

Gender	ATI Fundamental score	ATI Pharmacology score	ATI OB score
Pre program GPA	ATI Fundamental level	ATI Pharmacology level	ATI OB level
TEAS Composite		ATI Med Surg score	ATI Peds score
TEAS Reading		ATI Med Surg level	ATI Peds level
TEAS English		ATI Psychology score	RN comp II score
TEAS Math		ATI Psychology level	
TEAS Science			
Chemistry			
Anatomy			
Physiology			
Microbiology			
Oral communication			
English composition			
Critical thinking			
Math			
Pre requisite GPA			

NCLEX-RN

Pass 1st attempt   Fail 1st attempt

RN to workforce   Retake in 45days

Figure 5. Adaptation of Dreyfus/Benner Theory Novice to Expert.

transition is from "detached observer to involved performer," therefore ending at the expert level (Benner, 2001).

The literature review that follows includes NCLEX-RN predictors in nursing research in the categories of the prenursing program, nursing program progression, and those with research inclusive of both prenursing program and progression throughout the program to graduation. In an attempt to clarify the data of this literature review, a table located in Appendix A is included. The header of this table lists the author and year of the research data. The far right column lists the independent variables used in the corresponding studies that the researchers found to predict NCLEX-RN outcomes. This table also allows the reader to readily see studies with overlapping findings (see Appendix A).

Predicting NCLEX-RN Results

Prenursing Program

Prior to admission to an accredited nursing program, students are required to successfully complete several prerequisite courses needed to build a solid base of information in preparation for the rigor of a nursing program. Students are often also required to take one of several standardized admission testes of math, science, reading, and writing skills. Many researchers contend that preadmission courses and standardized testing reflect evidence of success in programs and on the licensing exam.

Allen et al. (1988) conducted a study of 296 BSN students in one nursing program between 1979 and 1981 to determine success in a nursing program using 40 variables including academic and nonacademic factors related to success. Depending on the variable, chi-square, *t*-tests, Analysis of Variance (ANOVA), Pearson correlation, and multiple regression were used to determine relationships

between variables and outcomes. Success was defined by remaining in the program, and attrition by failing out of the program due to not holding the required grades/GPA, or dropping out of the program due to poor grades before actually receiving failing grades on college transcripts. Of the 40 academic and nonacademic variables, only prenursing grade point average (PGPA) and grade point average (GPA) in the program were significant to progression and completion of the program. None of the nonacademic variables were found to be significant. These nonacademic variables included (a) personal references, (b) age, (c) marital status, (d) previous experience as a licensed practical nurse or health aide, (e) the amount of time working (job), (f) full-time or part-time student status, (g) previous upper division courses, (h) number of colleges attended, and (i) traditional versus transfer students (Allen et al., 1988).

Newton, Smith, Moore, and Magnan (2007) used an exploratory descriptive design to study a sample of 164 first semester nursing students in two cohorts admitted in fall and winter session. Each student took the TEAS at the beginning of the first semester. The composite TEAS score along with the PGPA, which included the final grades in the required prenursing courses of the program, were evaluated to determine if these outcomes predict early achievement in nursing. The researchers used these items because both PGPA and TEAS measure aptitude identified for predicting academic success. The fall and winter cohorts varied greatly; however, each group was found to have significant findings related to the TEAS test and PGPA. In the fall cohort, the PGPA was significant to success in the program as well (Newton et al., 2007).

A study by Wolkowitz and Kelley (2010) used a multiple regression model to look at student TEAS test scores to determine if TEAS subtest scores in reading, math, science, and English had any correlation to success early in a

nursing program as determined by the Assessment Technologies Institute fundamental assessment criteria. In this study the science subscore was the strongest predictor. The study population was a large multi-program sample with data from 4,105 RN students in multiple nursing programs. Results concluded program success is best predicted by TEAS subscores in this order: science, written reading, verbal reading, and math. This study demonstrated a low to moderate correlation between science subscores and ATI fundamental assessment (Wolkowitz & Kelley, 2010).

The monitoring of prerequisite criteria of nursing programs in order to predict successful outcomes benefits both nursing students and nursing programs. This prerequisite monitoring allows schools of nursing to set admission standards that increase the chances of student program success. Successful nursing students who complete the program, pass the NCLEX-RN, and join the nursing profession reflect positively on the academic institution of study and the profession as a whole. In the next section, research on performance predictors from within a nursing program will be reviewed.

Nursing Program Progression

Academic performance in the years of nursing school appears to give some foresight into what the future may hold for nursing students. Once students who are at risk of dropping out of the program due to poor grades or failing out of a program for the same reason are confirmed, strategies to assist these students could be available through intervention and remediation. Much of the literature reflecting NCLEX-RN success makes reference to the need to monitor students before and during nursing education to implement intervention and remediation for students in a timely manner if identified as at risk for program or NCLEX-RN success. Determining which constructs predict academic and NCLEX-RN success

enables nursing faculty the opportunity to provide students with strategies to accomplish the goal of becoming a registered nurse. Student achievement and progress during the nursing program may also indicate positive NCLEX-RN results. Studies of predictor variables within a nursing program will be addressed in the following section.

Nursing researchers have also studied sectors within nursing programs, postadmission to the program, to predict program and NCLEX-RN success. Gross, Takazawa, and Rose (1987) studied a sample size of 108 Associate Degree in Nursing (ADN) and BSN students at one nursing program in Hawaii. The independent variables included age, years of college, ethnicity, NLN entrance test score, and a critical thinking ability test. The dependent variables, considered predictors of program success, were GPA, completion of the nursing program, and NCLEX-RN results. Through correlation and multiple regression ($p < .01-.05$) the study results revealed that of the variables studied, NLN test scores, (a) verbal, (b) math, (c) science, (d) composite, (e) years of education after high school, and (f) GPA within the nursing program, were found to be the best and only predictors of performance on the NCLEX-RN (Gross et al., 1987).

Friedemann and Valentine (1988) studied 159 BSN students at Eastern Michigan University. The dependent variable was the result of the licensing exam. Independent variables included age, prenursing credits, GPA, medical experience as a licensed practical nurse (LPN), grades in the prerequisite courses, chemistry, psychology, sociology, anthropology, grades in six in-program nursing courses, and exit GPA. This study, using one-way ANOVAs, found that GPA in the nursing program, reflective of course grades, was the best predictor of whether or not students would pass the licensing exam. Students with higher GPAs (>3.5) were found to have greater NCLEX-RN pass rates than those with GPAs below

3.5. These researchers found older students, above age 21, often had higher GPAs and higher NCLEX-RN pass rates. However, of traditional students, those aged 18 to 21 years who held a GPA of greater than 3.5 did just as well as their older colleagues in passing the licensing exam (Friedemann & Valentine, 1988).

Dell and Valine (1990) completed a research study on 78 BSN graduates from three small schools in the southwestern U.S. The dependent variable was the results of the licensing exam and the independent variables included (a) GPA, (b) SAT, (c) ACT, (d) age, and (e) self-esteem. In a Spearman-Brown correlation ($p <$ .001), the results produced data supporting GPA in the nursing program as the best predictor of success on the national licensing exam in this small study. These researchers acknowledged that self-esteem was not a cognitive concept, thus making it difficult to predict "cognitive scores with non-cognitive measures" (Dell & Valine, 1990, p. 161).

In a study by Horns, O'Sullivan, and Goodman (1991), a sample of 408 BSN graduates correlated 11 predictor variables and the NCLEX-RN in a forward regression analysis, correlation coefficient ($p < .01$). This inquiry not only examined academic achievement but also the demographic information of age, gender, and race. The conclusions were significant for preadmission to the nursing program GPA and the GPA of all nursing courses completed by the end of the second year in the nursing program as predictive of NCLEX-RN success. This study found no significant correlation in the demographic variables as related to the national licensing exam pass rates (Horns et al., 1991).

Mills, Sampel, Pohlman, and Becker (1992) and Wall et al. (1993) both achieved similar results to Horns et al., (1991). Subsequent research revealed that a nursing student's GPA in the second out of 4 years for this BSN program is most significant to predicting program and NCLEX-RN success. Mills et al.'s (1992)

research included 534 nursing graduates between 1982 and 1990 from a private university in the Midwest. The research looked at demographic and academic information. NCLEX-RN success or failure was the dependent variable; the independent variables included (a) age; (b) gender; (c) high school GPA; (d) American College Testing (ACT) subscores in math, English, social science, and natural science; (e) traditional versus transfer student; and (f) cumulative GPA at the end of each of the 4 academic years. Stepwise logistic regression ($p < .05$) found the GPA following the second year of nursing school predictive of NCLEX-RN success. Age in this study was found to be inversely related to success, meaning that students' age > 22 years upon admission to the program had higher GPAs (Mills et al., 1992). Wall et al. (1993) also identified the nursing student's GPA in the second year of the nursing program as a predictor as well. These researchers included a sample of 92 BSN graduates from four consecutive cohorts from 1988 to 1991 at a small, private, religiously-affiliated nursing program in the Midwest. The NCLEX-RN results were the dependent variable, and the independent variables included (a) SAT, (b) high school rank, (c) GPA from each of the 4 years of baccalaureate study, (d) NLN diagnostic readiness score, and (e) the Mosby Assessment Test (MAT). Using *t*-tests and discriminate function analysis ($p < .01- .15$), the study identified four of the five academic variables, all except high school rank, were found to have significance in licensure exam results (Mills et al., 1992; Wall et al., 1993).

Sutherland, Hamilton, and Goodman (2007) studied the effects of implementing an At-Risk Minorities for Success Program (ARMS) to determine if an intervention program, implemented within the program itself, would improve the grades in the last semester of nursing school and NCLEX-RN pass rates for at-risk students. At-risk in this study were students from the following categories:

African American, Hispanic, and Asian Pacific students, first generation college students, students from rural communities, and students with a C grade or failing a nursing course. The study, supported by a 3-year grant, enabled the researchers to admit 64 at-risk students into a predominately White baccalaureate nursing program in the south central region of the U.S. The program also allowed for mentoring and tutoring of these at-risk students throughout the program. Descriptive statistics, *t*-tests and chi-square analysis resulted in a small, nonsignificant change in the final semester grades or on NCLEX-RN pass rates of the at-risk student group receiving the ARMS educational support. These results were not significantly different from students not in the ARMS program (Sutherland et al., 2007).

Morris and Hancock (2008) looked at a nursing program at a large, urban, public university in the southeastern part of the U.S. There were 53 students in the study from two cohorts. The study compared NCLEX-RN results before and after a curriculum change. The HESI nursing program exit examination was also studied in this research since the HESI exam is often used by nursing programs to help predict students' readiness to take the licensing exam. Morris and Hancock found no significant change in NCLEX-RN pass rates before or after the curriculum change and no significance between the new curriculum versus the old curriculum on HESI scores. The HESI, however, did show significance in predicting students who would pass the NCLEX-RN. The researchers used a HESI score of 900 or above to attempt to predict licensure exam success. Although those students with a score of 900 or above did pass the NCLEX-RN, 36 students scored below 900 and passed the NCLEX-RN as well. The researchers stated that in this study, significance for predicting students who pass the NCLEX-RN exists;

however, at a score of 900 predicting NCLEX-RN failure was not as reliable (Morris & Hancock, 2008).

Spurlock and Hunt (2008) also looked at the HESI exam as related to NCLEX-RN results. Using a retrospective descriptive, correlational design data were collected from 179 graduate records. The setting of this study was a nursing college in a large Midwestern town. The researchers did not use other academic or demographic data due to the retrospective nature of the study and because the progression policy at the college is based only on the HESI score. The researchers found no relationship between the HESI and NCLEX-RN results; however, this nursing program allowed students to retake the HESI to meet the minimum 850 score required. Even with the option of multiple attempts on the HESI, the results of the study did not change the risk of failing the NCLEX-RN (Spurlock & Hunt, 2008).

Alameida, Davis, and Renwanz-Boyle (2011) in a recent study at San Francisco State University, looked at predicting NCLEX-RN success in the nursing program at this large diverse urban university. A sample of 589 students graduating between 2003 and 2009 were included. The dependent variable was success or failure on first-attempt NCLEX-RN. The independent variables included (a) nursing courses GPA, (b) cumulative GPA, (c) program type, (d) ATI RN comprehensive predictor test score, (e) ATI predictor probability of first time NCLEX-RN pass, (f) nursing course grades, (g) age (h) gender, and (i) race. Using *t*-tests, one-way ANOVAs, and Pearson's correlations, the researchers found a significant relationship between NCLEX-RN success on the first try and the ATI. The study found no significant relationship between first-time NCLEX-RN success and age, race, or gender, and no significance between the ATI RN comprehensive predictor test score and age, race, or gender. The only other

significance found was between nursing course grades in medical surgical nursing and nursing pathophysiology (Alameida et al., 2011).

Prenursing and Programs Progression

In a study by Beeman and Waterhouse (2001), 21 variables containing both pre and postadmission items were evaluated using discriminant function analysis and Pearson correlation. This analysis was used to examine first-time NCLEX-RN pass fail rates in one nursing program. Of the 21 variables, (a) year of graduation, (b) gender, (c) age, (d) type of program, (e) SAT math, (f) SAT verbal, grades in biology (g) I & (h) II, grades for (i) physiology, (j) pathophysiology, (k-r) eight didactic nursing courses, (s) clinical grades, GPA at (t) end of sophomore year, and (u) the first semester or the senior year. Results were found to be significant only for the grades in the eight didactic nursing courses. Ninety-four percent of students were predicted correctly in passing the NCLEX-RN, and 92% of students were predicted correctly to fail the licensing exam (Beeman & Waterhouse, 2001).

Beeson and Kissling (2001) conducted a study of 505 baccalaureate nursing students from a college in the southeastern U.S. to define variables to predict NCLEX-RN success or failure. The independent variables were (a) type of student, (b) age, (c) gender, prenursing grades in (d) anatomy, (e) physiology, (f) microbiology, (g) psychology, (h) sociology, (i) lifespan, and (j) family development, as well as all (k) nursing course grades, (l) scores on the Mosby standardized predictive test, and (m) cumulative GPA at graduation. Methods including nonparametric Mann-Whitney test, t-tests, chi-square, and logistic regression found that those students who passed the NCLEX-RN had higher biology grades and prenursing or prerequisite GPA. These students also had a higher overall GPA, and higher scores on the Mosby standardized predictive test (Beeson & Kissling, 2001).

Daley et al. (2003) also analyzed variables as potential predictors of NCLEX-RN success in BSN programs. The study included 224 undergraduate BSN seniors in two cohorts graduating in 1999 and 2000. The independent variables included in this study were (a) age, (b) gender, (c) ethnic background, (d) American College Testing (ACT) score, (e) prerequisite GPA, (f) prerequisite course grades, (g) grades from nursing program courses, (h) HESI test score, and (i) MAT test score. NCLEX-RN success or failure was the dichotomous dependent variable. Only two of these variables consistently showed significant association with NCLEX-RN success. Those were the senior level medical surgical nursing course and cumulative program GPA. When the HESI and MAT predictors were compared, the HESI exam was also found to be a better predictor of NCLEX-RN results than the MAT (Daley et al., 2003).

Crow et al. (2004) sent a 32-item questionnaire to BSN program directors across the United States. The goal of this descriptive correlation national study was to answer five questions regarding BSN nursing programs and the ability to promote and predict NCLEX-RN success. The first question in the study asked what baccalaureate programs used most often with regard to admission criteria. The study showed most BSN nursing programs used college cumulative GPA most often for admission criteria. The second question in the survey asked what data is used by BSN programs to predict NCLEX-RN success. The most common response was the use of a comprehensive exam. The third question inquired as to what specific interventions were used to assist NCLEX-RN success. The answer was academic referrals. The next question asked how admission and progression requirements predicted NCLEX-RN success in BSN programs. In the findings, most responses under admission criteria referred to standardized entrance exams. The graduation criteria cited most were clinical proficiency and standardized exit

exams. Finally, this research team inquired as to what influence specific interventions had on NCLEX-RN performance. The findings determined that only the use of commercial review was significant in relationship to NCLEX-RN success. This study supports nursing program use of standardized entrance and exit exams to help assess NCLEX-RN readiness success (Crow et al., 2004).

Haas, Nugent, and Rule (2004) orchestrated a study of 368 students in one nursing program in southeastern United States. The retrospective study over a 10-year span from 1991 to 2001 was composed mostly of White female students from 22 to 50 years of age. The independent variables included (a) gender, (b) race, (c) prenursing GPA, (d) nursing GPA, and the location of the campus where courses are taken either on the (e) main campus or at a (f) satellite campus. NCLEX-RN results were the dependent variable. Methods included discriminant function analysis, chi square, and *t*-tests to attempt to predict nursing student success on the NCLEX-RN. The researchers of this study deliberately set a Type I error rate (alpha) at 0.10 instead of 0.05 because they were willing to take a 10% Type I Error rate in the study results. In other words, studies often have students who pass but were expected to fail, and students who are expected to pass yet fail the exam. The Type I Error rate, in the researcher's opinion, could account for this phenomenon. The results of this study found that the men in this study failed the licensing exam at a higher rate than women. The study consisted of 39 men and 312 women. However, even though the groups were not evenly distributed, the failure rate for men was proportionately greater than for the women. Second, although the majority of the students were Caucasian, the pattern of class NCLEX-RN success by race ranked in the following order: Hispanic, Caucasian, African American, and Asian. This was not deemed significant since there were only two Hispanic students in the study. Third, GPA in the nursing program was significant

for NCLEX-RN success; however, the location of instruction was not significant. Students who studied on campus and at satellite sites had nearly the same pass rates. These researchers concluded that existing student data can predict first-try success on the NCLEX-RN (Haas et al., 2004).

A study by Seldomridge and DiBartolo (2004) included 184 BSN students over a 4-year period between 1998 and 2002. The sample was obtained from one rural BSN program in the mid-Atlantic region, and the researchers looked to uncover the best way to predict NCLEX-RN success. This study focused on three specific time frames in nursing education to attempt to predict results. The first time frame was the examination of student academic standings at preadmission to the program, the second time frame was after the completion of the first year of nursing school, and the third time frame was just prior to graduation from the program. The dependent variable was NCLEX-RN success. The independent variables, (a) traditional or transfer student, (b) PGPA, (c) prerequisite course grades, (d) GPA after one semester of nursing program, (e) grades in core nursing courses, (f) test scores in beginning and advanced medical surgical nursing courses, (g) scores on the NLN Comprehensive Achievement Test for Baccalaureate Students (NLN-CATBS), and (h) graduation GPA. This study concluded that specific items in each time frame predicted success on the NCLEX-RN. According to these researchers, student grades in pathophysiology as a prerequisite course to admission to the nursing program correlated to successful NCLEX-RN results. While in the nursing program, the average grade of two medical surgical courses gave the strongest relationship to national exam results. The results of the NLN-CATBS exit exam given prior to graduation from the nursing program as an evaluation of NCLEX-RN readiness was significant in this study (Seldomridge & DiBartolo, 2004).

Newton et al. (2007) studied early academic achievement defined as overall first semester GPA, which consisted of student grades from four didactic nursing courses. This sample came from admission into the program each of the two semesters of the academic year. One-hundred eight mostly White female students were admitted in the Fall and 70 in the winter. The independent variables were scholastic aptitude (PGPA from seven prerequisite courses including biology, anatomy, physiology, chemistry, biochemistry, psychology, and composition I & II) as well as nursing aptitude measured by the ATI TEAS test. Exploratory descriptive analysis found that both scholastic and nursing aptitude were significant predictors of early academic achievement. The study also found that the ATI TEAS test, which was used to measure nursing aptitude, predicted slightly higher than the scholastic aptitude variables. These researchers contended that the strongest prediction of NCLEX-RN success lay in scholastic and nursing aptitude together (Newton et al., 2007).

