

CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

PRE-ENTRY ACADEMIC ACHIEVEMENT AND STUDENT SUCCESS
IN ASSOCIATE DEGREE NURSING PROGRAMS

A dissertation submitted in partial fulfillment of the requirements
For the Doctor of Education Degree in Educational Leadership

By

Carol A. Velas

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The dissertation of Carol A. Velas is approved

Linda Loiselle, MSN, RN, APRN, CPN

Date

Philip Rusche, Ed.D.

Date

Miguel Ceja, Ph.D, Chair

Date

California State University, Northridge

DEDICATION

I dedicate this dissertation to my family, especially my husband Dave, who embraced my journey by encouraging me every step of the way. In 2009, when I started this program, you kept me motivated when I didn't think I could finish the first class, you regularly told me and all your friends how proud you were, and toward the end you inspired me to push hard to finish. To my son Joey, I hope I have taught you the importance of dedication and hard work to further your education. Thank you for giving me the time to accomplish this goal. To my daughter Jeni, even though you weren't physically present during this degree you were very mentally present to me. I enjoyed commiserating with you over homework, writing papers, and our professors. I am so proud of your accomplishments and your love for the underserved!

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ABSTRACT

PRE-ENTRY ACADEMIC ACHIEVEMENT AND STUDENT SUCCESS IN ASSOCIATE DEGREE NURSING PROGRAMS

By

Carol A. Velas

Doctor of Education Degree

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This research addresses the larger social context of a nursing shortage and the supply of registered nurses. This quantitative, correlational, predictive design has explored the use of prerequisite coursework grade point average, and the Test of Essential Academic Skills (TEAS) sub scores in English, math, reading, and science to predict retention in the first semester, program completion, and mastery of the National Council Licensure Exam.

The findings suggest the independent variable prerequisite grade point average has no predictability with retention, persistence, or mastery of the National Council Licensure Exam. The independent variables TEAS English and TEAS science have predictability for retention. The findings also suggest TEAS science has predictability for both persistence and mastery of the National Council Licensure Exam. The implications of these results will support the use of the TEAS exam in the admission process as well as the identification of “at risk” students at both colleges. The results will also be of value in the reauthorization of California Assembly Bill 1559, Multicriteria Screening Process in Associate Degree Nursing Programs.

CHAPTER 1: STATEMENT OF THE PROBLEM

The United States is enduring a critical nursing shortage that will continue to impact the safety and quality of patient care in our nation. The current economy has driven registered nurses back into the workforce providing a “pseudo” increase in supply but, as the recession wanes, the shortage is expected to be twice as severe as any seen since the 1960’s (Buerhaus, Staiger, & Auerbach, 2009). To increase the supply of nurses, we must admit qualified academically ready students into nursing programs, retain them, and prepare them to successfully master the National Council Licensure Exam (NCLEX). This research addresses the larger social context of the nursing shortage and the importance of increasing the supply of registered nurses by ensuring the admission of the most academically prepared student.

Ventura County Community College District

Ventura and Moorpark Colleges are two of three community colleges in the Ventura County Community College district in Southern California. The Associate Degree Nursing Program (ADN) offered at both colleges is a two-year program, graduating students in the fall and spring that are qualified to take the NCLEX and begin entry-level registered nurse employment in hospitals or other healthcare settings.

Low Retention Rates

Program coordinators at both Moorpark and Ventura Colleges monitor retention and program completion rates. Retention rates in the first semester of the Associate Degree of Nursing Program at Moorpark College between Fall 2005- Fall 2009 averaged 68% (personal communication, C. Higashida, November 3, 2010). During the same time

span the persistence rate at Moorpark College was 65%, despite the self-assigned program outcome goal of 80% (C. Higashida personal communication, November 3, 2010). Ventura College retention and program completion rates are similar (personal communication, S. Melton, February 26, 2011).

The low retention rate affects the completion of the program and directly impacts the supply of nurses. Peterson (2009), in her research on predictors of academic success in nursing students including past academic performance, self-esteem, and self-efficacy, found a significant correlation between past academic performance and academic success in the first semester. One of the challenges Ventura and Moorpark colleges have is open access to the college and nursing programs.

Community College Open Enrollment

California Community Colleges, also called the people's college, opportunity college, and democracy's college, admit any student that applies (Bissett, 1995). The college mission and historical lawsuit by the Mexican-American Legal Defense Fund (MALDEF) maintains open enrollment to ensure education to all people. The MALDEF lawsuit, *Romero-Frias, et al. v. Mertes, et al.*, 1988/1991, contends that,

Outdated assessments, used in lieu of full matriculation services, had the effect of tracking Latino students into required remedial coursework that prevented full participation in the transfer curriculum, contrary to the Matriculation Act's provision that assessment instruments be used as an advisory tool. (Perry, Bahr, Rosin & Woodward 2010, p. 6-7)

The findings of this landmark case implemented "open access" in all California community colleges.

Open access grants admission to any student wanting to study nursing who has completed the prerequisites for the program. Bissett (1995) posits allowing any student admission to a nursing program has the potential to create an unfair disadvantage, as the lesser-prepared student would be set up for failure. When a student leaves the nursing program before completion, educators and student peers feel a sense of personal loss including feelings of vulnerability, while the student experiences financial, social, and considerable emotional distress (Taylor, 2005; O'Donnell, 2009).

Pre-Admission Exam

Students take the Test of Essential Academic Skills (TEAS) exam prior to admission to the program. The TEAS exam, developed by Assessment Technologies Institute (ATI), tests the student's English and language usage, math, reading, and science aptitude. ATI computed a total equated mean percent correct and standard deviation score from a sample of 26,649 prior examinees to determine total (composite) and sub scores in English, math, reading, and science (Assessment Technologies Institute, 2009). Each school determines the individual composite score that they feel reflects the individual student's ability to be successful in their program. Moorpark and Ventura College nursing programs choose to use the National mean score for their composite and individual sub scores as indicators for success but not as criteria for admission at this time. The national norm score is also reported in this dissertation as the national mean.

Lottery Admission

Prior to 2009, all students who applied to the nursing programs at Ventura and Moorpark colleges were given a lottery number. Twice a year 33-55 students, depending on grant funding, were taken from the lottery and admitted into the program. Many

students enter the program with English, math, reading, and science scores that are below the national mean score on the TEAS exam. Many have remedial needs that are so profound they even defer their entrance into the program. The students, labeled as “at risk” with low English, math, reading, and science scores start the program with a very high chance of failure during the first semester (C.Woo, personal communication, November 3, 2009).

California Assembly Bill 1559

In 2007 California Assembly Bill 1559 (AB 1559), co-authored by California Assembly Member Tom Berryhill and Senator Jack Scott and signed into law by Governor Arnold Schwarzenegger, changed open enrollment in California community college to admission based on merit. AB 1559 allows merit-based criteria to evaluate the potential for success by selecting the most academically prepared student. Admission criteria set forth by AB 1559 and approved by the California State Chancellor (Multicriteria Screening, AB 1559, CA Leg., 2007) includes grade point averages in relevant coursework, work or volunteer experience in a health-related field, demonstrated foreign language skills, life experiences, and the special circumstances of each applicant (first generation college student, single parenthood, etc). This law also allows other diagnostic assessments to be used to choose the most academically prepared student to enter nursing programs. Ventura and Moorpark Colleges have chosen a multicriteria screening process that includes the academic measures included in the recommendations from the California State Chancellor’s Office as part of AB 1559, as well as test results from the TEAS entrance exam. Full implementation of this screening process is expected in Fall 2012. One aspect of this research is to examine the appropriateness of prerequisite

coursework and TEAS exam score in an effort to support these criteria for the admission process.

California Nursing Shortage

The limited capacity to increase enrollment at Ventura and Moorpark colleges coupled with low program retention and persistence contribute to the challenge in meeting the California labor workforce needs.

The forecasted shortage of registered nurses in California is somewhat different from the national picture. California has been harder hit by the critical nursing shortage than other states due, in part, to the 1999 legislation of the nurse to patient ratio (Furillo, 2001). In 1999 California Assembly Bill 394, introduced by Assemblyperson Kuehl and signed into law by Governor Davis, enforced the regulation of minimum nurse to patient ratios in California. This landmark legislation regulates one nurse for the care of five patients in medical-surgical units, one nurse for the care of four patients on telemetry units (those units monitoring the cardiac function of patients), and one nurse for the care of four pediatric patients (Institute for Health and Socioeconomic Policy, 2001). Prior to this legislation, registered nurse staffing models included team nursing with one registered nurse and other licensed and unlicensed staff caring for 10-12 patients.

The registered nurse supply problems are complex, multifaceted, and include: program access and open enrollment in community colleges, limited nursing faculty and the broad difference in wages for faculty versus their clinical counterparts, limited clinical sites, and the recognition of nursing as a profession.

Program Access

As mentioned earlier, open access to community colleges has been regulated secondary to a lawsuit initiated by the Mexican American Legal Defense Fund, which stated that students of color were being denied access to programs in community colleges (Bissett, 1990; Wiseley, 2006). Any student who desires to become a registered nurse has the ability to complete prerequisite coursework and apply to Associate Degree Nursing Program. Open access limits the ability to ensure the academic readiness of a student. Many students are admitted to the program with very low reading, writing, math, and English skills. Many programs experience a direct correlation with low literacy skill and failure in the first semester of nursing school, resulting in low retention and program completion rates (Phillips, Spurling, & Armstrong, 2002).

Nursing Faculty Shortage

The American population and the nursing faculty workforce are ageing. The majority of nurses currently working are baby boomers and slated to retire between 2010 and 2020 (Berlin & Seachrist, 2002). A recent survey by the American Association of Colleges of Nursing (AACN) reports a 6.9% vacancy rate across the nation (The Newsletter of the American Association of Colleges of Nursing, 2010).

Impacted Clinical Sites

In an effort to increase the supply for nurses, nursing programs are desperate to increase enrollment in programs. Community College attempts to increase capacity in nursing programs across the nation is being halted due to the lack of clinical space for the increase in students (Chisari, Brown, Calkins, Echternacht, Kearney-Nunnery, Knopp, Shipps, Vogt & Blubaugh, 2005; Jones, 2009).

Nursing as a Profession

There is a transformational movement in nursing occurring today, funded by the Robert Wood Johnson Foundation (RWJF) and in partnership with the Institute of Medicine (IOM) that outlines what the future of the profession holds. “The Future Of Nursing” was a 2-year project between RWJF and the IOM that outlines nursing as a profession where nurses have autonomy and practice to the full potential of their education and experience, achieve higher education and training, work side-by-side with physicians to change the future of healthcare, and improve the collection of data and information infrastructure (Institute of Medicine, 2010). With this change, the status of nursing moves from an occupation to a profession that attracts more highly educated people. “The Future of Nursing” project changes policy, researches and implements best practices, leads boardroom discussions, and envisions what the future of nursing should be (Institute of Medicine, 2010).

National Nursing Shortage

The national nursing shortage is not new but has been a topic of discussion in healthcare, education, and political arenas since the late 1990’s. The implementation of managed care, in an effort to contain skyrocketing healthcare costs in 1990’s, began the decline in the supply of registered nurses (Buerhaus, et al., 2009). Just as the longest running nursing shortage continues, the new Healthcare Reform Bill will impact the amount of people to care for and the largest population of Americans will be retiring increasing the populous of patients in the future. The largest number of nurses will also retire, further complicating the nursing shortage (Buerhaus, et al., 2009).