Uyehara, Magnussen, Itano, and Zhang (2007) studied 224 graduates from University of Hawaii at Manoa generic BSN program for a 5-year period after implementation of a new nursing curriculum. The purpose was to identify factors of program success versus withdrawal and NCLEX-RN passing data. The dependent variables were program completion and NCLEX-RN results. Success was defined as completion of the nursing program and passing the NCLEX-RN. Nonsuccess was defined as failing out due to poor grades, withdrawal from the nursing program for any reason, or failure on the NCLEX-RN. The study consisted of descriptive statistics, correlations, and regression analysis in three time settings: preadmission, in program, and end of program. Preadmission independent variables included (a) GPA from all prerequisite courses, (b) cumulative college GPA, NLN prenursing readiness test, (c) composite scores as

well as (d) verbal and (e) math subscores, (f) ethnicity, and (g) age. In-program independent variables included (a) grades in seven nursing courses, (b) achievement test scores on four NLN program standardized tests, and (c) a critical thinking appraisal. End-of-program independent variables were the Mosby Assessment test score, GPA in nursing courses, and GPA at graduation. Results of this study showed significant correlations between NCLEX-RN success and (a) the Mosby Assessment test score, (b) three of the four NLN program standardized tests, (c) GPA in nursing courses, and (d) fundamentals nursing course grade. However, after the completion of logistic regression analysis, only the NLN program standardized tests in adult health showed the most significance for success on the NCLEX-RN. Age and ethnicity were not significant in this study.

Ukpabi (2008) studied 39 graduates from North Carolina Central University generic BSN program. The purpose of the study was to find specific variables that would predict NCLEX-RN success for future students in the program. NCLEX-RN pass/fail results comprised the dichotomous dependent variable. The independent variables included (a) 13 ATI test score categories, including the TEAS, (b) five NLN test categories, and (c) GPA in the nursing curriculum. Using discriminate analysis, the researcher found that six of the eight prenursing categories were significant ($p < .05$). Of the NLN testing variables, three of the five were significant, and three of the six ATI tests used during the program were also significant. In this study, student GPA was not found to be predictive of NCLEX-RN success. The researcher found standardized testing to be a good predictor in the nursing program studied (Ukpabi, 2008).

Korvick, Wisener, Loftis, and Williamson (2008), in a retrospective, quasi-experimental study, evaluated the success of first semester nursing students in one nursing program. The students, although all beginning nursing students, were

admitted either as traditional students in search of a primary degree or on track for an accelerated BSN degree; meaning, these students are admitted to the BSN program already holding a baccalaureate degree in another field of study. The setting for this study was a nursing program at a mid-sized, private, urban university in the heart of America. The sample included 29 second baccalaureate candidates and 32 traditional BSN students. The study purpose was to determine if either sample performed better in the nursing program than the other. Program success was measured on a faculty made point system. The independent variables included age and PGPA for science courses only. The researchers found that age had no significance on first semester success; however, when looking at PGPA of those already holding a baccalaureate degree in another subject, it correlated to first semester success. The study also determined that when traditional BSN students with a grade of B or better in prerequisite courses were isolated from the other traditional BSN students in the group with lower prerequisite grades, the B grades correlated with first semester success.

Yucha, Kowalski, and Cross (2009) did a quasi-experimental study with two groups of nursing students from one nursing program. The differences in the groups were based solely on the placement of their clinical practice courses. Seventy-eight students were placed at the traditional hospital that educated students from this Las Vegas nursing program for years. Seventy-nine students were placed in new alternate hospital sites for the study. This alternate hospital site placement was done to determine if clinical placement would make a difference in students' outcomes due to the added stress of clinical placement at sites outside the traditional program hospital. NCLEX-RN success rate on the first try was the dependent variable. Independent variables included (a) GPA in nursing courses, (b) Nurse Entrance Test (NET), and (c) data from the Registered Nurse

Computerized Adaptive Test (RN-CAT). The RN-CAT is a mock NCLEX-RN assessment test typically given in the last weeks of a nursing program to determine NCLEX-RN readiness. The results of the study concluded that GPA was significant in predicting the results of the NET and RN-CAT tests. The NET and RN-CAT tests were not found to be associated to each other in this study. Finally, as far as passing the NCLEX on the first try, these researchers found that the higher the NET score, RN-CAT scores, and GPA in nursing courses, the more students were prone to passing the NCLEX-RN on the first try.

Newton and Moore (2009) studied a nursing program in a large Midwestern state supported BSN program. The purpose of the study was to look at BSN readiness for the NCLEX-RN and attrition late in the nursing program. The dependent variables leave the program or take the NCLEX-RN. The independent variables in the study fell under the categories of scholastic and nursing aptitude similar to Newton et al. (2007). Scholastic aptitude included prenursing GPA from seven prerequisites including (a) biology, (b) anatomy, (c) physiology, (d) chemistry, (e) bio-chemistry, (f) composition I, and (g) composition II. Nursing aptitude variables included (a) TEAS composite score as well as subscores of (b) math, (c) science, (d) reading, and (e) English. Logistic regression was used to examine effects of scholastic aptitude variables and nursing aptitude variables first on attrition, and neither was found to be predictive. Stepwise regression analysis was used to assess effects of scholastic and nursing aptitude on NCLEX-RN readiness. This part of the study indicated scholastic aptitude was predictive but nursing aptitude was not predictive. Of all the variables, these researchers found first semester nursing GPA to be the most predictive of NCLEX readiness.

Gaps in Research

In the preceding literature review, many studies were dedicated to the attempt to find program and NCLEX-RN success predictors either before admission to a nursing program, after admission, during the progression stages throughout the program, or both before and after admission individually, or in comparison. Standardized testing has been studied as a possible predictor before and on admission to a program as a gauge of readiness for the content and rigor of nursing education and professional practice. Standardized testing has also been a popular assessment at the conclusion of the nursing education process as a predictor of readiness to sit for the licensing exam. Other variables have been visible in research at pre and postadmission as well such as course grades, GPA, and nonacademic criteria. However, missing in the research is standardized testing throughout nursing education. Progressive standardized topic-related tests like those offered to nursing programs by ATI, are available to evaluate not only nursing content knowledge throughout the education process but also computerized testing (not adaptive) with NCLEX-RN style questions. These tests give simulated NCLEX-RN practice with benchmark and potential percent of NCLEX-RN success for each student as immediate feedback at the end of the test (see Figure 5, p. 29).

Many nursing programs in the California State University system use the ATI system. The ATI "box," as it is referred to, may only be purchased through a nursing program by students in that program. The box contains a set of books, online access for 3 years with secured codes, and proctored tests for each of the following subject areas: TEAS, Adult Medical-Surgical, Fundamentals, Pharmacology, Nutrition, Maternal Newborn, Leadership, Mental Health, Pediatrics, and the RN comprehensive exam. Although the pre or admission TEAS

test and the end of program RN comprehensive exam are becoming visible in nursing research, there is no sign of the full use of the "boxed" program, as it was designed to assist students, faculty, and nursing programs to meet the demand for safe, competent, practice-ready, registered nurses who graduate from accredited institutions. Research in the complete use of the ATI testing program is the focus of this dissertation. Information in this area would address this gap in the research and provide insight to the strength, or lack of strength, that comes with progressive standardized testing before, throughout, and at the end of nursing education.

Summary

The theoretical framework, Dreyfus and Dreyfus's (1980) model, and Benner's (2001) nursing theory, were applied to this study. This framework assumes that the principals of nursing theory, taught in the educational setting, will prepare graduates to be safe, competent nurses, armed with the knowledge needed to master skills while using upper level thinking. In nursing practice this would include the use of critical thinking and clinical reasoning to ask the right questions and problem solve effectively (Benner, 2001). Nursing education is responsible for providing the groundwork of this model in the nursing school experience. Implementation of this model is completed by giving students the knowledge and theoretical framework needed to pass the NCLEX-RN and practice under the nursing scope of practice in the current workforce. Using Benner's nursing theory in the education realm keeps the focus on building upon past education and experience to advance to the next level of academic and clinical training.

Chapter 3 discusses the methodology of the dissertation research and the procedures used to conduct this study.

CHAPTER 3: METHODOLOGY

Introduction

The importance of this licensing exam raises questions about the content of nursing curriculum, how students are educated, if there are effective measures that can be used to correlate student results, and what early interventions will improve the test outcomes. Chapter 3 includes (a) study purpose, (b) research design, (c) research questions, (d) operational definitions, (e) study sample, (f) data collection, (g) human subjects review, (h) instrumentation, (i) pilot study, (j) procedures, (k) data analysis, and (l) limitations and delimitations.

Purpose of the Study

The purpose of this study is to explore whether academic aptitude and nursing aptitude are correlated with first-attempt pass rates on the NCLEX-RN in baccalaureate nursing programs. This research has the potential to (a) investigate admission criteria of baccalaureate nursing programs, (b) assist in the identification of students that will struggle in nursing education and would benefit from early intervention and/or remediation, and (c) better prepare senior nursing students as successful graduates who will pass the NCLEX-RN on the first try.

Research Design

The research in this study will be nonexperimental, retrospective, quantitative, and correlational. It will examine independent variables prior to admission to a nursing program as well as independent variables within the education of a professional nurse. The study will look for correlations among these variables separately, together, and how they relate to student outcomes on the NCLEX-RN licensing exam. What distinguishes the study as nonexperimental is

that the data will not be manipulated in any way, nor will there be randomization. Both randomization and manipulation would need to be present in an experimental study, and manipulation would be present only in a quasi-experimental design (Pedhazur & Schmelkin, 1991). This study will be retrospective, also known as ex post facto, because the data are archival or in the past (Polit & Hungler, 1995). This research will be correlational due to the variation in the criterion variable, and the NCLEX-RN outcome which will be examined for its relationship to the variables (Kerlinger & Lee, 2000). The criterion variable (NCLEX-RN) results are reported as pass or fail, rendering them dichotomous.

Research Questions

This study is guided by the following research questions.

1. How do academic aptitude and nursing aptitude correlate?
2. How does nursing aptitude correlate with first-try NCLEX-RN pass rates, controlling for academic aptitude of BSN students?
3. How do academic aptitude and nursing aptitude predict first-try NCLEX-RN pass rates for BSN students in the CSU system?

Operational Definitions

The following definitions are explained to provide understanding and clarification of specific terms that will be included in this paper.

Bachelor of Science in Nursing (BSN) or Baccalaureate degree – awarded after typically a 4-year period of study at a university or private college. The degree requires a more expansive range of study besides that required for nursing practice and prepares students for leadership and management roles along with readiness for advanced practice education (BRN, 2010).

Benchmark – "A statement of expected achievement, frequently inspirational in nature, posed generally by a group or organization; a means by which a program can compare themselves with a larger group" (NLN, 2006, p. 76).

Board of Registered Nursing (BRN) – state legislative body responsible for regulating nursing practice with a mission to protect the public as defined by the nurse practice act, to uphold standards of safe, competent nursing practice, and manage issues of its licensees (BRN, 2010).

National Council Licensure Exam for Registered Nurses (NCLEX-RN) – national licensing exam available to nursing students who have graduated from an accredited school of nursing. Graduates must pass this licensing exam in order to practice in the profession of nursing. Reliability reported at Cronbach's alpha .91 in a national study of 31,036 nurses (NCSBN, 2010).

National Council of State Boards of Nursing – an independent nonprofit organizational board represented by members from each state that are responsible for development and monitoring of the NCLEX-RN (NCSBN, 2010).

NCLEX-RN pass rates – percentage of nursing student candidates passing the licensing exam (Woo, 2011). In this study only students who have taken the NCLEX-RN for the first time will be included. The rationale for this decision is, although students have up to six months after graduation to take the NCLEX-RN, should they fail the exam, they must wait 45 days between subsequent attempts.

Predictors

Academic aptitude – preadmission data, including no nursing content (a) preprogram GPA, (b) TEAS composite, (c) TEAS reading, (d) TEAS English, (e) TEAS math, (f) TEAS science, (g) chemistry, (h) anatomy, (i) physiology, (j)

microbiology, (k) oral communication, (l) English composition, (m) critical thinking, (n) math, and (o) prerequisite GPA.

ATI Test of Essential Academic Skills (TEAS) – a preadmission assessment test to measure entry-level skills in math, verbal and written reading, as well as science (ATI, 2010). Reliability reported at Cronbach's alpha 0.90 for a national sample of program using ATI (ATI, 2009).

Criterion

ATI RN Comprehensive Assessment – a 180-question test, typically given to nursing students in the final semester of nursing school, as an assessment of safety and competence for entrance into the nursing profession. Upon completion of this exam, students receive feedback regarding the probability of passing the NCLEX-RN (ATI, 2007). Reliability reported at Cronbach's alpha 0.79 in a national study (ATI, 2009).

ATI RN Content Mastery Series Online Practice Assessments – content-based proctored tests to assess nursing content knowledge during progression through a nursing program (ATI, 2007).

Nursing aptitude – in nursing school progression, all nursing content (a) ATI fundamental score, (b) ATI fundamental level, (c) ATI pharmacology score, (d) ATI pharmacology level, (e) ATI medical/surgical score, (f) ATI medical/surgical level, (g) ATI psychology score, (h) ATI psychology level, (i) ATI OB score, (j) ATI OB level, (k) ATI pediatrics score, (l) ATI pediatrics level, and (m) RN comp II score.

Study Sample

The study will include California State University baccalaureate nursing programs that are willing to participate and have the data available for the time

frame presented. There are 23 CSUs in the system. Three of these universities do not have nursing programs. One school has an RN to BSN program only, another school offers only the prerequisites to a nursing education, a third has a new program, with the first class graduating in 2011, and a fourth has cancelled the nursing program altogether. These seven will not be included in the study.

An informative invitation email was sent to the remaining 16 CSUs. All student data from the university nursing programs, who agree to participate, and have available data within the time frame, will be included in the study. The study will look at specific variables over two academic years, including 2009-2010 and 2010-2011. Of the 16 CSU schools invited, four nursing programs had the needed data in the study time frame and were willing to participate (see Table 4). In order to determine the population size and the need for a power analysis, an estimate has been made as follows. Of the four participating programs, program number 1 has 245 participants, program number 2 has 255 participants, program number 3 has 146 participants, and program number 4 has 203 participants. This provides a sample population of 864 participates in the study, an adequate sample confirmed by prior power analysis.

The research sample was estimated from graduation statistics of the four CSU baccalaureate nursing programs in the study: CSU Fresno, CSU Sacramento, CSU Bakersfield, and CSU Fullerton. This estimated sample was 794 nursing graduates posted as statistical data on the CSU website; however, when the data were collected for the academic years of 2009-10 and 2010-11 for students who completed the NCLEX-RN exam once, not all data were complete from each school. The decision was made to keep all four schools in the study and eliminate variables with incomplete data from all four schools. This left only 11 of the 23 initial variables in the study intact and the number of participants dropped to 532.

Table 4

California State University Nursing Programs

CSU	Study status	Response
Bakersfield	Invitation extended	Accepted N=146
Channel Islands	New program – 1st grad 2011	N/A
Chico	Invitation extended	No response
Dominguez Hills	RN-BSN program only	N/A not 4-year BSN
East Bay	Invitation extended	No response
Fresno	Invitation extended	Accepted N=245
Fullerton	Invitation extended	Accepted N=203
Humboldt	Program discontinued	N/A
Long Beach	Invitation extended	No response
Los Angeles	Invitation extended	No response
Maritime Academy	No program	N/A
Monterey Bay	No program – prerequisites only	N/A
Northridge	Invitation extended	No response
Pomona	No program	N/A
Sacramento	Invitation extended	Accepted N=255
San Bernardino	Invitation extended	No response
San Diego	Invitation extended	No response
San Francisco	Invitation extended	No response
San Jose	Invitation extended	Denied
San Luis Obispo	No program	N/A
San Marcos	Invitation extended	No response
Sonoma	Invitation extended	No response
Stanislaus	Invitation extended	Denied

It was the decision of this researcher to include more schools and fewer variables in order to make the study more generalizable. A quantitative, retrospective, correlational design was used to analyze the relationship of the independent prenursing program predictor variables of prenursing GPA, communication 3, reading TEAS, math TEAS, science TEAS, English TEAS, and independent in-program criterion variable of ATI fundamentals, ATI medical surgical, ATI pediatrics, ATI psychology, and ATI maternal child. The dependent dichotomous NCLEX-RN pass/fail variable was also used.

Data Collection

The variables for this study were determined using the Dreyfus/Benner (1984) theoretical framework adapted for this research study in the theoretical framework section of chapter 2 (see Figure 5, p. 29). Since students are admitted into nursing programs as novices of nursing education, each course or set of courses builds upon prior courses on a stair-step path from novice nursing student to expert nursing student prepared to graduate and take the NCLEX-RN. Dreyfus and Dreyfus (1980) would recognize this progression through the nursing program in three major steps: (a) Encompasses the theory model reliance on the abstract, bookwork, or "know it" phase; (b) The use of concrete experience, which adds the "do it" phase; and (c) Less fragmented learning that takes on a holistic approach of the "detached observer to involved performer" (Benner, 2001) (see Figure 4 in the theoretical framework section of chapter 2, p. 28). These three steps as related to nursing education are preadmission, in-program progression, and NCLEX-RN results. The variables for this study fit under these theoretical framework headings. First, preadmission (a) preprogram GPA, (b) TEAS composite, (c) TEAS reading, (d) TEAS English, (e) TEAS math, (f) TEAS science, (g) chemistry, (h) anatomy, (i) physiology, (j) microbiology, (k) oral communication, (l) English composition,

(m) critical thinking, (n) math, and (o) prerequisite GPA. Second, in-program progression (a) ATI fundamental score, (b) ATI fundamental level, (c) ATI pharmacology score, (d) ATI pharmacology level, (e) ATI medical/surgical score, (f) ATI medical/surgical level, (g) ATI psychology score, (h) ATI psychology level, (i) ATI OB score, (j) ATI OB level, (k) ATI pediatrics score, (l) ATI pediatrics level, and (m) RN comp A and B scores. Third, NCLEX-RN results (a) pass, (b) fail. Each CSU nursing program in the study will complete a data collection sheet for the students from that institution. The data tool included the input of all variables into the Microsoft Excel formatted data collection tool that was imported into SPSS.

Human Subjects Review

Institutional Review Board (IRB) permission was obtained from all participating universities and nursing programs as well as the university of this doctoral dissertation. All of the participating nursing programs were asked to complete a data collection tool containing only the information requested, free of any personal information, to maintain anonymity. The study was deemed exempt at the four campuses in the study due to the use of only archival data and no psychological risk. Information received by this researcher, for general research security, was secured on password protected computers and flash drives and locked in a key-entry office. Any identification information will be deleted at the end of the study. Individual school findings will be reported to each participating program through the faculty or staff involved with this researcher during the study. Complete findings of all participating school data will be reported in aggregate fashion to each participating CSU nursing department.