Significance of Research

The significance of this research is multifaceted, including providing the most accurate selection of students who are academically ready to endure a rigorous program and to identify the student who is “at-risk” for failure. This research is important because as we enter another critical nursing shortage we must have a plan to increase the supply of nurses, a plan that is different from those tried in the past and one that benefits not only the student but also our communities.

Patient Safety and Quality Care

A nursing shortage has a great impact on the quality of care and safety of patients. Buerhaus, et al. (2009) reports that prominent leaders in the field and quality improvement organizations view the current nursing shortage more in terms of a threat to quality care and safety for patients than a serious health workforce problem. Aiken, Clarke, & Sloane (2002) found that improved nurse staffing is associated with better clinical outcomes for patients.

Academically Ready Student

Selecting the most academically ready students to enter the nursing program will not only benefit the students but also potentially increase the supply of nurses. National and international research on academic indicators for success in retention and persistence identify English, math, and reading as strong predictors of success (Phillips, Spurling, & Armstrong, 2002; Sayles, Shelton, & Powell, 2003; Sandiford & Jackson, 2003; Higgins, 2005; Hopkins, 2006; Newton, Smith, Moore, & Magnan, 2007; Johnson, Johnson, Kim, & McKee, 2008; Seago, Wong, Keane, & Grumbaugh, 2008; Stickney, 2008; Prymachuk, Easton, & Littlewood, 2009). It is also imperative that in selecting students

for academic readiness we also identify the student who is not academically ready and, according to their GPA and entrance exams, needs remediation in a variety of subjects.

Ethical Considerations

Ethically speaking, the multicriteria screening process will screen out many students who desire to become nurses but are not academically ready to begin the program. When the “at-risk” students are admitted, academic support in the form of peer tutoring, supplemental instruction and learning contracts, are strategies that have been found to be beneficial (Rath, Peterfreund, Xenos, Bayliss, & Carnal, 2007). As Bissett (1995) reminds us, the community college mission of open access is based on the egalitarian theory of justice and by implementing selective admission policies we represent barriers to educational mobility. It is our responsibility as educators to ensure that our selective admission process does not cause a disproportionate impact to underserved students.

Support of AB 1559

Elements of the Multicriteria Screening Selection Process Tool (Appendix A) are some of the independent variables used in this research. The original bill stipulates selection criteria that include college grade point averages in relevant coursework. Other criteria of the bill include work or volunteer experience in a health-related field; demonstrated foreign language skills; life experiences; and special circumstances of each applicant (Millan, 2009).

Using the cumulative GPA in English composition, college algebra, and core biology (anatomy, physiology, and microbiology) and TEAS exam scores to predict their relationship to retention, persistence, and mastery of the NCLEX exam could potentially

support the use of the Multicriteria Screening tool and provide empirical data for use in the reauthorization of AB 1559.

Purpose Statement

The purpose of this research is to examine the predictive relationship between prerequisite coursework (English composition, college algebra, anatomy, physiology, and microbiology) GPA and TEAS composite and sub scores in English, math, reading, and science and the retention, persistence, and NCLEX mastery for nursing students in Associate Degree Nursing Programs in Ventura County, California.

Research Questions

Four broad research questions will be asked.

1. How well does the student's pre-entry academic achievement predict nursing student retention, persistence, and mastery of the NCLEX?
2. How well does the nurse entrance exam (TEAS) predict retention?
3. How well does the nurse entrance exam (TEAS) predict persistence?
4. How well does the nurse entrance exam (TEAS) predict mastery of the NCLEX?

Description of Independent and Dependent Variables

The independent variables for this research include one demographic variable, ethnicity. Academic independent variables include, prerequisite coursework grade point average (pqgpa). Prerequisite courses include English composition, college algebra, and the core biology courses of anatomy, physiology, and microbiology. All students complete the TEAS 4.0 prior to entry into the nursing program. The composite score (tc)

as well as individual sub scores in English (te), math (tm), reading (tr), and science (tsc) will also be included as independent variables.

The dependent variables used for this research will be retention of students through the first semester and enrollment in the second semester, continual enrollment and persistence of students through the two-year program, and mastery of the National Council Licensure Exam on the first try.

Definition of Terms

The term retention, for the purpose of this research, will be passing (74.5% in both theory and clinical classes) the first semester of nursing school with subsequent enrollment in the second semester theory and clinical classes.

Persistence will be defined as continuous enrollment and completion of the two-year nursing program with receipt of the Associate Degree of Nursing.

National Certification Licensure Exam (NCLEX) is the exam that is taken by the student who completes a course of study recognized by the Board of Registered Nurses. Passing the NCLEX exams provides the student with licensure to practice nursing.

Each nursing applicant takes the Test of Essential Academic Skills (TEAS) exam prior to being admitted into the nursing program. The content knowledge and skills assessed are a sample of those basic essential knowledge and skills that individuals would be expected to have acquired as part of a typical secondary schooling experience (Assessment Technologies Institute, LLC).

Overview of Methodology

Quantitative methodology, defined by Creswell (2008), includes the description of trends or an explanation of the relationship among variables. Understanding the

relationship between previous academic success and success in the nursing program lends itself to a quantitative model. A correlational, prediction design is used with logistic regression as the primary analytical technique. The research setting is the Associate Degree Nursing Programs at Moorpark and Ventura Colleges and the sample includes student cohorts entering the Fall 2008 and Spring 2009 semesters. With the assistance of Institutional Researchers at both colleges, secondary data sets will be used to capture independent variable retrospective in nature. SPSS v.19 will be used to run descriptive and inferential statistics.

The limitations of this research are yet to be understood. The sample size is small and will be a limit in the ability to confidently generalize the results. The small geographical area will also be a limit as this is one community college district in one county in California.

Summary of Chapter 1

The United States is in the midst of a critical nursing shortage and the need to increase the supply of registered nurses is paramount to the safety of our population. The proposed research will examine the predictive relationship that prerequisite coursework and TEAS scores have on student retention, persistence, and mastery of the NCLEX in the hopes of increasing the supply of nurses in of our communities, state, and nation.

Organization of Dissertation

Subsequent chapters of this Dissertation will include a literature review in Chapter 2 covering the breath of knowledge that exists on the topic of retention, persistence, and academic and social influences that support students in their quest to become a nurse. A comprehensive review of social and cognitive variables will also be

included. Chapter 3 includes the methodology used in this research along with the research design, setting, and sample. Data collection and analysis will also be explored. Chapter 4 includes the analysis of the data and presentation of finding and Chapter 5 includes an in-depth discussion of the results and findings and their relationship to the larger body of literature, educational improvements and policy implication.

CHAPTER 2: LITERATURE REVIEW

Chapter 2 begins the depth and breath of the literature review that focuses on the academic needs of the student to successfully complete a nursing program and master the National Council Licensure Exam (NCLEX). It is important for the reader to understand the nursing shortage in the larger social context so they see the direct relationship between academic readiness, retention, program completion and mastery of the NCLEX in an attempt to increase the supply of the registered nurse.

The major components of Chapter 2 include a look at the factors that impact the nursing shortage today including support of the problem from a local, state, and national level. Specific information about program access and California Public Policy will be presented. A closer look at student readiness, including cognitive and noncognitive variables, which drive the research questions and support the need to conduct this research, is extensively portrayed.

Nursing Shortage

It has been reported we are entering a nursing shortage that is twice as severe as any seen since the 1960's (Buerhaus, et al., 2009). Nursing program access and capacity are two factors that have impacted the ability to balance the supply and demand of registered nurses. Program access includes the community college "open access" policy. Since the 1990's, open access in California Community Colleges was enforced secondary to a Mexican-American Legal Defense and Education Fund lawsuit (Bissett, 1995; Wiseley, 2006). Open enrollment allows any student, despite their academic ability, to enroll in nursing programs. The lack of academic readiness of many students has had a negative impact on retention, program completion, and the supply of the registered nurse.

Prerequisite grade point average (GPA) and entrance exam scores are significant factors that affect the success or failure of the student while personal attributes are less significant (Phillips, et al., 2002; Stickney, 2008; Newton & Smith, 2009). Others argue that social integration and environmental support are more influential on student success (Bean & Metzner, 1985; Tinto, 1997; Braxton, Hirschy, & McClendon, 2004).

The purpose of this research is to examine the predictive relationship between prerequisite coursework GPA in English composition, college algebra, and core biology (anatomy, physiology, and microbiology) and nurse entrance exam (Test of Essential Academic Skills-TEAS) scores, with nursing student retention, persistence in an Associate Degree of Nursing Program, and successful mastery of the National Council Licensure Exam (NCLEX). This research addresses the larger social context of the nursing shortage and the supply and demand of nurses.

Factors Impacting the Nursing Shortage

Factors that impact the supply of nurses are multifactorial. Changes in the population of people seeking nursing as a career (women in the age group of 18-40), societal preference for the nursing profession, registered nurses from other countries that come to the United States to practice, economic factors like wages in the nursing labor market, and the number of nursing programs and program capacity are just a few (Seago & Spetz, 2002; Seago & Spetz, 2003; Buerhaus, et al., 2009).

Program capacity, mentioned earlier in the introduction, has been a focus of many recent articles and books that (Benner, Sutphen, Leonard, & Day, 2010; California Nurse Education Initiative Annual Report 2009, 2010; Jones, 2009; Jones, 2010) identified community college access issues, lack of nursing faculty, impacted clinical sites, faculty

wages and nursing as a profession as barriers to increasing student enrollment. But these are not the only issues. Keeping nursing students in nursing programs to the point of successful completion and passing the National Certification Licensure Exam is one of the answers to the nursing shortage.

Program Access

Most nursing undergraduate and graduate nursing programs have merit-based admission, often reviewing previous GPA, SAT, and ACT scores to find the most academically prepared student (Campbell & Dickson, 1996; Sayles, et al., 2003). California Community College, in maintaining their commitment to their mission and open access, admit students whose prerequisite coursework GPA is 2.5 or higher. In 2002, a “cut score” formula was used to increase the selection of students in an attempt to change the increasing attrition noted by program directors and healthcare providers who were concerned about the lack of qualified registered nurses (Phillips, et al., 2002). The “cut score” is a mathematical formula that includes the student’s overall GPA, English GPA, and Core Biology GPA (anatomy, physiology, and microbiology) and any Core Biology repeats. The “cut score” was a result of The Associate Degree Nursing: Model Prerequisites Validation Study, a study conducted by the Center for Student Success (CSS) and funded by the California Chancellor’s office through a Healthcare Initiative (Phillips, et al., 2002). The Model Prerequisites Validation Study examined the relationship between over 50 variables commonly associated with student success in nursing programs. The sample included over 5000 students in 20 California Associate Degree Nursing programs from two cohorts (1994-95 and 1998-99). According to Phillips, et al. (2002), the strongest predictors of success included overall GPA, English

GPA, and Core Biology GPA (anatomy, physiology, and microbiology). A negative correlation was found with core biology repeats and student failure in the nursing program (Phillips, et al., 2002).

Nursing Faculty Shortage

Despite the projected nursing shortage, thousands of students are turned away from nursing programs each semester because of the lack of nursing faculty, (Yordy, 2006; Ganley & Sheets, 2009; Hoover, 2009; Kelly, 2010). According to Kelly (2010), “the faculty shortage is one of the factors that is accelerating the nursing shortage and an obstacle to slowing or reversing the shortage” (p. 266). The minimum requirement for a nurse to become faculty and teach in a community college is a master’s degree in nursing (Title 16, California code of Regulations, n.d.).