Instrumentation

To collect and record student data for this study, a separate Microsoft Excel document was created for each school in the study initially and then merged. All 28 preadmission and in-program variables are categorical or continuous. There will be 13 preadmission academic aptitude variables, 18 in-program nursing aptitude variables, and one dichotomous criterion variable. Many variables in this study have been previously identified in nursing literature as having some significance to NCLEX-RN success in baccalaureate nursing graduates (see Appendix A). Additional variables have been added to address gaps in the literature and research.

Pilot Study

Demographics

A pilot study was completed using the assessment tool and all variable data from one volunteer CSU nursing program, California State University, Fresno. The pilot study had 245 participants and data available for the 28 variables in the time frame of academic years of 2009-10 and 2010-11 (see Table 5). The participant population was made up of 83% females and 17% males. Majority ethnic groups represented were White 42%, Mexican 11%, and Filipino 10%. Ten percent of the population did not respond to the ethnicity question. The remaining 27% fell between 0.4% and 4.1% of the remaining CSU system ethnic classification choices: American Indian/Alaskan Native, African American, Other Caribbean, Other Asian, Other Pacific Islander, Other, Chinese, Decline to State, Japanese, Korean, Laotian, Puerto Rican, Asian Indian, Other Southeast Asian, Thai, and Vietnamese.

Table 5

Pilot Population Demographic Information

Category	N	%
Gender		
Male	42	17.1
Female	203	82.9
Ethnic group		
Amer Indian/Alaskan	1	.4
African American	7	2.9
Mexican	28	11.4
Other Caribbean	5	2.0
Other Asian	4	1.6
White	103	42.0
No response	24	9.8
Chinese	2	.8
Decline to State	9	3.7
Filipino	25	10.2
Japanese	3	1.2
Korean	1	.4
Laotian	3	1.2
Puerto Rican	2	.8
Asian Indian	10	4.1
Other SE Asian	7	2.9
Thai	1	.4
Vietnamese	10	4.1
Family income		
Less than $24,000/ yr	33	13.5
$24,000 to $35,999	13	5.3
$36,000 to $47,999	16	6.5
$48,000 to $59,999	8	3.3
$60,000 to $71,999	11	4.5
$72,000 or more	41	16.7
Cannot estimate	9	3.7
No response	114	46.5
Mother's education		
No high school	39	15.9
Some high school	12	4.9
High school graduate	47	19.2
Some college	38	15.5
2-year college grad	22	9.0
4-year college grad	47	19.2
Postgraduate	16	6.5
No response	24	9.8
Father's education		
No high school	36	14.7
Some high school	12	4.9
High school graduate	45	18.4
Some college	43	17.6
2-year college grad	9	3.7
4-year college grad	46	18.8
Postgraduate	26	10.6
No response	28	11.4

In the area of family income, 47% of the population did not respond. Seventeen percent reported a family income $72,000 or greater, followed by 14% who reported less than $24,000. The remaining family income categories each had less than 7% representation. These categories are $24,000 to $35,999, $36,000 to $47,999, $48,000 to $59,999, $60,000 to $71,999, and cannot estimate.

For information regarding the students' mother's education, 19% reported their mother's education as high school graduate, 19% 4-year college graduates, 16% had no high school education, and 15% had some college. Ten percent did not respond in this area, 9% were 2-year college graduates, post-graduate education made up 7%, and the remaining 5% had some high school.

In the category of father's education, 19% said their father was a 4-year college graduate, 18% high school graduate, and 18% some college. Fourteen percent had no high school, 11% did not respond, 10% had postgraduate degrees, 5% had some high school, and 5% were 2-year college graduates.

Statistical Analysis

Correlation coefficients were run between all the academic aptitude independent variables of (a) pre-program GPA, (b) TEAS composite, (c) TEAS reading, (d) TEAS English, (e) TEAS math, (f) TEAS science, (g) chemistry, (h) anatomy, (i) physiology, (j) microbiology, (k) oral communication, (l) English composition, (m) critical thinking, (n) math, and (o) prerequisite GPA with all of the nursing independent variables of (a) ATI fundamental score, (b) ATI fundamental level, (c) ATI pharmacology I score, (d) ATI pharmacology I level, (e) ATI pharmacology II score, (f) ATI pharmacology II level, (g) ATI medical/surgical score, (h) ATI medical/surgical level, (i) ATI psychology score, (j) ATI psychology level, (k) ATI OB score, (l) ATI OB level, (m) ATI pediatrics score, (n) ATI pediatrics level, (o) RN comp A score, (p) RN comp A probability

score, (q) RN comp B score, (r) RN comp B probability score, and (s) the dichotomous dependent variable NCLEX-RN.

Correlating these 34 variables resulted in 561 correlation coefficients. These correlations ranged from -.374 to -.798. They are not reported here due to the volume of these statistics; however, all correlations and their probabilities appear in Appendix B. It was determined that some of the nursing variables would not provide useful information in this study for several reasons. These variables included the ATI test proficiency levels, 1-3, for each of the individual ATI subject. The ATI test scores are reported levels as percentages from 0% to 100%, while ATI levels represent the blocking of ATI test scores into four levels. Although the level simplifies goal setting and proficiency for nursing faculty and students, the actual student score is a higher statistical measure than the ATI proficiency levels of 1-3. Only ATI test scores were retained in this data set as the ATI level consisted of duplicated information with less variability. The same is true for the probability of passing the NCLEX-RN percentages based on the RN comprehensive exam A and the RN comprehensive exam B individual student scores. Therefore, the level data would be a duplication of the individual test scores, and the probability percentage is a duplication of the individual exam score. The decision was made to use only one set of variables to eliminate duplication and avoid multicolinearity.

The nursing aptitude independent variables included in the study are (a) ATI fundamental score, (b) ATI pharmacology I score, (c) ATI pharmacology II score, (d) ATI medical/surgical score, (e) ATI psychology score, (f) ATI OB score, (g) ATI pediatrics score, (h) RN comp A scores, and (i) RN comp B scores. It was also determined that there were multiple variables measuring the same constructs more than once. For example, the prerequisite GPA is an average of the

eight prerequisite course grades. Since both the grades for each prerequisite course and the prerequisite GPA were available and the actual grades are more specific, the prerequisite GPA variable was removed. In addition, correlations would be inflated if both were used since that information would be included in the statistical analysis twice. The same was found to be true regarding the comprehensive TEAS score and the four subtest scores of math, reading, science, and English. The four subtest scores are averaged and reported as the comprehensive score, therefore multiples provide redundant information. The comprehensive TEAS were removed from the study. The final pilot study included 13 academic variables, 9 nursing variables, and the dichotomous NCLEX-RN pass/fail dependent variable.

Canonical Correlation

Question 1 – How do academic aptitude and nursing aptitude correlate? Canonical Correlation (CC) analysis was conducted for the nine nursing aptitude criterion variables and the 13 academic aptitude variables as predictors. CC evaluates the multivariate shared relationship between the two variable sets. The CC analysis yields a number of functions based upon the number of predictors or the number or criterion variables, whichever is smaller, in addition to the test of the overall model. Collectively, the model across all functions was statistically significant using the Wilk's Lambda criterion (Wilk's Lambda = .208, $F(117, 1298.00) = 2.60$, $p < .001$). Because Wilk's Lambda represents the variance unexplained by the model, 1-Lambda yields the full model effect size in an r^2 metric. Thus, for this set of canonical functions, the r^2 type effect size was 1-.208 = .792, which indicates that the full model explained a substantial portion (~79%) of the variance shared between the sets of predictor and criterion variables. Although this CC yielded nine functions, a decision must be made regarding

interpretation. This subjective decision is based on the significance of each of the nine functions and the magnitude of the structure coefficients.

The dimension reduction analysis allowed the researcher to test the hierarchal arrangement of functions for statistical significance. The models for the first three functions were statistically significant, as were the model functions for one to nine: (F (117, 1298.99) = 2.60, p <001). The model for functions two to nine were significant (F (96, 1175.66) = 1.74, p < .001), as was the model for functions three to nine (F (77, 1050.12) = 1.46, p =.01). The next six functions were not statistically significant.

CCs ((R_c) of .701, .504, .404, .384, .347, .255, .214, .139, and .059) were revealed for each successive function. The (R^2_c) for the nine functions were .49, .25, .16, .15, .12, .06, .05, .02, and .003. The first two functions were considered noteworthy in the context of this study, 49% in function 1, 35% in function 2, and the remaining variance in the variable sets after the extraction of the prior functions leveled off and did not explain as much of the variance.

Table 6 presents the standardized canonical functions coefficient and structure coefficients for all variables across functions 1 and 2. The squared structure coefficients (r^2_s) are also given, which is the index of the percentage of shared variance between a predictor or criterion variable and the remaining predictor or criterion variables in the variable set or how much variance they share. The far right column lists the communality coefficients (h^2), which represent the amount of variance in the academic and nursing aptitude that was explained across the functions. Structure coefficients above .40 are underlined, as are communalities above 40% to reveal the variables with the highest usefulness in the function.

Table 6

Canonical Solution for Nursing Aptitude Predicting Academic Aptitude for Functions 1 and 2

Variable	Function1			Function2			
	Coef	r_s	r_s^2(%)	Coef	r_s	r_s^2(%)	h_s(%)
GPAb4Nsg	-.139	-.379	.144	-.343	-.296	.088	.232
Chem3A	.005	-.003	.000	-.032	.022	.000	.000
Anatomy	-.143	-.361	.130	-.009	-.045	.002	.132
Physiology	-.141	-.200	.040	.123	.027	.000	.040
Micro	-.090	-.241	.058	-.384	-.406	.165	.223
Comm3	-.078	-.125	.016	-.339	-.389	.151	.167
Eng 1A	-.022	-.124	.015	.008	-.036	.001	.016
Math 11	-.011	.035	.001	-.477	-.422	.178	.179
CritThink	-.032	-.106	.011	.199	.245	.060	.071
Read TEAS	-.245	-.721	.520	-.639	-.283	.080	.600
Math TEAS	-.194	-.694	.482	.395	.236	.056	.538
Scien TEAS	-.456	-.817	.667	.214	.181	.033	.700
Eng TEAS	-.221	-.665	.442	.326	.132	.017	.459
R_c^2		49.1			25.4		
Comp A	.356	-.869	.755	.155	-.236	.056	.811
Comp B	-.213	-.808	.653	.122	-.189	.036	.689
ATI Fund	-.266	-.783	.613	.223	.007	.000	.613
ATI Pharm I	-.058	-.654	.428	-.151	-.231	.053	.481
ATI Pharm II	-.163	-.692	.479	.071	-.246	.061	.540
ATI MedSurg	-.113	-.712	.507	-.150	-.270	.073	.580
ATI Peds	-.314	-.458	.210	-.557	-.552	.305	.515
ATI Psych	.313	-.732	.536	.576	.148	.022	.558
ATI MatChi	-.023	-.483	.233	-.791	-.756	.572	.805

In function 1 coefficients, the salient predictor variable with the highest structure coefficients were reading TEAS (r_s = -.721), math TEAS (r_s = -.694), science TEAS (r_s = -.817), and English TEAS (r_s = -.665). On the criterion side of function 1, all nine criterion variables had high structure coefficients: RN comp A (r_s = -.869), RN comp B (r_s = -.808), ATI fundamentals (r_s = -.783), and ATI pharmacology I (r_s = -.654), ATI pharmacology II (r_s = -.692), ATI medical/surgical (r_s = -.712), ATI pediatrics (r_s = -.458), ATI psychology (r_s = -.732), and ATI maternal child (r_s = -.483). In function 2 coefficients, the salient predictor variable with the highest structure coefficients were microbiology (r_s = -.406), math 11 (r_s = -.422), microbiology (r_s = -.406), ATI pediatrics (r_s = -.522), and ATI maternal child (r_s = -.756). In function 3, the structure coefficient for only one variable reached the .40 cut-off level so that function and the others were deemed uninterruptable.

These results reveal that in function 1 it is known that if students score high on predictor variables, they will also score high on criterion variables because the sign for all structure coefficients is the same. All TEAS subscores are good predictors of ATI tests scores or nursing criterion. Function 2 reveals that if students score high on microbiology and math 11, they will do well in pediatrics and maternal child. These are relevant based on the importance of well child visits and prenatal visits for preventative care. Since both of these are considered states of wellness and not illness, when illness does arise microbiology becomes significant. Also, since medication calculations are based on weight and body surface area for infants and children, the significance of math can also be understood. Considering this statistical information, the decision was made to interpret only function 2.

Regression Analysis Results

One can think of regression analysis as a type of post hoc test for canonical correlation. Table 7 shows a separate regression analysis for each of the nine criterion variables with the 13 predictor variables. This table presents *t* values and their significance levels for each predictor variable in the model for each dependent variable. Prenursing GPA, anatomy, reading TEAS, and science TEAS were significant predictors of the RN comprehensive A. Prenursing GPA, microbiology, reading TEAS, and science TEAS were significant predictors of the RN comprehensive B. Anatomy, reading TEAS, and science TEAS were significant predictors of the ATI fundamentals test. Physiology, microbiology, and science TEAS were significant predictors of the ATI pharmacology I test. Microbiology and science TEAS were significant predictors of the ATI pharmacology II test. Microbiology, reading TEAS, and the science TEAS were significant predictors of the ATI medical surgical test. Anatomy, microbiology, and reading TEAS were significant predictors of the ATI pediatrics test. Physiology, math TEAS, and science TEAS were significant for the ATI psychology test. Prenursing GPA, communication 3, math 11, and the reading TEAS were significant for the ATI maternal child test.

Of the predictor variables, the science TEAS was significant in seven regression modules. The reading TEAS was significant in six regression modules. Microbiology was significant in five regression modules. Prenursing GPA and anatomy each were significant in three regression models. Physiology was significant in two regression models, and math 11 and math TEAS were each significant in one regression model.

Table 7

T-values and Probabilities of the Regression Coefficients for the Nine Models Using Nursing Variables as Dependent Variables and Academic as Predictors

				Criterion Variables					
Predict Variables	RN CompA	RN CompB	ATI Fund	ATI Pharm1	ATI Pharm2	ATI MedSurg	ATI Peds	ATI Psych	ATI MatChild
Pre nsg GPA	(2.18, .03)	(2.45, .02)	(.19,.85)	(1.30, .19)	(1.59, .11)	(.55, .58)	(1.29, .20)	(.48, .63)	(3.04,< .001)
Chem 3A	(.79, .43)	(< .001, .99)	(-.11, .91)	(-.45, .65)	(-.63, .53)	(.13, .90)	(.97, .34)	(.51, .61)	(.06, .95)
Anatomy	(2.68, < .001)	(.36, .72)	(1.94, .05)	(1.54, .12)	(.88, .38)	(.73, .47)	(2.02, .04)	(1.23, .22)	(.06, .95)
Physio	(1.10, .27)	(-.92, .36)	(1.27, .20)	(2.30, .02)	(.53, .60)	(.16, .87)	(.05, .96)	(2.50, .01)	(.51, .61)
Micro	(-.056, .96)	(1.98, .05)	(1.67, .10)	(2.69,< .001)	(2.82,< .001)	(2.98,< .001)	(3.11,< .001)	(.50, .62)	(1.66, .10)
Comm 3	(1.64, .10)	(-.50, .62)	(-.89, .38)	(1.67, .10)	(1.28, .20)	(.44, .66)	(1.26, .21)	(.07, .95)	(2.08, .04)
Eng 1A	(.07, .94)	(-.1.00, .32)	(-.02, .98)	(-.53, .58)	(-.37, .71)	(.69, .49)	(-1.85, .07)	(-.58, .56)	(.64, .52)
Math 11	(1.11, .27)	(.42, .68)	(-1.84, .07)	(.65, .52)	(.87, .38)	(1.56, .12)	(1.39, .17)	(.62,.54)	(3.53,< .001)
Crit Think	(.08, .94)	(-.15, .88)	(.33, .75)	(.91, .36)	(.75, .45)	(-.24, .81)	(.75, .45)	(1.25, .21)	(-1.54, .13)
Read TEAS	(3.34, .001)	(3.03, < .001)	(3.41, < .001)	(.85, .40)	(1.25, .21)	(2.06, .04)	(3.58,< .001)	(.49, .63)	(3.82,< .001)
Math TEAS	(.90, .37)	(.83, .41)	(.86, .39)	(-.63, .53)	(-.10, .92)	(.72, .47)	(-.31, .76)	(3.16,< .001)	(-.30, .76)
Scien TEAS	(2.88, .004)	(3.83, < .001)	(2.25, .03)	(3.0, < .001)	(3.67,< .001)	(.05,< .001)	(.41, .68)	(2.55, .01)	(.46, .64)
Eng TEAS	(1.28, .20)	(.75, .45)	(1.28, .20)	(1.42, .16)	(.82, .41)	(.06, .61)	(-.96, .34)	(1.18, .24)	(-.55, .58)

Linear Regression

Question 2 – How does nursing aptitude correlate with first-try NCLEX-RN pass rates controlling for academic aptitude of BSN students? To answer Question 2, linear regression analysis was run. To test for this question, three multiple linear regression models were run. The first model included all academic and nursing variables. The second model controlled for academic variables, so the regression weights for those academic variables were set equal to zero. The restricted model only included the nursing variables. The R^2 values from these two models are then used to calculate a change F as follows:

$$F = \frac{(R^2_F - R^2_R)/(m_1 - m_2)}{(1 - R^2_F)/(N - m_1)}$$

Where
m_1 = the number of weights in the full model
m_2 = the number of weights in the restricted model

$R^2_F = R^2$ in the full model
$R^2_R = R^2_\Sigma$ in the restricted model

This F tests for the effects of the nursing variables controlling for the academic variables (McNeil, Newman, & Kelly, 1996).

To do this analysis, a full model, a restricted model, and a change model are run. The full and restricted models appear in Table 8. Both the full model ($F = 2.71$, $df = 22, 171$, $p = < .001$) and the restricted model ($F = 4.19$, $df = 9, 184$, $p = < .001$) are significant, while the change model ($F = 1.57$, $df = 13, 171$, $p = .10$), which answers the research question, is not significant. When the change model removes the variables of academic aptitude from the NCLEX-RN results, it is no longer significant. In practical terms, this means NCLEX-RN is better predicted from both academic and nursing variables or from nursing variables only.

Table 8

Results of Full, Restricted, and Change Model to Predict NCLEX-RN

Model	df	F	p	R^2	ΔR
Full (academic + nursing)	22, 171	2.71	< .001	.258	
Restricted (academic)	9, 184	4.19	< .001	.170	
Change (nursing)	13, 171	4.57	.100		.088

Logistic Regression

Question 3 – How do academic aptitude and nursing aptitude predict first-try NCLEX-RN pass rates for BSN students in the CSU system? Finally, to answer research Question 3, a logistic regression analysis was completed. Logistic regression allows for several variables, 13 academic aptitude variables and nine nursing aptitude variables, to predict one dichotomous pass-fail criterion, NCLEX-RN. To determine the best model, all predictors were included in the model, and then a backwards conditional stepwise solution was run to determine the best model.

When all 22 variables are included, the model is significant ($x^2 = 54.47$, $df = 22$, $p < .001$) and the Nagelkerke R^2, which explains the amount of variance accounted for in the model, was .483. However, all variables are not significant. Table 9 presents the Wald statistical degrees of freedom, a significant level for all 22 variables in this model.

Also, the classifications appear in Table 10. All students were predicted to pass the NCLEX-RN, yet 22 failed, for an 88.7% correct percentage.