Berlin & Seachrist (2002) report, nationally the average age of doctoral prepared nursing faculty was 54.3 years and that between 200 and 300 were eligible for retirement each year from 2004 through 2012. They also report that 220 to 260 masters prepared nursing faculty will retire between 2012 and 2018 (Berlin & Seachrist, 2002).

Tracy & Fang (2010) report a 6.9% faculty shortage nationally and cite the top reasons for this shortage is the noncompetitive salaries compared to nurses in the clinical setting and a limited number of doctoral prepared nurses. Kelly (2010) also reports that doctoral prepared nurse practitioners earned a mean salary of \$99,070 compared to doctoral prepared nursing faculty whose mean salary is \$81,552. Kuehn (2007) reports the annual starting salary of a bachelor’s prepared nurse working in San Francisco Bay Area to be \$104,000 compared to a nursing professor with a PhD at University of California, San Francisco starting at \$60,000. Wage difference from the clinical setting to

the academic setting was cited as the main reason for the difficulty getting nurses into nursing education (Hoover, 2009 and Kelly, 2010).

Impacted Clinical Sites

The American Association of Colleges of Nursing (AACN) recently reported that insufficient clinical sites were one of the top reasons for turning away qualified students into entry-level baccalaureate programs (American Association of Colleges of Nursing, 2009). The California Board of Registered Nursing's 2009-2010 Annual School Report: Data Summary for Prelicensure Nursing Programs identifies the most reported barrier to program expansion was the lack of clinical sites (Bates, Keane, & Spetz, 2011). In California, the 2005 Nurse Education Initiative assisted the state in opening 37 new nursing programs. With the increase in programs more students need clinical hours in hospitals, impacting clinical sites. Strategies for program expansion, secondary to the lack of clinical sites, include the use of simulation, evening, weekend, and 12-hour shifts, and the use of alternative clinical sites including community-based and ambulatory care settings (Bates, Keane, & Spetz, 2011).

Clinical experience is paramount to the transfer of theory into practice. Each semester students spend approximately 120 hours in the hospital setting as a requirement of the State Board of Registered Nursing. Chisari et al. (2005), in a position paper titled "Clinical Instruction in Prelicensure Nursing Programs", reports "prelicensure nursing education programs shall include clinical experiences with actual patients; they might also include innovative teaching strategies that complement clinical experiences for entry into practice competency" (p. 1). This sets the stage for use of simulation as part of clinical practice. Most colleges have invested in high-fidelity simulators and in rural

areas there are regional simulation laboratories. Clinical simulation is one strategy to relieve the pressure of clinical impaction.

Nursing as a Profession

Nurses are “managers” of a multidisciplinary approach to patient care and safety. Borrowing from the disciplines of psychology and sociology, the registered nurse provides care and comfort to his/her patients. Florence Nightingale was known as the pioneer of nursing. She is most recognized for her nursing efforts during the Crimean War where she insisted on removing the blood and dirt soaked uniforms the soldiers wore, bleaching the linen soldiers were placed on and opening the windows to allow fresh air in. Her efforts decreased the death rate of her patients (Nightingale, 1859). In her *Notes on Nursing: What It Is and What It Is Not*, Nightingale defined nursing as having “charge of the personal health of somebody ... and what nursing has to do ... is to put the patient in the best condition for nature to act upon him” (Nightingale, 1859). Florence Nightingale is not only credited with her care of patients but also with her collection of data, analysis, and reporting of rates of illness and death. These attributes began the recognition of nursing as more than caring for the ill but also the portrayal of nursing as a true profession.

Emerson & Records (2005) state, “knowledge application in the practice of nursing is the ultimate goal of the profession” (p. 9). Nurses today choose a variety of reasons for entering the nursing profession. In a recent qualitative study by Moore, Kelly, Schmidt, Miller & Reynolds (2011), second-degree prelicensure graduate nurses were asked what attracted them to the Nursing Profession. Some of their responses included,

finding a purpose for life, the helping and caring nature of the work, and working collaboratively with others.

Historically, there has been a decline in the “interest” of nursing as a profession as more women enter the workplace and were competitive in the previously male dominated jobs. Buerhaus, et al. (2009) describes the change in age trends entering nursing and the women’s movement that expanded career options for women as two reasons for the continued shortage in nurses.

Moorpark College

Increasing student retention and persistence in the Associate Degree Nursing program at Moorpark College has been a program goal with little success for the past 5 years. Christina Woo, Retention Specialist at Moorpark College, reports 68% retention of students in the first eight weeks of the first semester nursing course (C. Woo personal communication, November 3, 2009). Although a specific percentage of retention was not available for Ventura College’s nursing program, the rate is very similar to Moorpark College (personal Communication, S. Melton, February 26, 2011). The National Benchmark for first semester retention is 80% (Phillips, et al., 2002). Seago & Spetz (2003) report retention rates in some community college programs as low as 50%, and attribute low rates primarily to the admission of minimally qualified students. According to Senators Perata and Scott, authors of Senate Bill 1309 (2006), California nursing schools and colleges will need to graduate 11,000 more nurses a year until 2011 to fill a projected shortfall but with low retention and completion rates (Senate Bill 1309, 2006), Moorpark College is challenged to increase the supply of nurses.