Nineteen models were fit to arrive at an optimal model, which included four variables and was significant ($x^2 = 38.90$, $df = 4$, $p < .001$) and the Nagelkerke R^2 for this model is .358. Table 11 presents the Wald Statistic, degrees of freedom, and probability for the four variables in the final model.

Table 9

Variables in Model

Step 1[a]	Wald	df	Sig
RN Comp A	.031	1	.860
RN Comp B	.928	1	.335
Pre Nsg GPA	1.004	1	.316
Chemistry 3A	1.162	1	.281
Anatomy	.430	1	.512
Physiology	2.342	1	.126
Microbiology	.000	1	.988
Communication 3	5.921	1	.015
English 1A	.546	1	.460
Math 11	.518	1	.472
Critical Thinking	1.965	1	.161
Reading TEAS	.062	1	.804
Math TEAS	3.487	1	.062
Science TEAS	1.093	1	.296
English TEAS	1.523	1	.217
ATI Fundamentals	.100	1	.751
ATI Pharmacology I	1.104	1	.293
ATI Pharmacology II	2.367	1	.124
ATI Med/Surg	.732	1	.392
ATI Pediatrics	.130	1	.718
ATI Psychology	.817	1	.366
ATI Maternal Child	.162	1	.687

Table 10

Classification Table[a,b]

	Predicted		
Observed	NCLEX 1st		Percentage correct
	1	*2*	
Step 0 NCLEX 1st 1	172	0	100.0
2	22	0	.0
Overall percentage	38.902	4	88.7

a. Constant is included in the model
b. The cut value is .500

Table 11

Variables in Model

Step 19[a]	Wald	df	Sig
RN Comp B	4.136	1	.042
Physiology	5.786	1	.016
Communication 3	8.051	1	.005
Pharmacology II	5.363	1	.021

a. Variables entered on step 1: RNcompA, RNcompB, prensgGPA, Chem3A, Anatomy, Physiology, Microbiology, Comm3, Eng1A, Math11, CritThink, ReadTEAS, MathTEAS, ScienceTEAS, EngTEAS, ATIfund, ATIpharm1, ATIpharm2, ATIMedSurg, ATIPeds, ATIPsyche, ATIMatChild

The final classification Table 12 shows that 169 students were predicted to pass the NCLEX-RN and 13 were predicted to fail. In the overall model, correct percent was greater than 99.7%. Both models are significant and, in the first, some variables are significant and some are not. In the second model, only the significant variables were retained which slightly improved the percent correct to 91.8%.

Finally, in Table 13, the stepwise regression ends at Step 19, removing variables in each step. The results revealed that four variables were significant, two predictor academic aptitude variables, communication 3 ($p = .004$), physiology ($p = .013$) and two criterion nursing aptitude variables, RN comp B ($p = .038$), and ATI pharmacology II (p = .016).

Table 12

Classification Table[a]

	Predicted			
Observed	NCLEX 1st		Percentage correct	
	1	*2*		
Step 19 NCLEX 1st 1	169.000	3	98.3	
2	13.000	9	40.9	
Overall percentage	38.902	4	91.8	

a. The cut value is .500

Table 13

Model if Term Removed

Variable	Model log likelihood	Change in -2 log likeliness	df	Sig. of the change
Step 19 RN Comp B	-51.298	4.312	1	.038
Physiology	-52.237	6.191	1	.013
Communication3	-53.377	8.471	1	.004
ATI Pharm II	-52.027	5.771	1	.016

The answer to research Question 3 is yes for the academic aptitude variables of communication 3 and physiology and for the nursing aptitude variables of RN comp B and pharmacology II.

This pilot study was completed to evaluate the data collection tool and the statistical analysis methods proposed for a doctoral dissertation study. The tool was found to contain all the desired variables needed for the study. The nursing aptitude variables of ATI comp A and B probability percentages and the levels for the ATI subject tests were found to be repetitive data and will not be used for the dissertation study. The academic aptitude variables of GPA before nursing and

comprehensive TEAS were also repetitive data and will be excluded as well. The actual research study plan is to run the three statistical analysis used in this study to answer the three research questions proposed. The complete doctoral research will use four CSU universities who agreed to be part of the study.

Procedures

A request was made to each CSU nursing program in the study to complete the formatted data collection Excel tool for the students from that institution, which includes all variables, and is compatible with SPSS 19.0. Data were obtained from sources available to each CSU nursing program including, but not limited to (a) student reports per university archival sources, (b) nursing department records, (c) college transcripts, (d) ATI archival data, and (e) BRN NCLEX-RN pass rate data. As each CSU completed the data collection tool with data from the corresponding institution, the completed tool was electronically returned to the researcher. The completed individual university data files were merged into a file that was created for the statistical package used to analyze the data. SPSS 19.0 was used to perform the research calculations.

Data Analysis

Data were compiled completely into the research instrument. A file created in SPSS 19.0 statistical package was used to analyze the data and perform calculations. Descriptive Statistics, Correlational Analysis, Canonical Analysis, Regression Analysis, and Logistic Regression were run.

Descriptive Statistics

Descriptive Statistics are techniques used to summarize the data of individual dependent variable (Huck, 2008). This was used with mean and standard deviation data for variables per CSU program and total.

Correlation Analysis

Correlational analysis is using statistical correlation to evaluate if there is a relationship between variables, and also Correlation also helps determine the strength of those relationships (Kerlinger & Lee, 2000).

Canonical correlation analysis (CCA) is a multivariate statistical method used when the researcher wants to study relationships between two variable sets. Figure 6 is an "Illustration of the first function in a canonical correlation analysis with three predictors and two criterion variables. The canonical correlation is the simple Pearson r between the two synthetic variables, which were linearly combined from the observed variables" (Sherry & Henson, 2005).

Adaptation of CC (see Figure 7) demonstrates the plan for this research, as implemented in the CC illustration by Sherry and Henson (2005). For example (see Figure 8), predictor 1 would represent the 15 academic aptitude variables of this study, and predictor 2 would represent the 18 nursing aptitude variables. Likewise, criterion 1 would represent NLCEX-RN passing outcomes, and criterion 2 would represent NCLEX-RN failing outcomes.

This statistical method examines relationships between sets of criteria and predictor variables. In this dissertation study that would include academic aptitude, and nursing aptitude variables (Sherry & Henson, 2005). A CCA statistical technique will limit error (Type I) probability throughout the study due to the simultaneous analysis of data.

Logistic Regression

Logistic regression uses several predictor variables to predict one dichotomous criterion (Huck, 2008). It is a type of multiple regression, "in which the outcome is a categorical variable" (Field, 2009, p. 265). Regression is a way of
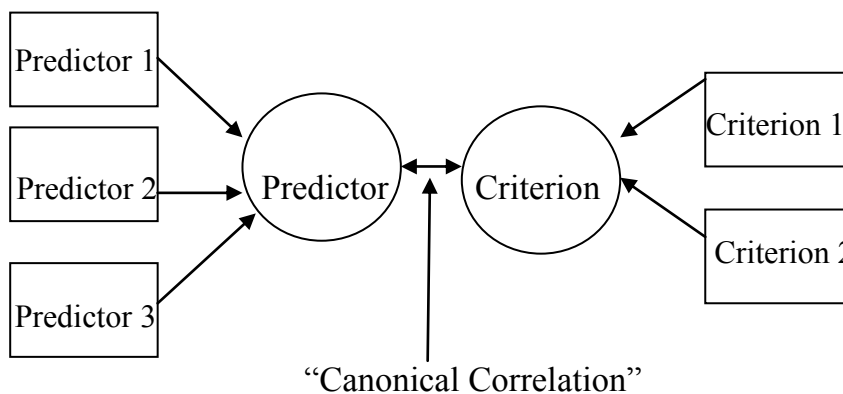
Figure 6. Canonical correlation.
(Sherry & Henson, 2005, p. 39)
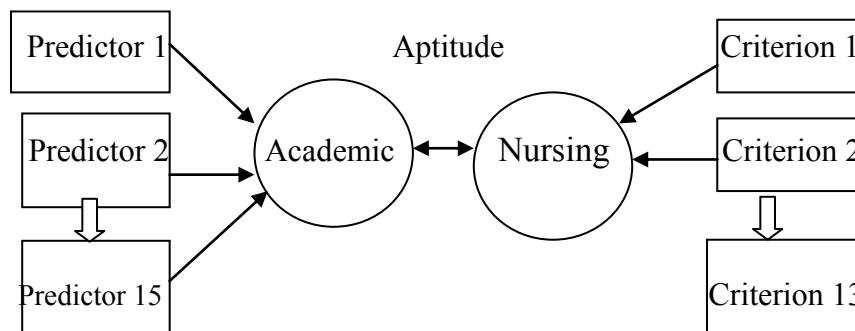
Figure 7. Adaptation of canonical correlation.
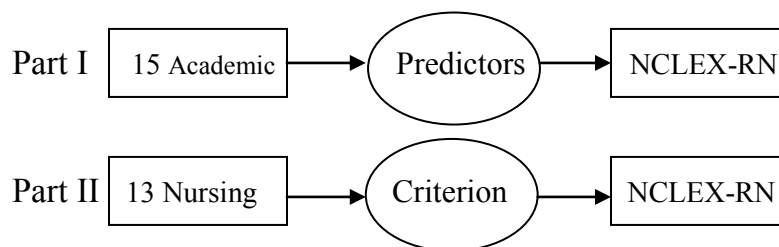
Figure 8. Parts of the analysis process.

evaluating an outcome variable using one or more variables. Use of one variable would be referred to as simple regression as the use of more than one would be considered multiple regression. In this proposed study (see Figure 9), a type of multiple regression, Logistic Regression, is used since there are 28 predictor variables (Field, 2009).
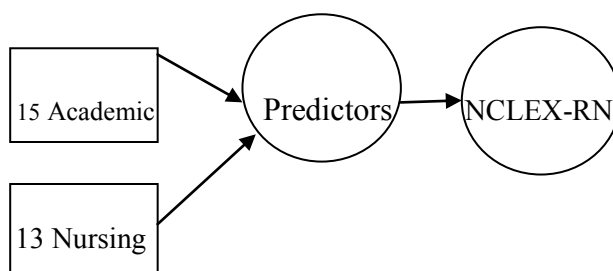
Figure 9. Adaptation of logistic regression.

This method will be used to estimate the probability of the predictor variables relating to the outcome of pass or fail on the NCLEX-RN. Logistic regression analysis "transforms the probability of an event occurring … into its odds, that is, into the ratio of one event's probability relative to the probability of a second event" (Polit & Hungler, 1995, p. 514). In logistic regression there can be multiple independent, predictor variables. These variables can be categorical or continuous; however, there is only one dependent or criterion variable. This variable is dichotomous (Huck, 2008). The level of significance for this study will be 0.05.

Limitations

Limitations considered for this study.

1. The study is limited to students of baccalaureate nursing programs in the California State University system. California has other BSN programs not included in this study. The study of BSN nursing programs in the

CSU system only affect the external validity of this study; therefore, the findings are not generalizable to other nursing programs throughout the nation.

2. The study does not look at other extraneous variables such as age, ethnicity, socioeconomic status, family status, job status, motivation, etc., which could have affected the study and lead to a Type I or Type II error.

Delimitations

Delimitations imposed by the researcher.

1. The findings of this study are only generalized to the schools who agreed to participate in the study due to only four willing programs with data available.

2. In the pilot study an attempt was made to gather information related to other extraneous variables.

Summary

This correlational, retrospective, nonexperimental, research was conducted to assess the relationship between multiple variables, before admission to a nursing program and during nursing school, to each other, and their effects on the dichotomous pass/fail criterion variable the NCLEX-RN. The researcher used traditional baccalaureate nursing programs in the CSU system. Data were obtained from the academic records of the students and the ATI database. CC and logistic regression analysis were proposed to examine the data using SPSS. Chapter 4 will follow and present the findings of this data analysis.

CHAPTER 4: RESULTS/OUTCOMES

Review of Methodology

A retrospective quantitative study was completed to analyze predictors of first-try success of 4-year degree nursing students on the NCLEX-RN. All nursing students graduating in the two academic years of 2009-10 and 2010-11 from four nursing programs in the California State University system were considered for the study. These universities included CSU Fresno, CSU Sacramento, CSU Bakersfield, and CSU Fullerton. Out of the four universities, 794 participants met criteria to be included in the study. Demographic information was obtained from each university statistical department and variable data from the nursing departments. This estimated sample was 794 nursing graduates posted as statistical data on the CSU website; however, when the data were collected including the academic years of 2009-10 and 2010-11 for students who completed the NCLEX-RN exam once, not all data were complete from each school. The demographic data provided by the universities was complete; however, nursing departments had missing data. The findings of this research will be presented as a summary and results of the three research questions.

The purpose of this study was to explore whether scholastic aptitude and nursing aptitude are correlated with each other and with first-attempt pass rates on the NCLEX-RN in baccalaureate nursing programs. Specifically, this research was completed to identify correlations between academic aptitude and nursing aptitude and to assess how well preadmission academic aptitude variables correlate with first-try NCLEX-RN pass rates of nursing students in the California State University system.

The three research questions posed were (a) How do academic aptitude and nursing aptitude correlate? (b) How does nursing aptitude predict with first-try NCLEX-RN pass rates when controlling for academic aptitude of BSN students? and (c) How do academic aptitude and nursing aptitude predict first-try NCLEX-RN pass rates for BSN students in the CSU system? Frequencies, means, and standard deviations were reported. CC was used to determine correlations between the two variable groups. Linear and logistic regression analysis was used to develop models to predict success on the NCLEX-RN.

Summary of Findings

Demographics

The sample (see Table 14) was made up of females (n=659, 83%) and males (n=135, 17%). The majority ethnic groups represented were White (n=326, 41.1%), Mexican (n=89, 11.2%), Other Asian (n=88, 11.1%), and Filipino (n=50, 6.3%). Over 9% of the population did not respond to the ethnicity question. The remaining 20.7% fell between 0.1% and 3% of the remaining CSU system ethnic classification choices.

For the variable of students' mother's education, most responded that their mothers had completed a bachelor's degree (n=134, 16.9%).

In the category of father's education, most responded that their fathers were high school graduates (n=127, 16%).

Data

The data collected and variables available at each CSU nursing program were very different. All four schools did not collect all of the same data and although an Excel data collection tool was provided, there were still missing data. Of the 13 prenursing variables and the 9 in-program variables, CSU Fresno was

Table 14

Demographic Information

Category	N	%
Gender		
Male	135	17
Female	659	83
Ethnic group		
Amer Indian/Alaskan	7	0.9
African American	20	2.5
Mexican	89	11.2
Other Caribbean	5	0.6
Other Asian	88	11.1
Other Pacific Island	23	2.9
White	326	41.1
Other	20	2.5
No response	76	9.6
Chinese	14	1.8
Decline to state	24	3.0
Filipino	50	6.3
Japanese	4	0.5
Korean	5	0.6
Laotian	3	0.4
Puerto Rican	2	0.3
Asian Indian	11	1.4
Other SE Asian	7	0.9
Thai	1	0.1
Vietnamese	12	1.5
Mother education		
No high school	57	7.2
Some high school	34	4.3
High school grad	124	15.6
Some college	96	12.1
2-year college grad	71	8.9
4-year college grad	134	16.9
Post graduate	55	6.9
No response	33	4.2
Father education		
No high school	59	7.4
Some high school	32	4.0
High school grad	127	16.0
Some college	117	14.7
2- year college grad	39	4.9
4- year college grad	125	15.7
Post graduate	70	8.8
No response	34	4.3

the only program to have data for each category. CSU Sacramento did not have prerequisite nursing course grades, RN comprehensive A, and had only one of the two pharmacology test scores. CSU Bakersfield had missing data in the variables of RN comprehensive B and only one of the two pharmacology test scores. CSU Fullerton did not have data in prenursing GPA, RN comprehensive A and B, and only one of the two pharmacology test scores. With this in mind, the academic and nursing variables with the most complete data were used to answer the three research questions. The missing data reduced prenursing variables from 13 variables to 6, and nursing variables from 9 variables to 5. The academic variables included prenursing GPA, communication, reading TEAS, math TEAS, science TEAS, English TEAS. The nursing variables included ATI fundamentals score, ATI medical surgical score, ATI pediatrics score, ATI psychology score, and ATI maternal child score. The NCLEX-RN remained the dichotomous dependent variable (see Table 15).

Correlation

Correlation coefficients were run between all the academic aptitude independent variables of (a) preprogram GPA, (b) communication, (c) TEAS reading, (d) TEAS math, (e) TEAS science, (f) TEAS English; with the nursing independent variables of (a) ATI fundamental score, (b) ATI medical/surgical score, (c) ATI pediatrics, (d) ATI psychology score, (e) ATI maternal child score, and the dichotomous dependent variable NCLEX-RN coded 0=fail, 1=pass (see Tables 16, 17, 18).

Table 15

Data Available for Each CSU Nursing Program

Preprogram	Fresno	Sacramento	Bakersfield	Fullerton
Prenursing GPA	X	X	X	
Chemistry	X		X	X
Anatomy	X		X	X
Physiology	X		X	X
Microbiology	X		X	X
Communication	X		X	X
English	X		X	X
Math	X		X	X
Critical Thinking	X		X	X
TEAS Reading	X	X	X	X
TEAS Math	X	X	X	X
TEAS Science	X	X	X	X
TEAS English	X	X	X	X
In-program				
RN Comp A	X		X	
RN Comp B	X	X		
ATI Fundamentals	X	X	X	X
ATI Pharm I	X	X		
ATI Pharm II	X	X	X	X
ATI Medical/Surg	X	X	X	X
ATI Pediatrics	X	X	X	X
ATI Psychology	X	X	X	X
ATI Maternal/Child	X	X	X	X

Table 16

Correlations Among NCLEX and Academic Variables

Variables		NCLEX	Pre Nsg GPA	Comm	Reading TEAS	Math TEAS	Science TEAS	English TEAS
Pre Nsg GPA	r	.146						
	p	< .001						
Communication	r	.126	-.034					
	p	.001	.409					
Reading TEAS	r	.197	.232	.139				
	p	< .001	< .001	.001				
Math TEAS	r	.158	.295	.075	.515			
	p	< .001	< .001	.063	< .001			
Science TEAS	r	.171	.210	.086	.506	.565		
	p	< .001	< .001	.032	< .001	< .001		
English TEAS	r	.103	.166	.078	.564	.500	.483	
	p	.008	< .001	.051	< .001	< .001	< .001	

Table 17

Correlations Among NCLEX and Nursing Variables

Variables		NCLEX	ATI Fund	ATI Med/Surg	ATI Pediat	ATI Psych	ATI Mat/Child
ATI Fundamentals	r	.225					
	p	< .001					
ATI Med/Surg	r	.257	.494				
	p	< .001	< .001				
ATI Pediatrics	r	.270	.506	.565			
	p	< .001	< .001	< .001			
ATI Psychology	r	.236	.210	.570	.559		
	p	< .001	< .001	< .001	< .001		
ATI Mat/Child	r	.225	.577	.568	.565	.493	
	p	< .001	< .001	< .001	< .001	< .001	

Table 18

Correlations Among Academic and Nursing Variables

Variables		ATI Fund	ATI Med/Surg	ATI Pediatrics	ATI Psychology	ATI Mat/Child
Pre Nsg GPA	r	.239	.289	.325	.237	.345
	p	< .001	< .001	< .001	< .001	< .001
Communication	r	.162	.128	.113	.146	.108
	p	< .001	.001	.003	< .001	.001
Reading TEAS	r	.487	.404	.292	.457	.407
	p	< .001	< .001	< .001	< .001	< .001
Math TEAS	r	.436	.417	.417	.481	.371
	p	< .001	< .001	< .001	< .001	< .001
Science TEAS	r	.463	.377	.383	.437	.350
	p	< .001	< .001	< .001	< .001	< .001
English TEAS	r	.390	.324	.277	.374	.293
	p	< .001	< .001	< .001	< .001	< .001

The NCLEX-RN correlates low and positive with all prenursing variables and all are significant. Most variables are a positive correlation, and all are significant. In the prenursing GPA variable, the range of r is -.034 to .295. For communication the range is -.034 to .139. The range for reading TEAS is -.034 to .564, math TEAS is -.034 to .565, and English TEAS is -.034 to .483.