Entrance into the Moorpark College Nursing Program is currently open enrollment, a practice of Ventura County Community College District. The nursing program includes enrollment of 55 students who are concurrently enrolled in both theory and clinical laboratory for fall and spring semesters during the 2-year program. Carol Higashida, Program Coordinator, reports the nursing program completion rate for 2005-2009 was 68% (Carol Higashida, personal communication, November 3, 2010). As the student advances through the curriculum the material taught builds on the foundation learned in the first semester class. The course work is rigorous. Currently there are 679 students on a wait list to enter the nursing program at Moorpark College. Recently, the California state budget cuts impacted the college enrollment by decreasing enrollment in the nursing program to 33 students further prolonging the waiting period for many students and further decreasing the potential supply of nurses.

There is a high demand for enrollment in the nursing program, however, open access enables any student to enter, affecting retention rates and prohibiting academically prepared students from occupying those seats.

California's Nursing Shortage

The need for registered nurses is growing in California due to the aging population, the aging nursing workforce, and recent healthcare reform (Jones, 2009). Between 1991 and 2008, the average age of working RNs residing in California rose from 42.9 to 47.1 years and 61% are over the age of 45 (Spetz, Keane, & Herrera, 2009, p. 15 & 23).

As the new healthcare reform bill is implemented, Bates, Blash, Chapman, Dower, & O'Neil (2011) report an increase of four to six million more Californians being

covered from the Patient Protection and Affordable Care Act (ACA). With this increase, California is bracing itself for the increase by addressing the healthcare infrastructure and changes that need to take place now including the demand for registered nurses. One policy consideration is to promote and support the retention and completion of students in nursing programs, especially the historically under represented student (Bates, Blash et al, 2010).

Dolores Jones, California Institute for Nursing and Healthcare in Northern California, projects a state shortfall of 108,000 nurses by 2020 (Jones cited in Pizzi, 2009), while the California Board of Registered Nurses currently reports a registered nurse shortage of between 10,294 and 59,027 (Holden, 2010). Basu (2006), in her work for the Center for California Health Workforce Studies, projects that every region in California will face a registered nurse shortage with some of the most critical regions in the northern counties of the state. It is projected that urban areas like the Bay Area and Los Angeles will have challenges from the “shear number of nurses who will be needed to care for a growing aging population” (Basu, 2006, p. 1). According to Basu (2006), Region 6 that includes Los Angeles, Ventura, and Orange counties, is projected to have over a 15,000 registered nurse full time equivalent (FTE) shortage by 2025 and a 20,000 FTE by 2030. Whether you are looking at northern, central, or southern California, the need for registered nurses all point to the same conclusion; the aging population and aging workforce are greatly impacting the need.

The 2005 California Nurse Education Initiative established by Governor Schwarzenegger that provided funding to increase the supply of nurses has helped, but the nursing shortage in California still exists. The 90 million dollar public and private

partnership focused on these five key areas: expanding educational capacity in nursing programs, recruiting and retaining nursing faculty, forging public-private partnerships to address the shortage collaboratively, develop new avenues to nursing careers, and identifying additional funding sources to support the initiative. California reported 653 RNs employed/100,000 in 2009, one of the lowest in the country (Spetz et al., 2009). Now, more than ever before, the need to graduate nursing students is paramount to the health of California residents. California is a reflection of the rest of the nation.

National Nursing Shortage

By the year 2020, it is estimated that there will be a shortfall of more than half a million Registered Nurses in the United States (Bureau of Labor Statistics, 2010). The demand for nurses includes changes in health, size, and age composition of the population (Buerhaus, et al., 2009; California Postsecondary Education Commission; 2009-2010). By 2020, it is estimated there will be 5 million more people over the age of 65 than there were alive in 2000 (cited by HRSA; 2003 in Buerhaus, et al., 2009).

Peter Buerhaus, known for his exhaustive work looking at historical data and trends of the supply and demand of nurses over time, uses a Projection Model that considers the population, cohort, and age effects to project the need for the registered nurse. According to Buerhaus, et al. (2009), the term “population” refers to the size of the total population in the United States of a given age in a given year (p.188). The term “cohort” refers to all the individuals born in any given year and the term “cohort effects” refers to the propensity of individuals born in any given year to work as registered nurse (RN). Historically, the women’s movement changed the supply when women, expecting to go into nursing, choose other professional roles. Buerhaus, et al. (2009) also explains

that “age effects” reflect the relative propensity of RNs to work at any given age and are expected to capture the tendency of RNs to work less during their childbearing years and as they approach retirement age (p. 189). Taking this information into account, the forecast for the nursing shortage is roughly 300,000 RNs by 2020 (Kuehn, 2007; Buerhaus, 2008; Buerhaus, et al., 2009).

In addition to the need for an increase in the supply of nurses, there is a shift from the hospital to other healthcare settings. More nurses are needed in home health services and long-term care facilities. Health Resources and Services Administration (HRSA) projects a 91% growth in the need for home health nurses and a 73% increased need in long term care facilities. Other projected growth areas include 40% in hospital and nurse education settings, 23% in ambulatory care settings, 12% in occupational settings, 8% in schools and 17% in all other settings (Buerhaus, et al., 2009).

The Bureau of Labor Statistic’s 2010 report on the projections for employment for the RN, reports a 22% change in the workforce between 2008 and 2018 (Bureau of Labor Statistics, 2010). This amounts to a shortage of 581, 000 nurses (Bureau of Labor Statistics; 2010, United States Department of Labor; 2010). The numbers are alarming and will have a great impact on the quality of patient care of Americans in the near future.

Nursing programs across the nation are at program capacity. In 2005, according to National League for Nursing, 147,000 qualified students were turned away from nursing programs at diploma, associate degree, and baccalaureate degree levels (Malone, 2007). Kuehn (2007) report 42,000 students being turned away from nursing programs between 2006-2007 showing a decrease but continual problem. By 2009, the picture of enrollment

has not changed much with 40,000 qualified applicants for undergraduate and graduate programs being turned away (Kelly, 2010). The question we must ask ourselves is how can we address the high attrition rate of nursing programs, especially in light of qualified applicants being denied access?