The NCLEX-RN correlation with all nursing variables is also positive, and all are significant except one. For the in-program nursing variable ATI fundamentals, the range of r *is* .225 to .270. The range for medical/surgical is .210 to .577, ATI pediatrics is .506 to 570, ATI psychology is .210 to .570, and for ATI Maternal/Child .493 to .577.

Correlations among prenursing and nursing variables are all positive, and all are significant. For ATI fundamentals the r range is .162 to .487, ATI

medical/surgical .128 to .417, ATI pediatrics .113 to .417, ATI psychology .146 to .481, and maternal/child .108 to .407.

Canonical Correlation

Question 1 – How do academic aptitude and nursing aptitude correlate? CC analysis was conducted using the five nursing aptitude criterion variables and the six academic aptitude variables as predictors. CC evaluates the multivariate shared relationship between the two variable sets. The canonical correlation analysis yields a number of functions, for whichever is smaller, the number of predictors or the number or criterion variables. It also provides a test of the overall model. Collectively, the model across all functions was statistically significant using the Wilk's Lambda criterion (Wilk's Lambda = .464, $F(30, 2214) = 15.64$, $p < .001$). Because Wilk's Lambda represents the variance unexplained by the model, 1-Lambda yields the full model effect size in an r^2 metric. Thus for this set of canonical functions, the r^2 type effect size was 1-.464 = .536, which indicates that the full model explained a substantial portion, about 54%, of the variance shared between the sets of predictor variables and criterion variables. Although this canonical correlation yielded five functions, a decision must be made about whether these are all interpretable. This subjective decision is based on the significance of each of the five functions, the amount of variance each function accounts for, and the magnitude of the structure coefficients.

The dimension reduction analysis allowed the researcher to test the hierarchal arrangement of functions for statistical significance. The models for the first two functions were significant. The model functions one to five were statistically significant ($F (30, 2214.00) = 15.64$, $p < .001$). The model for functions 2-5 was significant ($F (20, 1838.36) = 2.70$, $p < .001$). The next three functions were not statistically significant.

CCs (R_c) of .700, .239, .159, .093, and .050 for each successive functions. The (R^2_c) for the five functions were .49, .06, .03, .01, and .002. The first function was considered noteworthy in the context of this study, as it explains 49% of the variance. The remaining function for the variable sets after the extraction of the first function dropped off and did not explain much of the variance. Therefore, only one function is reported for these data.

Table 19 presents the standardized canonical functions coefficient and structure coefficients for all variables across function 1. The standardized canonical function coefficients are used to weight the variables, and the structure coefficients can be used to show the importance of variables in this function. The squared structure coefficients (r_s^2) are also given, which is the index of the percentage of shared variance between a predictor or criterion variable and the remaining predictor or criterion variables in the variable set. Structure coefficients above .40 are underlined as are communalities above 40% to reveal the variables with the highest usefulness in the model.

In function 1 coefficients, the salient predictor variable with the highest structure coefficients were prenursing GPA, reading TEAS, math TEAS, science TEAS, and English TEAS. On the criterion side of Function 1, all five criterion variables had high structure coefficients: ATI fundamentals, ATI medical/surgical, ATI pediatrics, ATI psychology, and ATI maternal child.

Since all the structure coefficients in function 1 are positive, it is known that if students score high on predictor variables, they will also score high on criterion variables because the sign for all structure coefficients is the same. Prenursing GPA and all TEAS subscores are good predictors of ATI tests scores or nursing criterion.

Table 19

Canonical Solution for Nursing Aptitude Predicting Academic Aptitude Function 1

	Function 1		
Variable	Coefficient	r_s	$r_s^2(\%)$
Prenursing GPA	.242	.523	.274
Communication	-.016	.099	.010
Reading TEAS	.320	.794	.561
Math TEAS	.349	.844	.712
Science TEAS	.335	.791	.626
English TEAS	.092	.661	.437
R_c^2		.490	
ATI Fundamentals	.409	.848	.719
ATI Med/Surg	.268	.763	.582
ATI Pediatrics	.125	.698	.487
ATI Psychology	.324	.826	.682
ATI Mat/Child	.131	.719	.517

Linear Regression

Question 2 – How does nursing aptitude correlate with first-try NCLEX-RN pass rates controlling for academic aptitude of BSN students? To answer Question 2, linear regression analysis was run. To test for this question, three multiple linear regression models were run. The first model included all academic and nursing variables. The second model controlled for academic variables, so the regression weights for those academic variables were set equal to zero. The restricted model included only the nursing variables. The R^2 values from these two models are then used to calculate a change F as follows:

$$F = \frac{(R^2{}_F - R^2{}_R)/(m_1 - m_2)}{(1 - R^2{}_F)/(N - m_1)}$$

Where

m_1 = the number of weights in the full model

m_2 = the number of weights in the restricted model

$R^2{}_F = R^2$ in the full model

$R^2{}_R = R^2{}_\Sigma$ in the restricted model

This F tests for the effects of the nursing variables controlling for the academic variables (McNeil et al., 1996).

The full, restricted, and change models appear in Table 20. The full model, the restricted model, and the change model are significant. The change model, which answers the research question, is significant because when the change model removes the variance of the academic aptitude, it is still significant in predicting NCLEX-RN for nursing aptitude. This means the NCLEX-RN can be predicted from academic and nursing variables together (full model), from the academic variables only (restricted model), and for nursing variables controlling for prenursing variables (change model).

Table 20

Results of Full, Restricted, and Change Model to Predict NCLEX-RN

Model	df	F	p	R^2	ΔR^2
Full (Academic + Nursing)	11, 552	6.747	< .001	.119	
Restricted (Academic)	6, 557	6.436	< .001	.065	
Change (Nursing)	5, 552	6.723	< .001		.054

Logistic Regression

Question 3 – How do academic aptitude and nursing aptitude predict first-try NCLEX-RN pass rates for BSN students in the CSU system? Finally, to answer research Question 3, a logistic regression analysis was run. Logistic

regression allows for several variables, six academic aptitude variables, and five nursing aptitude variables to predict one dichotomous pass/fail criterion, NCLEX-RN. To determine the best model, the predictors were included in the model and then a backwards conditional stepwise solution was run to determine the best model.

When all 11 variables are included, the model is significant ($\chi^2 = 62.72$, $df = 11$, $p < .001$) and the Nagelkerke R^2, which explains the amount of variance accounted for in the model was .298; however, all variables are not significant. Table 21 presents the Wald statistical degrees of freedom and probability values for all 11 variables in this model. The significant variables included communication, ATI medical/surgical, and ATI psychology.

Table 21

Variables in Model

Step 1[a]	Wald	df	*Sig*
Pre Nsg GPA	.523	1	.470
Communication 3	3.868	1	.049
Reading TEAS	.090	1	.764
Math TEAS	1.002	1	.317
Science TEAS	.049	1	.825
English TEAS	3.117	1	.075
ATI Fundamentals	.001	1	.971
ATI Med/Surg	4.706	1	.030
ATI Pediatrics	1.018	1	.313
ATI Psychology	5.593	1	.018
ATI Maternal Child	2.243	1	.134

Also, the classifications appear in Table 22. When using all 11 independent variables, all students were predicted to pass the NCLEX-RN, yet 32 failed for an 94.3 correct percentage.

Table 22

Classification Table[a,b]

	Predicted		
Observed	NCLEX 1st		Percentage correct
	Pass	*Fail*	
Step 0 NCLEX 1st Pass	532	0	100.0
Fail	32	0	.0
Overall percentage			94.3

a. Constant is included in the model
b. The cut value is .500

To control for an inflated Type I error rate, the Bonferroni technique was used (Mundfrom, Perrett, Schaffer, Piccone, & Roozeboom, 2006). The technique divides the alpha $\acute{\alpha} = .05$, by 11, the number of independent variables, so the new Type I error rate is .05 divided by 11 which equals .0045. This value was entered into SPSS at the probability for allowing variables in and out of the model (see Table 23).

Table 23

Variables in Model

Step 10[a]	Wald	df	*Sig*
ATI medical surgical	12.23	1	< .001
ATI psychology	12.62	1	< .001

The final classification appears in Table 24 and shows that 530 students were predicted to pass the NCLEX-RN and 30 predicted to fail. In the overall model, correct percent was 94.3%. The percentage correct is the same for both step zero and step 10; however, more of the students who failed were correctly classified in step 10.

Table 24

Classification Table[a]

Observed	Predicted		Percentage correct
	NCLEX 1st		
	Pass	*Fail*	
Step 10 NCLEX 1st Pass	530	2	99.6
Fail	30	2	6.3
Overall percentage			94.3

a. The cut value is .500

Results of Research Questions

Chapter 4 presented statistical analysis of variables purposed to answer three research questions addressing the relationship of predictor and criterion variables with first-try NCLEX-RN pass rates. Tables presenting correlation, canonical correlation, linear regression, and logistic regression results were provided.

Correlation results revealed significance for almost all prenursing or academic variables with the NCLEX-RN. It also revealed all nursing variables with the NCLEX-RN to be significant, as well as significance among academic and nursing variables.

CC was used to answer Question 1. How do academic aptitude and nursing aptitude correlate? The results revealed a strong correlation between academic and nursing aptitudes. If students score high on predictor variables, they will also score high on criterion variables. Prenursing GPA and all TEAS subscores, reading, math, science, and English taken together are good predictors of ATI tests scores or nursing criterion, ATI fundamentals, ATI medical surgical, ATI pediatrics, ATI psychology, and ATI maternal child taken together.

In Question 2, How does nursing aptitude correlate with first-try NCLEX-RN pass rates controlling for academic aptitude of BSN students?, linear regression revealed that the NCLEX-RN can be predicted from academic and nursing variables together and separately when controlling for academic aptitude. Finally, to answer Question 3, Do academic aptitude and nursing aptitude predict first-try NCLEX-RN pass rates for BSN students in the CSU system?, using logistic regression the answer is yes for the nursing aptitude variables of ATI medical surgical, and ATI psychology.

The question could be asked why linear regression would reveal all models as significant and logistic regression would determine only two ATI standardized nursing tests as significant. The response is in the analysis itself. Multiple linear regression determines significance in models or sets of variables. Stepwise backward logistic regression starts with step zero and analyzes step by step until only the variables with the most significance remain. In this study the analysis included 10 steps with the final and most significance revealed with the ATI medical surgical test and the ATI psychology test. These two standardized tests revealed a significance of $< .001$.

Chapter 5 will discuss the research findings, recommendations, implications for practice, and implications for further research.

CHAPTER 5: DISCUSSION/SUMMARY/CONCLUSION

The purpose of this study was to explore whether academic aptitude and nursing aptitude are correlated with each other and with first-attempt pass rates and whether NCLEX-RN success could be predicted using standardized testing variables in baccalaureate nursing programs. Dreyfus and Dreyfus's (1980) and Benner's (2001) Novice to Expert model theories were adapted for use as the guiding theoretical framework for this study. Three areas of learning were emphasized in the study framework: (a) academic aptitude (which included variables prior to admission to the nursing program), prenursing GPA, a communication prerequisite course, and the four TEAS composite subset scores of reading, math, science, and English; (b) nursing variables (which included the standardized testing completed throughout the program of ATI fundamentals of nursing), ATI medical/surgical nursing, ATI pediatrics, ATI psychology, and ATI maternal child; and (c) first-try NLCEX-RN success rates for this dichotomous pass/fail variable.

CC, multiple linear regression, and backward stepwise logistic regression were run to analyze the data. CC, a multivariate statistical method used when the researcher wants to study relationships between two variable sets, was used to analyze the variable sets of prenursing academic predictor variables and the in-program nursing criterion variables. The results of this analysis found significant correlation between all the academic variables of prenursing GPA, reading TEAS, math TEAS, science TEAS, and English TEAS. The only prenursing academic predictor variable that did not prove to be significant was the prerequisite course communication. The nursing variables of ATI fundamentals, ATI medical

surgical, ATI pediatrics, ATI psychology, and ATI maternal child were all found to have significance in this correlation.

Multiple linear regression was used to determine nursing aptitude correlation with first-try NCLEX-RN pass rates controlling for academic aptitude. Linear regression was used to determine the significance of the models in the study. Three models were considered: The full module, which included all 11 variables in the study; The restricted module, which included only prenursing academic aptitude variables; and The change module, which included nursing, in-program variables controlling for prenursing variables. The results revealed that the NCLEX-RN can be predicted from academic and nursing variables together, from the academic variables only, or from nursing variables only. Backward stepwise logistic regression was used to analyze all variables to predict one dichotomous pass-fail variable, NCLEX-RN. The results from this analysis revealed the nursing aptitude variables of ATI medical surgical and ATI psychology best predicted NCLEX-RN success.

Discussion of Research Variables

In discussing the research variables, one must consider that this study was based on what this researcher found as gaps in current research. Table 25 shows an analysis of the literature review and the added bold variables of this research study. The shaded areas demonstrate possible overlap in research that could support or dispute this research study. The use of ATI standardized testing throughout nursing education is not found in current research.

Table 25

Meta-analysis of Current Literature Review and Research Study Variables

Variables	Allen '08	Newton'07	Wolkowitz '10	Gross '87	Friedemann '88	Dell '09	Horns '91	Mills '92	Wall '93	Morris '08	Alameida '11	Beeman '01	Beeson '01	Daley'03	Haas '04	'04	Uyehara '07	Ukpabi '08	Yucha '09	Newton '09	McCarthy '12
Yrs of educ post HS				X																	
PGPA	X	X					X						X		X						
1st semester GPA																			X		
GPA (2nd yr prog)							X	X	X	X											
GPA (program)	X			X	X	X					X	X	X	X					X		
ATI TEAS English			X																		**X**
ATI TEAS reading			X																		**X**
ATI TEAS math			X																		**X**
ATI TEAS science			X																		**X**
ATI TEAS composite		X	X																		
ATI in-prog tests																		X			**X**
ATI predict prob											X										
NLN verbal				X																	
NLN math				X																	
NLN science				X																	
NLN composite				X													X				
NLN in prog tests																	X	X			
MAT														X							
HESI													X								
NET																			X		
RN-CAT																			X		
Courses – med/surg														X			X	X			
Pathophysiology														X							
Prenursing GPA																					**X**

Relevance to Literature

Although this study is not a replica of any previous study, multiple studies in the literature review revealed data on one or more corresponding variables that may support or dispute this research. A discussion of these studies is presented in the following paragraphs.

In this study there was a significant relationship between the four TEAS subscores of reading, math, science, and English and the ATI standardized tests of fundamentals, medical surgical, pediatric, psychology, and maternal child. Wolkowitz and Kelley (2010) also looked at the four TEAS subscores to determine correlation between them, program success, and the ATI fundamentals assessment score. The results concluded that program success was best predicted by TEAS subscores in the order of science, reading, English, and math. There was a low to moderate correlation between the TEAS science score and the ATI fundamental exam (Wolkowitz & Kelley, 2010).

Gross et al. (1987) used standardized testing via the NLN exam, which is similar to the ATI TEAS and has categories of verbal, math, science, and a composite score. These researchers found that this NLN exam was the best and only predictor of NCLEX pass rates. Since the TEAS and the NLN are both standardized prenursing academic aptitude tests, this study would support the finding that standardized testing prior to program admission helps predict NCLEX success.

Newton et al. (2007) looked at the composite TEAS score as a predictor of nursing program success and found it to be significant. The composite TEAS score supports the ATI TEAS test as a tool for admission and progression in a nursing program. Ukpabi (2008) also found significance in three of the four ATI subscores, including reading TEAS, math TEAS, and English TEAS. This study

supports the significance of these prenursing standardized test scores in predicting NCLEX-RN success.

Morris and Hancock (2008) studied the HESI exam, which is an alternate standardized nursing exam, to determine NCLEX predictability. These significant results for the HESI exam support the prediction of students who would pass the NCLEX-RN. This would support the ATI testing system which is also a standardized evaluation of NCLEX-RN readiness.

Alameida et al. (2011) at San Francisco State University looked at predicting NCLEX-RN success using the ATI RN comprehensive predictor test score and the ATI predictor probability of first-time NCLEX-RN pass. These researchers found a significant relationship between NCLEX-RN success on the first try and the ATI variables. Although this study did not specifically look at the same ATI variables, the ATI system, standardized testing, comes up as significant in NCLEX success.

All five nursing variable ATI criteria (Fundamentals, Medical Surgical, Pediatrics, Psychology, and Maternal Child) in this study were found to have significance. The significance of these five nursing variable criteria is supported by similar findings revealed in a study by Ukpabi (2008). Included in the Ukpabi (2008) study were the criterion variables of ATI medical surgical, ATI community health, ATI psychology, ATI pharmacology, ATI fundamentals, and ATI pediatrics. Three of the six criterion variables, except ATI medical surgical, ATI community health, and ATI pediatrics were found to be significant. This supports the use of standardized in-program testing to predict NCLEX-RN success.

Crow et al. (2004) found that only the use of commercial review exams was significant in relationship to NCLEX-RN success. This study supported nursing program use of standardized entrance and exit exams to help assess NCLEX-RN

success readiness. Newton and Moore (2009) also studied academic and nursing aptitude in regard to NCLEX success and found scholastic aptitude was predictive, but nursing aptitude was not.

Pilot Study – Full Study

In comparing the pilot study, completed on one of the four schools in the study, to the full study containing data from all four schools, a discussion will follow comparing the results for each analysis run. The pilot study included many more variables than the actual study due to missing data from several schools. Only the variables in both studies, that revealed significance, will be discussed here.

CC results in the pilot study revealed academic aptitude significance with the variables of the TEAS subscores of reading, math, science, and English. The pilot study also revealed significant correlation with the nursing aptitude variables of the ATI tests of medical surgical, pediatrics, psychology, and maternal child. The complete study revealed significance in the academic variables of GPA before nursing, the four TEAS subscores of reading, math, science, and English as well as in the nursing aptitude variables of ATI fundamentals, medical surgical, pediatrics, psychology, and maternal child. Therefore, there was significant correlation between these sets of academic variables.

Linear regression analysis included three models used to determine NCLEX-RN success. The first model included all academic and nursing variables. The second model controlled for academic variables, so the regression weights for those academic variables were set equal to zero. The restricted model only included the nursing variables. The pilot study revealed the NCLEX-RN is better predicted from both academic and nursing variables or from nursing variables

only. The full study revealed that all three models, the full, restricted and the change model, are significant for predicting NCLEX-RN results.

Backward stepwise logistic regression revealed completely different results in the pilot study than in the actual study. This could be explained by including all 23 variables in the pilot study, whereas only 11 were variables were in the final study. In the pilot study, the backward stepwise regression continued to Step 19. At Step 19 the variables found to have the strongest predictors of the NCLEX-RN were the ATI comprehensive test B, prenursing courses of physiology and communication, and ATI pharmacology test II. The dissertation study continued to Step 11. At Step 11 the variables that best predicted NCLEX-RN success were the ATI tests of medical surgical and psychology.

CC and linear regression analysis results were similar in the pilot and the actual study. Logistic regression, however, did not have similar results. The difference in the variables used in each study could have an effect on the results obtained.

Strengths

This research provided valuable data for the nursing profession. Unique to this research was the analysis of data from four CSU nursing programs representing a large portion of California CSU Sacramento (Northern California), CSU Fresno (Central Valley), CSU Bakersfield (South Valley), and CSU Fullerton (Southern California). The analysis of gaps in the literature, the designing of a data gathering tool, and significant results regarding the prediction of NCLEX-RN success will benefit these nursing programs in ongoing outcome and evaluation development. Students will also benefit from this research. The financial commitment of the ATI, TEAS, resources, and standardized testing is supported with NCLEX-RN success. Passing the NCLEX-RN is the ultimate goal of each

nursing student since practicing as a registered nurse is contingent upon this high stakes exam. Research results will be shared with these programs in the hopes that planning and implementation of interventions and remediation to assist student success not only on the NCLEX-RN but in nursing programs as well. Communication, collaboration, and collegiality with CSU Bakersfield, Fullerton, and Sacramento are also benefits of the research in expanding data collection and nursing research across the state and eventually throughout the nation.

Recommendations

Prediction of NCLEX-RN success would benefit nursing students, faculty, programs, and universities. Without success, graduates cannot enter the professional workforce; and nursing schools, departments, and programs fail to use resources appropriately, meet the needs of students, and the needs of healthcare in society.

In completing this research, data collection was more difficult and time-consuming than expected within the CSU system. All three universities had demographic data collection; however, the access of these data was challenging. Although all schools in the study were in the state system, the IRB process for each was vastly different. No university would acknowledge the IRB process at any of the sister schools. Although these demographic data were difficult to attain, it was more uniformly complete than the nursing data.

In attempting to gather data from the CSU sites with nursing programs, several programs were unable to participate because of a data shortage or lack of data organization for access and retrieval. Even with the tool shared by this researcher for organizing and collecting data, some programs had no data or retrieval method. The tool was found to be useful for the schools that participated

and made the research process more feasible; however, the process of data retrieval took many months and constant communication and follow-up.

It is recommended that this tool, which is in Excel format, be used as a data entering tool for CSU nursing programs. It is suggested that data be entered at the end of every semester or term to ensure complete data sets and the prevention of time-consuming retrieval difficulties of finding missing data in the future.

Implications for Future Research

The following recommendations are made for future research. The study should be replicated following the academic year of 2012-13 to determine if similar results are achieved. The four CSU nursing programs in this study will be invited to participate in the follow-up study when the participation thank you and executive summary of these study results are shared.

The data collection tool should be shared with all CSU nursing programs, and the study replicated with more schools and more variables as data become available. This will better determine if results are supported statewide.

This study should be replicated with more or all CSU nursing programs to determine if results are supported statewide. Replication will also help to support whether other standardized testing variables not included in this study, used within nursing programs, can predict NCLEX-RN success. Another study is also important to validate the logistic model derived with the stepwise procedure.

Demographic information could be added to future studies to determine if any demographic information analyzed with standardized testing would help predict NCLEX-RN success. Attrition statistics could also be analyzed with the current variables of the study to identify students at risk and lend information on providing mentoring, tutoring, intervention and remediation to these students.

Future research could also be completed to look at these variables related to instructor impact, teaching strategies, and faculty support on NCLEX-RN success. Other programs such as associate degree programs (ADN), RN to BSN, accelerated, and entry-level masters programs (which all lead to the NCLEX-RN exam) could be used in comparative studies related to NCLEX-RN success.

A qualitative study could be completed by contacting those students who were unsuccessful on the NCLEX-RN on the first try. This interview process could gain some insight as to why students think they did not pass the first time and if any educational information is significant.

Finally, since standardized testing is available as a prerequisite to nursing programs, within nursing programs, and as postgraduation NCLEX-RN preparation courses, studies following students through this process including these postprogram courses could also be beneficial. Students take NCLEX preparations questions at the end of their nursing education. These programs are designed to assist students in the final preparation before taking this high stakes exam.

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APPENDIX A: LITERATURE REVIEW FINDINGS

Variables	Allen '08	Newton'07	Wolkowitz '10	Gross '87	Friedemann '88	Dell '09	Horns '91	Mills '92	Wall '93	Morris '08	Almameida '11	Beeman '01	Beeson '01	Daley '03	Haas '04	Seldomridge '04	Newton '07	Uyehara '07	Ukpabi '08	Yucha '09	Newton '09
yrs of educ post HS			X																		
PGPA	X	X				X						X		X		X					
1st semester GPA																				X	
GPA (2nd yr prog)						X	X	X	X												
GPA (program)	X		X	X	X					X	X	X	X							X	
ATI TEAS verbal		X	X																		
ATI TEAS written			X																		
ATI TEAS math			X																		
ATI TEAS science			X																		
ATI TEAS composite			X														X				
ATI in prog tests																		X			
ATI predict prob										X											
NLN verbal			X																		
NLN math			X																		
NLN science			X																		
NLN composite			X												X						
NLN in prog tests																	X	X			
MAT												X									
HESI													X								
NET																			X		
RN-CAT																			X		
courses- med/surg														X	X	X					
Pathophysiology															X						

APPENDIX B: PILOT STUDY COMPLETE CORRELATION

Correlating these 34 variables resulted in 561 correlation coefficients that ranged from -.374 to -.798.

Correlations

[DataSet1] C:\Documents and Settings\Susan Tracz.CSUFRESN-C880DE\My Documents \mary Ann Data 2-23-12.sav

Correlations

		A1GPAb4Nsg	A11CompTEAS	A12ReadTeas	A15EngTEAS
A1GPAb4Nsg	Pearson Correlation	1	.150	.133	.051
	Sig. (2-tailed)		.024	.053	.464
	N	231	228	211	210
A11CompTEAS	Pearson Correlation	.150	1	.687	.798
	Sig. (2-tailed)	.024		.000	.000
	N	228	241	223	222
A12ReadTeas	Pearson Correlation	.133	.687	1	.576
	Sig. (2-tailed)	.053	.000		.000
	N	211	223	223	222
A15EngTEAS	Pearson Correlation	.051	.798	.576	1
	Sig. (2-tailed)	.464	.000	.000	
	N	210	222	222	222
A13MathTEAS	Pearson Correlation	.145	.752	.401	.412
	Sig. (2-tailed)	.036	.000	.000	.000
	N	211	223	223	222
A14ScienTEAS	Pearson Correlation	.106	.701	.462	.448
	Sig. (2-tailed)	.125	.000	.000	.000
	N	210	222	222	222
A3Chem3A	Pearson Correlation	.308	-.007	-.035	-.058
	Sig. (2-tailed)	.000	.921	.613	.402
	N	229	232	214	213
A4Anatomy	Pearson Correlation	.243	.127	.088	.025
	Sig. (2-tailed)	.000	.054	.202	.712
	N	228	231	213	212
A5Physiology	Pearson Correlation	.133	.001	.001	-.113
	Sig. (2-tailed)	.044	.984	.992	.102
	N	228	231	213	212
A6Microbiology	Pearson Correlation	.200	.072	.049	-.007
	Sig. (2-tailed)	.002	.277	.480	.914
	N	228	231	213	212
A7Comm3	Pearson Correlation	.012	.060	.090	.067
	Sig. (2-tailed)	.854	.364	.192	.330
	N	228	231	213	212

Page 1

Correlations

		A13MathTEAS	A14ScienTEAS	A3Chem3A	A4Anatomy
A1GPAb4Nsg	Pearson Correlation	.145[*]	.106	.308[**]	.243[**]
	Sig. (2-tailed)	.036	.125	.000	.000
	N	211	210	229	228
A11CompTEAS	Pearson Correlation	.752[**]	.701[**]	-.007	.127
	Sig. (2-tailed)	.000	.000	.921	.054
	N	223	222	232	231
A12ReadTeas	Pearson Correlation	.401[**]	.462[**]	-.035	.088
	Sig. (2-tailed)	.000	.000	.613	.202
	N	223	222	214	213
A15EngTEAS	Pearson Correlation	.412[**]	.448[**]	-.058	.025
	Sig. (2-tailed)	.000	.000	.402	.712
	N	222	222	213	212
A13MathTEAS	Pearson Correlation	1	.447[**]	-.052	.212[**]
	Sig. (2-tailed)		.000	.453	.002
	N	223	222	214	213
A14ScienTEAS	Pearson Correlation	.447[**]	1	.056	.139[*]
	Sig. (2-tailed)	.000		.420	.043
	N	222	222	213	212
A3Chem3A	Pearson Correlation	-.052	.056	1	-.051
	Sig. (2-tailed)	.453	.420		.441
	N	214	213	235	234
A4Anatomy	Pearson Correlation	.212[**]	.139[*]	-.051	1
	Sig. (2-tailed)	.002	.043	.441	
	N	213	212	234	234
A5Physiology	Pearson Correlation	.051	-.002	-.040	.230[**]
	Sig. (2-tailed)	.458	.980	.544	.000
	N	213	212	234	234
A6Microbiology	Pearson Correlation	.120	.095	.071	.242[**]
	Sig. (2-tailed)	.081	.166	.281	.000
	N	213	212	234	234
A7Comm3	Pearson Correlation	.057	.104	-.064	-.065
	Sig. (2-tailed)	.411	.132	.330	.324
	N	213	212	234	234

Correlations

		A5Physiology	A6Microbiology	A7Comm3	A8Eng1A
A1GPAb4Nsg	Pearson Correlation	.133*	.200**	.012	.161*
	Sig. (2-tailed)	.044	.002	.854	.015
	N	228	228	228	228
A11CompTEAS	Pearson Correlation	.001	.072	.060	.085
	Sig. (2-tailed)	.984	.277	.364	.199
	N	231	231	231	231
A12ReadTeas	Pearson Correlation	.001	.049	.090	.141*
	Sig. (2-tailed)	.992	.480	.192	.039
	N	213	213	213	213
A15EngTEAS	Pearson Correlation	-.113	-.007	.067	.169*
	Sig. (2-tailed)	.102	.914	.330	.014
	N	212	212	212	212
A13MathTEAS	Pearson Correlation	.051	.120	.057	.058
	Sig. (2-tailed)	.458	.081	.411	.399
	N	213	213	213	213
A14ScienTEAS	Pearson Correlation	-.002	.095	.104	-.013
	Sig. (2-tailed)	.980	.166	.132	.855
	N	212	212	212	212
A3Chem3A	Pearson Correlation	-.040	.071	-.064	.004
	Sig. (2-tailed)	.544	.281	.330	.947
	N	234	234	234	234
A4Anatomy	Pearson Correlation	.230**	.242**	-.065	-.049
	Sig. (2-tailed)	.000	.000	.324	.452
	N	234	234	234	234
A5Physiology	Pearson Correlation	1	.110	-.008	-.117
	Sig. (2-tailed)		.093	.898	.073
	N	234	234	234	234
A6Microbiology	Pearson Correlation	.110	1	.033	-.010
	Sig. (2-tailed)	.093		.616	.879
	N	234	234	234	234
A7Comm3	Pearson Correlation	-.008	.033	1	.049
	Sig. (2-tailed)	.898	.616		.453
	N	234	234	234	234

Correlations

		A10CriticalTh	A9Math11	A2PrereqGPA	N1ATIfund
A1GPAb4Nsg	Pearson Correlation	.170*	-.001	.556**	.152*
	Sig. (2-tailed)	.010	.991	.000	.021
	N	228	228	230	230
A11CompTEAS	Pearson Correlation	.052	.035	-.008	.523**
	Sig. (2-tailed)	.436	.599	.906	.000
	N	231	231	233	240
A12ReadTeas	Pearson Correlation	-.024	.013	.005	.465**
	Sig. (2-tailed)	.732	.847	.947	.000
	N	213	213	215	222
A15EngTEAS	Pearson Correlation	.089	.031	-.046	.373**
	Sig. (2-tailed)	.196	.653	.502	.000
	N	212	212	214	221
A13MathTEAS	Pearson Correlation	.046	-.023	-.019	.343**
	Sig. (2-tailed)	.505	.734	.780	.000
	N	213	213	215	222
A14ScienTEAS	Pearson Correlation	.148*	-.014	.020	.454**
	Sig. (2-tailed)	.031	.835	.771	.000
	N	212	212	214	221
A3Chem3A	Pearson Correlation	.103	-.002	.554**	.015
	Sig. (2-tailed)	.115	.976	.000	.815
	N	234	234	235	234
A4Anatomy	Pearson Correlation	-.045	-.108	.374**	.236**
	Sig. (2-tailed)	.491	.100	.000	.000
	N	234	234	234	233
A5Physiology	Pearson Correlation	.007	.000	.487**	.146*
	Sig. (2-tailed)	.910	1.000	.000	.026
	N	234	234	234	233
A6Microbiology	Pearson Correlation	-.032	-.069	.396**	.171**
	Sig. (2-tailed)	.628	.290	.000	.009
	N	234	234	234	233
A7Comm3	Pearson Correlation	-.058	.004	.129*	-.001
	Sig. (2-tailed)	.374	.946	.049	.987
	N	234	234	234	233

Correlations

		FundLevel	N2ATIPharm1	Pharm1Level	N3ATIPharm2
A1GPAb4Nsg	Pearson Correlation	-.068	.135[*]	-.041	.165[*]
	Sig. (2-tailed)	.308	.041	.540	.012
	N	230	230	230	230
A11CompTEAS	Pearson Correlation	-.237[**]	.343[**]	-.042	.368[**]
	Sig. (2-tailed)	.000	.000	.522	.000
	N	240	238	238	240
A12ReadTeas	Pearson Correlation	-.180[**]	.295[**]	-.022	.293[**]
	Sig. (2-tailed)	.007	.000	.741	.000
	N	222	220	220	222
A15EngTEAS	Pearson Correlation	-.234[**]	.279[**]	.008	.274[**]
	Sig. (2-tailed)	.000	.000	.901	.000
	N	221	219	219	221
A13MathTEAS	Pearson Correlation	.006	.197[**]	.070	.245[**]
	Sig. (2-tailed)	.929	.003	.302	.000
	N	222	220	220	222
A14ScienTEAS	Pearson Correlation	-.118	.395[**]	-.102	.395[**]
	Sig. (2-tailed)	.080	.000	.133	.000
	N	221	219	219	221
A3Chem3A	Pearson Correlation	-.039	.011	-.109	-.033
	Sig. (2-tailed)	.556	.870	.095	.615
	N	234	234	234	234
A4Anatomy	Pearson Correlation	.089	.159[*]	.114	.147[*]
	Sig. (2-tailed)	.173	.015	.082	.025
	N	233	233	233	233
A5Physiology	Pearson Correlation	.038	.158[*]	.060	.098
	Sig. (2-tailed)	.566	.016	.362	.135
	N	233	233	233	233
A6Microbiology	Pearson Correlation	.005	.168[*]	-.074	.201[**]
	Sig. (2-tailed)	.934	.010	.260	.002
	N	233	233	233	233
A7Comm3	Pearson Correlation	.063	.124	-.171[**]	.120
	Sig. (2-tailed)	.337	.058	.009	.067
	N	233	233	233	233

Correlations

		Pharm2Level	N4ATIMedSurg	MedSurgLevel	N5ATIPeds
A1GPAb4Nsg	Pearson Correlation	.000	.091	-.163[*]	.172[**]
	Sig. (2-tailed)	.996	.172	.014	.009
	N	230	226	226	231
A11CompTEAS	Pearson Correlation	-.101	.439[**]	-.374[**]	.295[**]
	Sig. (2-tailed)	.119	.000	.000	.000
	N	240	236	236	241
A12ReadTeas	Pearson Correlation	-.029	.341[**]	-.248[**]	.323[**]
	Sig. (2-tailed)	.669	.000	.000	.000
	N	222	218	218	223
A15EngTEAS	Pearson Correlation	-.006	.301[**]	-.216[**]	.105
	Sig. (2-tailed)	.935	.000	.001	.117
	N	221	217	217	222
A13MathTEAS	Pearson Correlation	.041	.313[**]	-.249[**]	.168[*]
	Sig. (2-tailed)	.548	.000	.000	.012
	N	222	218	218	223
A14ScienTEAS	Pearson Correlation	-.018	.390[**]	-.286[**]	.236[**]
	Sig. (2-tailed)	.796	.000	.000	.000
	N	221	217	217	222
A3Chem3A	Pearson Correlation	-.018	-.065	.036	.081
	Sig. (2-tailed)	.784	.328	.588	.213
	N	234	230	230	235
A4Anatomy	Pearson Correlation	.111	.158[*]	-.070	.220[**]
	Sig. (2-tailed)	.090	.016	.288	.001
	N	233	229	229	234
A5Physiology	Pearson Correlation	-.048	.105	.012	.116
	Sig. (2-tailed)	.467	.115	.852	.076
	N	233	229	229	234
A6Microbiology	Pearson Correlation	.070	.216[**]	-.121	.236[**]
	Sig. (2-tailed)	.288	.001	.068	.000
	N	233	229	229	234
A7Comm3	Pearson Correlation	.112	.081	.000	.071
	Sig. (2-tailed)	.089	.220	.996	.276
	N	233	229	229	234

Correlations

		PedsLevel	n6ATIPsyche	PsychLevel	N7ATIMatChild
A1GPAb4Nsg	Pearson Correlation	-.112	.110	-.124	.207**
	Sig. (2-tailed)	.091	.094	.060	.002
	N	229	231	231	230
A11CompTEAS	Pearson Correlation	-.083	.481**	-.258**	.333**
	Sig. (2-tailed)	.200	.000	.000	.000
	N	239	241	241	240
A12ReadTeas	Pearson Correlation	-.170*	.314**	-.110	.365**
	Sig. (2-tailed)	.011	.000	.101	.000
	N	221	223	223	222
A15EngTEAS	Pearson Correlation	.069	.303**	-.156*	.159*
	Sig. (2-tailed)	.311	.000	.020	.018
	N	220	222	222	221
A13MathTEAS	Pearson Correlation	-.012	.419**	-.157*	.199**
	Sig. (2-tailed)	.859	.000	.019	.003
	N	221	223	223	222
A14ScienTEAS	Pearson Correlation	-.066	.434**	-.208**	.231**
	Sig. (2-tailed)	.328	.000	.002	.001
	N	220	222	222	221
A3Chem3A	Pearson Correlation	-.101	-.019	-.123	.010
	Sig. (2-tailed)	.124	.776	.060	.873
	N	233	235	235	234
A4Anatomy	Pearson Correlation	-.137*	.218**	.049	.069
	Sig. (2-tailed)	.037	.001	.459	.174
	N	232	234	234	233
A5Physiology	Pearson Correlation	-.180**	.214**	-.012	.110
	Sig. (2-tailed)	.006	.001	.851	.093
	N	232	234	234	233
A6Microbiology	Pearson Correlation	-.037	.109	-.027	.119
	Sig. (2-tailed)	.575	.096	.681	.069
	N	232	234	234	233
A7Comm3	Pearson Correlation	.025	.023	.049	.130*
	Sig. (2-tailed)	.706	.728	.452	.047
	N	232	234	234	233