The current recession has changed the immediate picture of the national nursing shortage. When there is a recession nurses return to work, when the recession is over the nurse's return home. Unfortunately, this has given the public a false sense that the nursing shortage is over. Olshansky (2010), in a recent Joint Statement from the Tri-Council for Nursing (consisting of the American Nurses Association, American Association of Colleges of Nursing, and the American Organization of Nurse Executives, and the National League for Nursing) reports, "the council has issued a strong caveat against decreasing the production of RNs based on unfounded data that the nursing shortage has been alleviated" (p. 255). Olshansky (2010) concludes that the need for nurses will increase over the next few years as the baby boomer generation increases in age and Healthcare Reform insures an additional 32 million people. The New Healthcare Reform Bill, signed by President Obama in March 2010, promises to provide healthcare to millions of people who have never had it before. The impact of this bill is already demonstrating the need for more nurses (Bates, Blash et al., 2011).

Current National Labor Trend

According to the 2010-2011 Edition of the United States Bureau of Labor Statistics Occupational Outlook, employment growth in nursing will increase 22% during 2008-2018. Registered nursing jobs will increase 48% in physician offices, 33% in Home Health Care, 25% in long term care facilities, 24% in employment services, and 17% in

hospitals (United States Department of Labor, 2010). Although these figures are different than HRSA projections, they confirm the need to increase the supply of the registered nurse. The change in workforce needs reflects today's advancing technology and the ability to perform many procedures in physician offices or outpatient centers. Also, as our population continues to age the need for nurses in long-term and home health care will grow (United States Department of Labor, 2010).

Community College Access

For over 40 years, Community Colleges in California have been the access point for many students in the quest of becoming a registered nurse (RN) and attaining the Associate Degree in Nursing (ADN). Historically, the community college educated students to become "technical" nurses to assist the baccalaureate registered nurse in an attempt to decrease the shortage of nurses in the hospital setting (Seago & Spetz, 2002). Since the inception of community colleges and the inclusion of the Servicemen's Readjustment Act in the 1960's, the mission of the community college has been to provide education that removes academic, financial, social, and geographic barriers to achieving a college education (Bissett, 1995).

Access to Nursing Programs

The mission of California community colleges and admission to nursing programs is to offer open access to all qualified students. Open access occurs but qualified students can stay on nursing program admission waitlists for an average of two years (Seago & Spetz, 2003). The current admission process lacks the ability to differentiate who is qualified and who is not. There is also no guarantee of success once admitted. Nursing coursework is rigorous and retention is low. It is unfortunate for the student and wasteful

of the programs scarce resources. AB 1559 will change this process and provide merit-based criterion in the admission selection process.

California Public Policy

The California State Government has made attempts at recognizing the problems inherent in the admission process, state and federal funding, and student success, by legislative action. California Assembly Bill 655 (February 1999) required community college nursing programs, as well as California State University and University of California schools, to write a report to the Governor and the Legislature recommending a plan for increasing the number of nursing graduates (Seago & Spetz, 2003). In 2000, the report was completed. AB 655 recommended a state developed plan to recruit, prepare, and retain nurses with funding for nursing programs, higher education that would increase enrollment opportunities and support progress to degree with the receipt of funding, and expand prelicensure RN nursing education (Seago & Spetz, 2003).

In January 2002, Governor Davis announced a \$60 million dollar 3-year Nursing Workforce Initiative that would provide funding for increasing program capacity, increase financial assistance to students who seek to become registered nurses, outreach campaigns to high school students, standardize prerequisites and other transfer requirements, and assist the Bureau of Registered Nurses with online applications for licensing. About the same time the University of California, San Francisco Center for Health Professions released a report titled, "Nursing in California: A Workforce in Crisis." According to Seago & Spetz (2003), the report identified several issues that negatively impact students enrolling and graduating from nursing programs including no standard core curriculum among districts, inadequate faculty resources to expand

program, no standard prerequisites, different applicant selection methods, inadequate information regarding nursing programs, and inconsistencies in attrition rates among colleges (Seago & Spetz, 2003). In October 2001, Senate Bill 644, according to Seago & Spetz (2003), required the California Postsecondary Education Commission to conduct an analysis of community college admission procedures and retention rates for the Associate Degree Nursing Programs. The study found that admission practices differ from college to college including prerequisite courses, inconsistent admission information for students and a wide disparity of required units to graduate, time to degree, and licensure. Other findings included the suggestion of a selective admission to increase program success, the negative impact of working while in school, and the use of successful colleges as “best-practice” models (Seago & Spetz, 2003). The Commission’s recommendations in response to the study were; standardization of admission policies, prioritization of admissions, development of consistent unit requirements, providing sufficient information to the public about programs, offer English as a Second Language, remedial support services and tutoring programs, and provide faculty development to improve student success (Seago & Spetz, 2003).

In June 2002, the Associate Degree Nursing: Model Prerequisites Validation Study was published. This was a Health Care Initiative Sponsored Project, remnants of funding from Assembly Bill 655 and Senate Bill 644. According to Phillips, et. al. (2002), the goal of this study was the development of a statistical selection model for the success of students in a nursing program. In the end there were four identified predictors of success including, overall GPA, English GPA, GPA in core biology (anatomy, physiology, and microbiology) and GPA for core biology repetitions, which were found

to have a negative predictive relationship. Next a cut score was calculated that identified the overall prediction of success (Phillips et al., 2002). Since 2002 the Validation Study success score has been used in ADN programs but the retention and success of students has not changed significantly.

Assembly Bill 1559, signed into law in 2007, was the culmination of previous work on student retention and gives the California community colleges the ability to use a multi-criteria screening selection process to admit students into nursing programs. The bill, coauthored by Assemblyman Tom Berryhill and Senator Jack Scott, provides a blueprint for academic and social criteria that would allow the colleges to rank students on a merit basis and take a percentage of the top ranking students into their programs. Individual colleges can determine the percent of students accepted that have been ranked, leaving the remainder of students to be placed in a pool and randomly selected for admission.