Correlations

		MatChildLevel	RNcompA2	Probability4A	RNCompB
A1GPAb4Nsg	Pearson Correlation	-.080	.103	.148[*]	.185[**]
	Sig. (2-tailed)	.229	.129	.028	.005
	N	228	217	222	231
A11CompTEAS	Pearson Correlation	-.240[**]	.370[**]	.516[**]	.530[**]
	Sig. (2-tailed)	.000	.000	.000	.000
	N	238	227	232	240
A12ReadTeas	Pearson Correlation	-.286[**]	.244[**]	.425[**]	.480[**]
	Sig. (2-tailed)	.000	.000	.000	.000
	N	220	209	214	222
A15EngTEAS	Pearson Correlation	-.078	.236[**]	.339[**]	.392[**]
	Sig. (2-tailed)	.248	.001	.000	.000
	N	219	208	213	221
A13MathTEAS	Pearson Correlation	-.136[*]	.266[**]	.322[**]	.332[**]
	Sig. (2-tailed)	.044	.000	.000	.000
	N	220	209	214	222
A14ScienTEAS	Pearson Correlation	-.149[*]	.283[**]	.390[**]	.531[**]
	Sig. (2-tailed)	.027	.000	.000	.000
	N	219	208	213	221
A3Chem3A	Pearson Correlation	.001	-.039	-.014	.042
	Sig. (2-tailed)	.990	.560	.832	.521
	N	232	221	226	235
A4Anatomy	Pearson Correlation	.014	.131	.158[*]	.122
	Sig. (2-tailed)	.831	.053	.018	.062
	N	231	220	225	234
A5Physiology	Pearson Correlation	-.055	.058	.059	.003
	Sig. (2-tailed)	.403	.396	.379	.967
	N	231	220	225	234
A6Microbiology	Pearson Correlation	.087	-.026	.077	.104
	Sig. (2-tailed)	.187	.697	.247	.112
	N	231	220	225	234
A7Comm3	Pearson Correlation	-.097	.072	.076	.009
	Sig. (2-tailed)	.141	.291	.259	.889
	N	231	220	225	234

Correlations

		Probability4B	NCLEX1st
A1GPAb4Nsg	Pearson Correlation	.169*	-.043
	Sig. (2-tailed)	.010	.514
	N	231	231
A11CompTEAS	Pearson Correlation	.503**	-.201**
	Sig. (2-tailed)	.000	.002
	N	240	241
A12ReadTeas	Pearson Correlation	.441**	-.176**
	Sig. (2-tailed)	.000	.009
	N	222	223
A15EngTEAS	Pearson Correlation	.362**	-.054
	Sig. (2-tailed)	.000	.424
	N	221	222
A13MathTEAS	Pearson Correlation	.289**	-.150*
	Sig. (2-tailed)	.000	.025
	N	222	223
A14ScienTEAS	Pearson Correlation	.492**	-.215**
	Sig. (2-tailed)	.000	.001
	N	221	222
A3Chem3A	Pearson Correlation	.004	-.061
	Sig. (2-tailed)	.945	.354
	N	235	235
A4Anatomy	Pearson Correlation	.071	-.006
	Sig. (2-tailed)	.281	.931
	N	234	234
A5Physiology	Pearson Correlation	-.029	-.106
	Sig. (2-tailed)	.664	.107
	N	234	234
A6Microbiology	Pearson Correlation	.073	-.062
	Sig. (2-tailed)	.268	.213
	N	234	234
A7Comm3	Pearson Correlation	-.007	-.204**
	Sig. (2-tailed)	.919	.002
	N	234	234

Correlations

		A1GPAb4Nsg	A11CompTEAS	A12ReadTeas	A15EngTEAS
A8Eng1A	Pearson Correlation	.161*	.085	.141*	.169*
	Sig. (2-tailed)	.015	.199	.039	.014
	N	228	231	213	212
A10CriticalTh	Pearson Correlation	.170*	.052	-.024	.089
	Sig. (2-tailed)	.010	.436	.732	.196
	N	228	231	213	212
A9Math11	Pearson Correlation	-.001	.035	.013	.031
	Sig. (2-tailed)	.991	.599	.847	.653
	N	228	231	213	212
A2PrereqGPA	Pearson Correlation	.556**	-.008	.005	-.046
	Sig. (2-tailed)	.000	.906	.947	.502
	N	230	233	215	214
N1ATIfund	Pearson Correlation	.152*	.523**	.465**	.373**
	Sig. (2-tailed)	.021	.000	.000	.000
	N	230	240	222	221
FundLevel	Pearson Correlation	-.068	-.237**	-.180**	-.234**
	Sig. (2-tailed)	.306	.000	.007	.000
	N	230	240	222	221
N2ATIPharm1	Pearson Correlation	.135*	.343**	.295**	.279**
	Sig. (2-tailed)	.041	.000	.000	.000
	N	230	238	220	219
Pharm1Level	Pearson Correlation	-.041	-.042	-.022	.008
	Sig. (2-tailed)	.540	.522	.741	.901
	N	230	238	220	219
N3ATIPharm2	Pearson Correlation	.165*	.368**	.293**	.274**
	Sig. (2-tailed)	.012	.000	.000	.000
	N	230	240	222	221
Pharm2Level	Pearson Correlation	.000	-.101	-.029	-.006
	Sig. (2-tailed)	.996	.119	.669	.935
	N	230	240	222	221
N4ATIMedSurg	Pearson Correlation	.091	.439**	.341**	.301**
	Sig. (2-tailed)	.172	.000	.000	.000
	N	226	236	218	217
MedSurgLevel	Pearson Correlation	-.163*	-.374**	-.248**	-.216**
	Sig. (2-tailed)	.014	.000	.000	.001
	N	226	236	218	217
N5ATIPeds	Pearson Correlation	.172**	.295**	.323**	.105
	Sig. (2-tailed)	.009	.000	.000	.117
	N	231	241	223	222

Correlations

		A13MathTEAS	A14ScienTEAS	A3Chem3A	A4Anatomy
A8Eng1A	Pearson Correlation	.058	-.013	.004	-.049
	Sig. (2-tailed)	.399	.855	.947	.452
	N	213	212	234	234
A10CriticalTh	Pearson Correlation	.046	.148*	.103	-.045
	Sig. (2-tailed)	.505	.031	.115	.491
	N	213	212	234	234
A9Math11	Pearson Correlation	-.023	-.014	-.002	-.108
	Sig. (2-tailed)	.734	.835	.976	.100
	N	213	212	234	234
A2PrereqGPA	Pearson Correlation	-.019	.020	.554**	.374**
	Sig. (2-tailed)	.780	.771	.000	.000
	N	215	214	235	234
N1ATIfund	Pearson Correlation	.343**	.454**	.015	.236**
	Sig. (2-tailed)	.000	.000	.815	.000
	N	222	221	234	233
FundLevel	Pearson Correlation	.006	-.118	-.039	.089
	Sig. (2-tailed)	.929	.080	.556	.173
	N	222	221	234	233
N2ATIPharm1	Pearson Correlation	.197**	.395**	.011	.159*
	Sig. (2-tailed)	.003	.000	.870	.015
	N	220	219	234	233
Pharm1Level	Pearson Correlation	.070	-.102	-.109	.114
	Sig. (2-tailed)	.302	.133	.095	.082
	N	220	219	234	233
N3ATIPharm2	Pearson Correlation	.245**	.395**	-.033	.147*
	Sig. (2-tailed)	.000	.000	.615	.025
	N	222	221	234	233
Pharm2Level	Pearson Correlation	.041	-.018	-.018	.111
	Sig. (2-tailed)	.548	.796	.784	.090
	N	222	221	234	233
N4ATIMedSurg	Pearson Correlation	.313**	.390**	-.065	.158*
	Sig. (2-tailed)	.000	.000	.328	.016
	N	218	217	230	229
MedSurgLevel	Pearson Correlation	-.249**	-.286**	.036	-.070
	Sig. (2-tailed)	.000	.000	.588	.288
	N	218	217	230	229
N5ATIPeds	Pearson Correlation	.168*	.236**	.081	.220**
	Sig. (2-tailed)	.012	.000	.213	.001
	N	223	222	235	234

Correlations

		A5Physiology	A6Microbiology	A7Comm3	A8Eng1A
A8Eng1A	Pearson Correlation	-.117	-.010	.049	1
	Sig. (2-tailed)	.073	.879	.453	
	N	234	234	234	234
A10CriticalTh	Pearson Correlation	.007	-.032	-.058	.092
	Sig. (2-tailed)	.910	.628	.374	.160
	N	234	234	234	234
A9Math11	Pearson Correlation	.000	-.069	.004	.035
	Sig. (2-tailed)	1.000	.290	.946	.591
	N	234	234	234	234
A2PrereqGPA	Pearson Correlation	.487**	.396**	.129*	.316**
	Sig. (2-tailed)	.000	.000	.049	.000
	N	234	234	234	234
N1ATIfund	Pearson Correlation	.146*	.171**	-.001	.021
	Sig. (2-tailed)	.026	.009	.987	.754
	N	233	233	233	233
FundLevel	Pearson Correlation	.038	.005	.063	-.052
	Sig. (2-tailed)	.566	.934	.337	.430
	N	233	233	233	233
N2ATIPharm1	Pearson Correlation	.158*	.168*	.124	.001
	Sig. (2-tailed)	.016	.010	.058	.994
	N	233	233	233	233
Pharm1Level	Pearson Correlation	.060	-.074	-.171**	.022
	Sig. (2-tailed)	.362	.260	.009	.738
	N	233	233	233	233
N3ATIPharm2	Pearson Correlation	.098	.201**	.120	.037
	Sig. (2-tailed)	.135	.002	.067	.577
	N	233	233	233	233
Pharm2Level	Pearson Correlation	-.048	.070	.112	.029
	Sig. (2-tailed)	.467	.288	.089	.658
	N	233	233	233	233
N4ATIMedSurg	Pearson Correlation	.105	.216**	.081	.030
	Sig. (2-tailed)	.115	.001	.220	.649
	N	229	229	229	229
MedSurgLevel	Pearson Correlation	.012	-.121	.000	.040
	Sig. (2-tailed)	.852	.068	.996	.548
	N	229	229	229	229
N5ATIPeds	Pearson Correlation	.116	.236**	.071	-.094
	Sig. (2-tailed)	.076	.000	.276	.154
	N	234	234	234	234

Correlations

		A10CriticalTh	A9Math11	A2PrereqGPA	N1ATIfund
A8Eng1A	Pearson Correlation	.092	.035	.316**	.021
	Sig. (2-tailed)	.160	.591	.000	.754
	N	234	234	234	233
A10CriticalTh	Pearson Correlation	1	.100	.248**	.060
	Sig. (2-tailed)		.127	.000	.360
	N	234	234	234	233
A9Math11	Pearson Correlation	.100	1	.133*	-.013
	Sig. (2-tailed)	.127		.042	.844
	N	234	234	234	233
A2PrereqGPA	Pearson Correlation	.248**	.133*	1	.065
	Sig. (2-tailed)	.000	.042		.323
	N	234	234	236	235
N1ATIfund	Pearson Correlation	.060	-.013	.065	1
	Sig. (2-tailed)	.360	.844	.323	
	N	233	233	235	244
FundLevel	Pearson Correlation	-.001	-.040	.009	-.223**
	Sig. (2-tailed)	.989	.548	.890	.000
	N	233	233	235	244
N2ATIPharm1	Pearson Correlation	.157*	.076	.115	.515**
	Sig. (2-tailed)	.017	.247	.079	.000
	N	233	233	235	241
Pharm1Level	Pearson Correlation	-.093	-.096	-.057	-.032
	Sig. (2-tailed)	.156	.144	.385	.617
	N	233	233	235	241
N3ATIPharm2	Pearson Correlation	.119	.149*	.060	.446**
	Sig. (2-tailed)	.070	.023	.359	.000
	N	233	233	235	243
Pharm2Level	Pearson Correlation	.011	-.172**	.005	-.063
	Sig. (2-tailed)	.866	.008	.933	.330
	N	233	233	235	243
N4ATIMedSurg	Pearson Correlation	.010	.105	.022	.505**
	Sig. (2-tailed)	.881	.113	.740	.000
	N	229	229	231	239
MedSurgLevel	Pearson Correlation	.030	.048	-.009	-.322**
	Sig. (2-tailed)	.647	.466	.889	.000
	N	229	229	231	239
N5ATIPeds	Pearson Correlation	.045	.079	.118	.507**
	Sig. (2-tailed)	.496	.231	.070	.000
	N	234	234	236	244

Correlations

		FundLevel	N2ATIPharm1	Pharm1Level	N3ATIPharm2
A8Eng1A	Pearson Correlation	-.052	.001	.022	.037
	Sig. (2-tailed)	.430	.994	.738	.577
	N	233	233	233	233
A10CriticalTh	Pearson Correlation	-.001	.157[*]	-.093	.119
	Sig. (2-tailed)	.969	.017	.156	.070
	N	233	233	233	233
A9Math11	Pearson Correlation	-.040	.076	-.096	.149[*]
	Sig. (2-tailed)	.548	.247	.144	.023
	N	233	233	233	233
A2PrereqGPA	Pearson Correlation	.009	.115	-.057	.060
	Sig. (2-tailed)	.890	.079	.385	.359
	N	235	235	235	235
N1ATIfund	Pearson Correlation	-.223[**]	.515[**]	-.032	.446[**]
	Sig. (2-tailed)	.000	.000	.617	.000
	N	244	241	241	243
FundLevel	Pearson Correlation	1	-.096	.053	.007
	Sig. (2-tailed)		.136	.415	.912
	N	244	241	241	243
N2ATIPharm1	Pearson Correlation	-.096	1	-.231[**]	.657[**]
	Sig. (2-tailed)	.136		.000	.000
	N	241	242	242	241
Pharm1Level	Pearson Correlation	.053	-.231[**]	1	-.112
	Sig. (2-tailed)	.415	.000		.083
	N	241	242	242	241
N3ATIPharm2	Pearson Correlation	.007	.657[**]	-.112	1
	Sig. (2-tailed)	.912	.000	.083	
	N	243	241	241	244
Pharm2Level	Pearson Correlation	.152[*]	-.094	.538[**]	-.005
	Sig. (2-tailed)	.018	.145	.000	.937
	N	243	241	241	244
N4ATIMedSurg	Pearson Correlation	-.021	.455[**]	.006	.531[**]
	Sig. (2-tailed)	.752	.000	.929	.000
	N	239	237	237	239
MedSurgLevel	Pearson Correlation	.094	-.231[**]	.020	-.407[**]
	Sig. (2-tailed)	.146	.000	.761	.000
	N	239	237	237	239
N5ATIPeds	Pearson Correlation	-.088	.472[**]	-.066	.538[**]
	Sig. (2-tailed)	.172	.000	.303	.000
	N	244	242	242	244

Correlations

		Pharm2Level	N4ATIMedSurg	MedSurgLevel	N5ATIPeds
A8Eng1A	Pearson Correlation	.029	.030	.040	-.094
	Sig. (2-tailed)	.658	.649	.548	.154
	N	233	229	229	234
A10CriticalTh	Pearson Correlation	.011	.010	.030	.045
	Sig. (2-tailed)	.866	.881	.647	.496
	N	233	229	229	234
A9Math11	Pearson Correlation	-.172**	.105	.048	.079
	Sig. (2-tailed)	.008	.113	.466	.231
	N	233	229	229	234
A2PrereqGPA	Pearson Correlation	.005	.022	-.009	.118
	Sig. (2-tailed)	.933	.740	.889	.070
	N	235	231	231	236
N1ATIfund	Pearson Correlation	-.063	.505**	-.322**	.507**
	Sig. (2-tailed)	.330	.000	.000	.000
	N	243	239	239	244
FundLevel	Pearson Correlation	.152*	-.021	.094	-.088
	Sig. (2-tailed)	.018	.752	.146	.172
	N	243	239	239	244
N2ATIPharm1	Pearson Correlation	-.094	.455**	-.231**	.472**
	Sig. (2-tailed)	.145	.000	.000	.000
	N	241	237	237	242
Pharm1Level	Pearson Correlation	.538**	.006	.020	-.066
	Sig. (2-tailed)	.000	.929	.761	.303
	N	241	237	237	242
N3ATIPharm2	Pearson Correlation	-.005	.531**	-.407**	.538**
	Sig. (2-tailed)	.937	.000	.000	.000
	N	244	239	239	244
Pharm2Level	Pearson Correlation	1	.011	.147*	.004
	Sig. (2-tailed)		.866	.023	.949
	N	244	239	239	244
N4ATIMedSurg	Pearson Correlation	.011	1	-.504**	.458**
	Sig. (2-tailed)	.866		.000	.000
	N	239	240	240	240
MedSurgLevel	Pearson Correlation	.147*	-.504**	1	-.318**
	Sig. (2-tailed)	.023	.000		.000
	N	239	240	240	240
N5ATIPeds	Pearson Correlation	.004	.458**	-.318**	1
	Sig. (2-tailed)	.949	.000	.000	
	N	244	240	240	245

Correlations

		PedsLevel	n6ATIPsyche	PsychLevel	N7ATIMatChild
A8Eng1A	Pearson Correlation	.112	-.014	-.070	.034
	Sig. (2-tailed)	.089	.833	.288	.607
	N	232	234	234	233
A10CriticalTh	Pearson Correlation	.062	.140*	-.045	-.059
	Sig. (2-tailed)	.346	.033	.495	.372
	N	232	234	234	233
A9Math11	Pearson Correlation	-.110	.047	-.072	.216**
	Sig. (2-tailed)	.095	.470	.275	.001
	N	232	234	234	233
A2PrereqGPA	Pearson Correlation	-.071	.040	-.053	.100
	Sig. (2-tailed)	.278	.544	.418	.128
	N	234	236	236	235
N1ATIfund	Pearson Correlation	-.295**	.554**	-.190**	.466**
	Sig. (2-tailed)	.000	.000	.003	.000
	N	242	244	244	243
FundLevel	Pearson Correlation	.125	-.083	.089	-.137*
	Sig. (2-tailed)	.053	.197	.164	.032
	N	242	244	244	243
N2ATIPharm1	Pearson Correlation	-.192**	.454**	-.232**	.361**
	Sig. (2-tailed)	.003	.000	.000	.000
	N	240	242	242	241
Pharm1Level	Pearson Correlation	.047	-.080	.217**	-.051
	Sig. (2-tailed)	.471	.215	.001	.431
	N	240	242	242	241
N3ATIPharm2	Pearson Correlation	-.229**	.411**	-.188**	.408**
	Sig. (2-tailed)	.000	.000	.003	.000
	N	242	244	244	243
Pharm2Level	Pearson Correlation	.077	-.059	.267**	-.038
	Sig. (2-tailed)	.235	.357	.000	.554
	N	242	244	244	243
N4ATIMedSurg	Pearson Correlation	-.243**	.420**	-.131*	.460**
	Sig. (2-tailed)	.000	.000	.043	.000
	N	238	240	240	240
MedSurgLevel	Pearson Correlation	.168**	-.260**	.234**	-.341**
	Sig. (2-tailed)	.009	.000	.000	.000
	N	238	240	240	240
N5ATIPeds	Pearson Correlation	-.650**	.498**	-.096	.584**
	Sig. (2-tailed)	.000	.000	.133	.000
	N	243	245	245	244

Correlations

		MatChildLevel	RNcompA2	Probability4A	RNCompB
A8Eng1A	Pearson Correlation	.077	.035	.035	.017
	Sig. (2-tailed)	.243	.603	.606	.792
	N	231	220	225	234
A10CriticalTh	Pearson Correlation	.042	.070	.020	.083
	Sig. (2-tailed)	.525	.300	.769	.206
	N	231	220	225	234
A9Math11	Pearson Correlation	-.165[*]	.048	.079	.063
	Sig. (2-tailed)	.012	.483	.236	.203
	N	231	220	225	234
A2PrereqGPA	Pearson Correlation	.012	-.043	.034	.016
	Sig. (2-tailed)	.852	.519	.613	.810
	N	233	222	227	236
N1ATIfund	Pearson Correlation	-.246[**]	.375[**]	.498[**]	.625[**]
	Sig. (2-tailed)	.000	.000	.000	.000
	N	241	231	236	243
FundLevel	Pearson Correlation	.167[**]	.043	-.164[*]	-.100
	Sig. (2-tailed)	.010	.514	.012	.121
	N	241	231	236	243
N2ATIPharm1	Pearson Correlation	-.239[**]	.337[**]	.465[**]	.570[**]
	Sig. (2-tailed)	.000	.000	.000	.000
	N	239	228	233	242
Pharm1Level	Pearson Correlation	.102	-.042	-.121	-.129[*]
	Sig. (2-tailed)	.118	.525	.065	.045
	N	239	228	233	242
N3ATIPharm2	Pearson Correlation	-.244[**]	.423[**]	.561[**]	.612[**]
	Sig. (2-tailed)	.000	.000	.000	.000
	N	241	230	235	243
Pharm2Level	Pearson Correlation	.078	-.027	-.085	-.072
	Sig. (2-tailed)	.229	.681	.193	.260
	N	241	230	235	243
N4ATIMedSurg	Pearson Correlation	-.268[**]	.426[**]	.650[**]	.619[**]
	Sig. (2-tailed)	.000	.000	.000	.000
	N	238	230	234	239
MedSurgLevel	Pearson Correlation	.300[**]	-.304[**]	-.496[**]	-.436[**]
	Sig. (2-tailed)	.000	.000	.000	.000
	N	238	230	234	239
N5ATIPeds	Pearson Correlation	-.299[**]	.366[**]	.540[**]	.561[**]
	Sig. (2-tailed)	.000	.000	.000	.000
	N	242	231	236	244

Correlations

		Probability4B	NCLEX1st
A8Eng1A	Pearson Correlation	-.023	.069
	Sig. (2-tailed)	.721	.290
	N	234	234
A10CriticalTh	Pearson Correlation	.056	.001
	Sig. (2-tailed)	.390	.984
	N	234	234
A9Math11	Pearson Correlation	.071	-.076
	Sig. (2-tailed)	.278	.248
	N	234	234
A2PrereqGPA	Pearson Correlation	-.018	-.057
	Sig. (2-tailed)	.780	.386
	N	236	236
N1ATIfund	Pearson Correlation	.570**	-.251**
	Sig. (2-tailed)	.000	.000
	N	243	244
FundLevel	Pearson Correlation	-.164*	.095
	Sig. (2-tailed)	.011	.138
	N	243	244
N2ATIPharm1	Pearson Correlation	.511**	-.386**
	Sig. (2-tailed)	.000	.000
	N	242	242
Pharm1Level	Pearson Correlation	-.146*	.344**
	Sig. (2-tailed)	.023	.000
	N	242	242
N3ATIPharm2	Pearson Correlation	.549**	-.357**
	Sig. (2-tailed)	.000	.000
	N	243	244
Pharm2Level	Pearson Correlation	-.111	.195**
	Sig. (2-tailed)	.085	.002
	N	243	244
N4ATIMedSurg	Pearson Correlation	.584**	-.282**
	Sig. (2-tailed)	.000	.000
	N	239	240
MedSurgLevel	Pearson Correlation	-.495**	.172**
	Sig. (2-tailed)	.000	.008
	N	239	240
N5ATIPeds	Pearson Correlation	.508**	-.288**
	Sig. (2-tailed)	.000	.000
	N	244	245

Correlations

		A1GPAb4Nsg	A11CompTEAS	A12ReadTeas	A15EngTEAS
PedsLevel	Pearson Correlation	-.112	-.083	-.170*	.069
	Sig. (2-tailed)	.091	.200	.011	.311
	N	229	239	221	220
n6ATIPsyche	Pearson Correlation	.110	.481**	.314**	.303**
	Sig. (2-tailed)	.094	.000	.000	.000
	N	231	241	223	222
PsychLevel	Pearson Correlation	-.124	-.258**	-.110	-.156*
	Sig. (2-tailed)	.060	.000	.101	.020
	N	231	241	223	222
N7ATIMatChild	Pearson Correlation	.207**	.333**	.365**	.159*
	Sig. (2-tailed)	.002	.000	.000	.018
	N	230	240	222	221
MatChildLevel	Pearson Correlation	-.080	-.240**	-.286**	-.078
	Sig. (2-tailed)	.229	.000	.000	.248
	N	228	238	220	219
RNcompA2	Pearson Correlation	.103	.370**	.244**	.236**
	Sig. (2-tailed)	.129	.000	.000	.001
	N	217	227	209	208
Probability4A	Pearson Correlation	.148*	.516**	.425**	.339**
	Sig. (2-tailed)	.028	.000	.000	.000
	N	222	232	214	213
RNCompB	Pearson Correlation	.185**	.530**	.480**	.392**
	Sig. (2-tailed)	.005	.000	.000	.000
	N	231	240	222	221
Probability4B	Pearson Correlation	.169*	.503**	.441**	.362**
	Sig. (2-tailed)	.010	.000	.000	.000
	N	231	240	222	221
NCLEX1st	Pearson Correlation	-.043	-.201**	-.176**	-.054
	Sig. (2-tailed)	.514	.002	.009	.424
	N	231	241	223	222

Correlations

		A13MathTEAS	A14ScienTEAS	A3Chem3A	A4Anatomy
PedsLevel	Pearson Correlation	-.012	-.066	-.101	-.137*
	Sig. (2-tailed)	.859	.328	.124	.037
	N	221	220	233	232
n6ATIPsyche	Pearson Correlation	.419**	.434**	-.019	.218**
	Sig. (2-tailed)	.000	.000	.776	.001
	N	223	222	235	234
PsychLevel	Pearson Correlation	-.157*	-.208**	-.123	.049
	Sig. (2-tailed)	.019	.002	.060	.459
	N	223	222	235	234
N7ATIMatChild	Pearson Correlation	.199**	.231**	.010	.089
	Sig. (2-tailed)	.003	.001	.873	.174
	N	222	221	234	233
MatChildLevel	Pearson Correlation	-.136*	-.149*	.001	.014
	Sig. (2-tailed)	.044	.027	.990	.831
	N	220	219	232	231
RNcompA2	Pearson Correlation	.266**	.283**	-.039	.131
	Sig. (2-tailed)	.000	.000	.560	.053
	N	209	208	221	220
Probability4A	Pearson Correlation	.322**	.390**	-.014	.158*
	Sig. (2-tailed)	.000	.000	.832	.018
	N	214	213	226	225
RNCompB	Pearson Correlation	.332**	.531**	.042	.122
	Sig. (2-tailed)	.000	.000	.521	.062
	N	222	221	235	234
Probability4B	Pearson Correlation	.289**	.492**	.004	.071
	Sig. (2-tailed)	.000	.000	.945	.281
	N	222	221	235	234
NCLEX1st	Pearson Correlation	-.150*	-.215**	-.061	-.006
	Sig. (2-tailed)	.025	.001	.354	.931
	N	223	222	235	234

Correlations

		A5Physiology	A6Microbiology	A7Comm3	A8Eng1A
PedsLevel	Pearson Correlation	-.180**	-.037	.025	.112
	Sig. (2-tailed)	.006	.575	.706	.089
	N	232	232	232	232
n6ATIPsyche	Pearson Correlation	.214**	.109	.023	-.014
	Sig. (2-tailed)	.001	.096	.728	.833
	N	234	234	234	234
PsychLevel	Pearson Correlation	-.012	-.027	.049	-.070
	Sig. (2-tailed)	.851	.681	.452	.288
	N	234	234	234	234
N7ATIMatChild	Pearson Correlation	.110	.119	.130*	.034
	Sig. (2-tailed)	.093	.069	.047	.607
	N	233	233	233	233
MatChildLevel	Pearson Correlation	-.055	.087	-.097	.077
	Sig. (2-tailed)	.403	.187	.141	.243
	N	231	231	231	231
RNcompA2	Pearson Correlation	.058	-.026	.072	.035
	Sig. (2-tailed)	.396	.697	.291	.603
	N	220	220	220	220
Probability4A	Pearson Correlation	.059	.077	.076	.035
	Sig. (2-tailed)	.379	.247	.259	.606
	N	225	225	225	225
RNCompB	Pearson Correlation	.003	.104	.009	.017
	Sig. (2-tailed)	.967	.112	.889	.792
	N	234	234	234	234
Probability4B	Pearson Correlation	-.029	.073	-.007	-.023
	Sig. (2-tailed)	.664	.268	.919	.721
	N	234	234	234	234
NCLEX1st	Pearson Correlation	-.106	-.082	-.204**	.069
	Sig. (2-tailed)	.107	.213	.002	.290
	N	234	234	234	234

Correlations

		A10CriticalTh	A9Math11	A2PrereqGPA	N1ATIfund
PedsLevel	Pearson Correlation	.062	-.110	-.071	-.295**
	Sig. (2-tailed)	.346	.095	.278	.000
	N	232	232	234	242
n6ATIPsyche	Pearson Correlation	.140*	.047	.040	.554**
	Sig. (2-tailed)	.033	.470	.544	.000
	N	234	234	236	244
PsychLevel	Pearson Correlation	-.045	-.072	-.053	-.190**
	Sig. (2-tailed)	.495	.275	.418	.003
	N	234	234	236	244
N7ATIMatChild	Pearson Correlation	-.059	.216**	.100	.466**
	Sig. (2-tailed)	.372	.001	.128	.000
	N	233	233	235	243
MatChildLevel	Pearson Correlation	.042	-.165*	.012	-.246**
	Sig. (2-tailed)	.525	.012	.852	.000
	N	231	231	233	241
RNcompA2	Pearson Correlation	.070	.048	-.043	.375**
	Sig. (2-tailed)	.300	.483	.519	.000
	N	220	220	222	231
Probability4A	Pearson Correlation	.020	.079	.034	.498**
	Sig. (2-tailed)	.769	.236	.613	.000
	N	225	225	227	236
RNCompB	Pearson Correlation	.083	.083	.016	.625**
	Sig. (2-tailed)	.206	.203	.810	.000
	N	234	234	236	243
Probability4B	Pearson Correlation	.056	.071	-.018	.570**
	Sig. (2-tailed)	.390	.278	.780	.000
	N	234	234	236	243
NCLEX1st	Pearson Correlation	.001	-.076	-.057	-.251**
	Sig. (2-tailed)	.984	.248	.386	.000
	N	234	234	236	244

Correlations

		FundLevel	N2ATIPharm1	Pharm1Level	N3ATIPharm2
PedsLevel	Pearson Correlation	.125	-.192**	.047	-.229**
	Sig. (2-tailed)	.053	.003	.471	.000
	N	242	240	240	242
n6ATIPsyche	Pearson Correlation	-.083	.454**	-.080	.411**
	Sig. (2-tailed)	.197	.000	.215	.000
	N	244	242	242	244
PsychLevel	Pearson Correlation	.089	-.232**	.217**	-.188**
	Sig. (2-tailed)	.164	.000	.001	.003
	N	244	242	242	244
N7ATIMatChild	Pearson Correlation	-.137*	.361**	-.051	.408**
	Sig. (2-tailed)	.032	.000	.431	.000
	N	243	241	241	243
MatChildLevel	Pearson Correlation	.167**	-.239**	.102	-.244**
	Sig. (2-tailed)	.010	.000	.118	.000
	N	241	239	239	241
RNcompA2	Pearson Correlation	.043	.337**	-.042	.423**
	Sig. (2-tailed)	.514	.000	.525	.000
	N	231	228	228	230
Probability4A	Pearson Correlation	-.164*	.465**	-.121	.561**
	Sig. (2-tailed)	.012	.000	.065	.000
	N	236	233	233	235
RNCompB	Pearson Correlation	-.100	.570**	-.129*	.612**
	Sig. (2-tailed)	.121	.000	.045	.000
	N	243	242	242	243
Probability4B	Pearson Correlation	-.164*	.511**	-.146*	.549**
	Sig. (2-tailed)	.011	.000	.023	.000
	N	243	242	242	243
NCLEX1st	Pearson Correlation	.095	-.386**	.344**	-.357**
	Sig. (2-tailed)	.138	.000	.000	.000
	N	244	242	242	244

Correlations

		Pharm2Level	N4ATIMedSurg	MedSurgLevel	N5ATIPeds
PedsLevel	Pearson Correlation	.077	-.243**	.168**	-.650**
	Sig. (2-tailed)	.235	.000	.009	.000
	N	242	238	238	243
n6ATIPsyche	Pearson Correlation	-.059	.420**	-.260**	.498**
	Sig. (2-tailed)	.357	.000	.000	.000
	N	244	240	240	245
PsychLevel	Pearson Correlation	.267**	-.131*	.234**	-.096
	Sig. (2-tailed)	.000	.043	.000	.133
	N	244	240	240	245
N7ATIMatChild	Pearson Correlation	-.038	.460**	-.341**	.584**
	Sig. (2-tailed)	.554	.000	.000	.000
	N	243	240	240	244
MatChildLevel	Pearson Correlation	.078	-.268**	.300**	-.299**
	Sig. (2-tailed)	.229	.000	.000	.000
	N	241	238	238	242
RNcompA2	Pearson Correlation	-.027	.426**	-.304**	.366**
	Sig. (2-tailed)	.681	.000	.000	.000
	N	230	230	230	231
Probability4A	Pearson Correlation	-.085	.650**	-.496**	.540**
	Sig. (2-tailed)	.193	.000	.000	.000
	N	235	234	234	236
RNCompB	Pearson Correlation	-.072	.619**	-.436**	.561**
	Sig. (2-tailed)	.260	.000	.000	.000
	N	243	239	239	244
Probability4B	Pearson Correlation	-.111	.584**	-.495**	.508**
	Sig. (2-tailed)	.085	.000	.000	.000
	N	243	239	239	244
NCLEX1st	Pearson Correlation	.195**	-.282**	.172**	-.288**
	Sig. (2-tailed)	.002	.000	.008	.000
	N	244	240	240	245

Correlations

		PedsLevel	n6ATIPsyche	PsychLevel	N7ATIMatChild
PedsLevel	Pearson Correlation	1	-.278**	.036	-.385**
	Sig. (2-tailed)		.000	.571	.000
	N	243	243	243	242
n6ATIPsyche	Pearson Correlation	-.278**	1	-.279**	.449**
	Sig. (2-tailed)	.000		.000	.000
	N	243	245	245	244
PsychLevel	Pearson Correlation	.036	-.279**	1	-.165**
	Sig. (2-tailed)	.571	.000		.010
	N	243	245	245	244
N7ATIMatChild	Pearson Correlation	-.385**	.449**	-.165**	1
	Sig. (2-tailed)	.000	.000	.010	
	N	242	244	244	244
MatChildLevel	Pearson Correlation	.306**	-.232**	.093	-.505**
	Sig. (2-tailed)	.000	.000	.150	.000
	N	240	242	242	242
RNcompA2	Pearson Correlation	-.172**	.341**	-.128	.319**
	Sig. (2-tailed)	.009	.000	.052	.000
	N	229	231	231	231
Probability4A	Pearson Correlation	-.364**	.453**	-.187**	.549**
	Sig. (2-tailed)	.000	.000	.004	.000
	N	234	236	236	236
RNCompB	Pearson Correlation	-.270**	.520**	-.228**	.543**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	242	244	244	243
Probability4B	Pearson Correlation	-.254**	.456**	-.251**	.516**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	242	244	244	243
NCLEX1st	Pearson Correlation	.191**	-.306**	.199**	-.283**
	Sig. (2-tailed)	.003	.000	.002	.000
	N	243	245	245	244

Correlations

		MatChildLevel	RNcompA2	Probability4A	RNCompB
PedsLevel	Pearson Correlation	.306**	-.172**	-.364**	-.270**
	Sig. (2-tailed)	.000	.009	.000	.000
	N	240	229	234	242
n6ATIPsyche	Pearson Correlation	-.232**	.341**	.453**	.520**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	242	231	236	244
PsychLevel	Pearson Correlation	.093	-.128	-.187**	-.228**
	Sig. (2-tailed)	.150	.052	.004	.000
	N	242	231	236	244
N7ATIMatChild	Pearson Correlation	-.505**	.319**	.549**	.543**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	242	231	236	243
MatChildLevel	Pearson Correlation	1	-.210**	-.410**	-.333**
	Sig. (2-tailed)		.001	.000	.000
	N	242	230	235	241
RNcompA2	Pearson Correlation	-.210**	1	.481**	.421**
	Sig. (2-tailed)	.001		.000	.000
	N	230	231	231	230
Probability4A	Pearson Correlation	-.410**	.481**	1	.661**
	Sig. (2-tailed)	.000	.000		.000
	N	235	231	236	235
RNCompB	Pearson Correlation	-.333**	.421**	.661**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	241	230	235	244
Probability4B	Pearson Correlation	-.371**	.377**	.679**	.924**
	Sig. (2-tailed)	.000	.000	.000	.000
	N	241	230	235	244
NCLEX1st	Pearson Correlation	.291**	-.109	-.323**	-.338**
	Sig. (2-tailed)	.000	.099	.000	.000
	N	242	231	236	244

Correlations

		Probability4B	NCLEX1st
PedsLevel	Pearson Correlation	-.254**	.191**
	Sig. (2-tailed)	.000	.003
	N	242	243
n6ATIPsyche	Pearson Correlation	.456**	-.306**
	Sig. (2-tailed)	.000	.000
	N	244	245
PsychLevel	Pearson Correlation	-.251**	.199**
	Sig. (2-tailed)	.000	.002
	N	244	245
N7ATIMatChild	Pearson Correlation	.516**	-.283**
	Sig. (2-tailed)	.000	.000
	N	243	244
MatChildLevel	Pearson Correlation	-.371**	.291**
	Sig. (2-tailed)	.000	.000
	N	241	242
RNcompA2	Pearson Correlation	.377**	-.109
	Sig. (2-tailed)	.000	.099
	N	230	231
Probability4A	Pearson Correlation	.679**	-.323**
	Sig. (2-tailed)	.000	.000
	N	235	236
RNCompB	Pearson Correlation	.924**	-.338**
	Sig. (2-tailed)	.000	.000
	N	244	244
Probability4B	Pearson Correlation	1	-.337**
	Sig. (2-tailed)		.000
	N	244	244
NCLEX1st	Pearson Correlation	-.337**	1
	Sig. (2-tailed)	.000	
	N	244	245

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

California State University, Fresno

Mary Ann McCarthy

Type full name as it appears on submission

June 11, 2012

Date