California's nursing shortage has been harder hit than other states, due in part to the 1999 implementation of AB 394, the nurse-patient ratios. As a result of the managed care movement in the 1990's and decrease in the quality of patient care, nurses lobbied for stronger regulation in the number of patients cared for by one registered nurse (Institute for Health and Socioeconomic Policy, 2001). The aging nursing workforce and a growing and ageing population, whose needs for medical attention are increasing, also impact the need for registered nurses, which currently outweighs the cumulative number of graduates in the whole state (Seago & Spetz, 2003).

Student Readiness

Student readiness, thought to be a problem of the education pipeline, has also added to the challenge. Many students coming out of high school have remedial needs. Kozman (2008) reports that only 38% of white students were proficient on the 2007 National Assessment of Educational Progress (NAEP) exam in reading, compared to 12% African-American, 14% Hispanic, and 15% low income students. The statistics for mathematics, science, and writing in these ethnicities are similar to the above data. While NAEP is a high school assessment, a large number of students entering community colleges have remedial needs in English and Math (Kozman, 2008).

Campbell & Dickson (1996), in a 10-year review using integrative review and meta-analysis, found that all GPAs (science, liberal arts, pre-nursing, nursing, and college cumulative) showed some significant correlation with graduation and NCLEX success. They also found nursing theory, clinical, and chemistry GPAs were equally significant in predicting student success. In a more recent national study using data from 513 generic Baccalaureate of Nursing Programs, Crow, Handley, Morrison, & Sheldon (2004) found that the use of an standardized entrance exam and the SAT scores of students had a positive correlation with passing the NCLEX. A longitudinal study by Phillips et al. (2002) collected nursing student data from the Chancellor's Office of the California Community College for a five-year cohort (1994-95 through 1998-99). Approximately 50 variables were tested to determine their relationship to the dependent variable of program completion. Four variables were identified as having predictive value including, overall GPA, English GPA, core biology GPA (anatomy, physiology and microbiology) and core biology repetitions which had a negative predictive relationship with student success (Phillips, et al., 2002). This study was the first that quantified the need to address

the admission process and the possibility of pre-screening applicants to admit the most qualified students to nursing programs. As reported earlier, the Associate Degree Nursing: Model Prerequisites Validation Study by Phillips, et al. allowed community colleges to determine a composite score (mathematical calculation of the aforementioned variables) in an attempt to improve completion rates of nursing programs. Much of the current research identifies preadmission screening as a recommendation to increase student success in nursing programs (Phillips, et al. 2002; Deary, Watson, & Hogston, 2003; Sandiford & Jackson, 2003; Higgins, 2005; Hopkins, 2006; Newton, Smith, Moore, & Magnan, 2007; Johnson, et al. 2008; Fowler & Norrie, 2009; Pryjmachak, et al., 2009).

Cognitive Variables

Students applying to nursing programs take between two and three years of prerequisite coursework (biology, chemistry, anatomy, physiology, and microbiology) along with general education to satisfy the requirement for the Associate of Degree in Nursing. Once the prerequisite courses are completed the student qualifies to apply to the program. Following is research that supports different cognitive attributes and their correlation with student success.

Prerequisite Coursework

Prerequisite coursework has been identified as having a strong correlation with retention (Sandiford & Jackson, 2003; Newton, Smith, Moore, & Magnan, 2007; ; Stickney, 2008), while Campbell & Dickson, 1996; Phillips et al, 2002; Higgins, 2005; Newton, Smith & Moore, 2007; Peterson, 2009; Newton & Moore, 2009 found prerequisite coursework to be correlated with student success. Conversely, Ukpabi (2008)

studied 39 graduates from North Carolina Central University to find the best predictor of NCLEX success and found no statistically significant relationship with prerequisite coursework GPA and mastery of the NCLEX.

In reviewing research both nationally and internationally, a strong indicator of success was English language proficiency (Phillips, et al., 2002; Sandiford & Jackson, 2003; Hopkins, 2006; Newton, Smith, Moore, & Magnan, 2007; Stickney, 2008). Proficiency in English language usage and overall prerequisite GPA was found to have a positive relationship with student success as reported by Phillips et al., 2002; Sandiford & Jackson, 2003; Newton & Moore, 2009; and Peterson, 2009. Reading, writing, and math scores as indicators of success were also identified by the majority of studies in current as well as older research (Phillips, et al. 2002; Sayles, et al. 2003; Higgins, 2005; Hopkins, 2006; Newton, Smith, Moore, & Magnan, 2007; Johnson, et al. 2008; Stickney, 2008). Tipton, Pulliam, Beckworth, Illich, Griffin & Tibbett (2008) found math and reading skills upon entry, as well as high GPA at completion of program to be the best predictors of success in the nursing program and mastery of NCLEX. Seldomridge & DiBartolo (2004) found a correlation between preadmission pathophysiology grade and mid-program coursework grade as predictors of success. Prerequisite science grades were found to be indicators of success by McGann & Thompson (2008).

Overall GPA

Pre-nursing overall GPA was one of the most cited variables with a relationship to success (Phillips, et al., 2002; Sandiford & Jackson, 2003; Sayles, et al. 2003; Hopkins, 2006; Newton, Smith, Moore, & Magnan, 2007; Fowler & Norrie, 2009; Peterson, 2009). One study that explored variables for predicting academic achievement in 179

undergraduate nursing students found no correlation between overall GPA and academic achievement (Blackman, Hall, & Darmawan, 2007).

Campbell & Dickson (1996) performed a meta-analysis of research on predictors of retention, program completion, and NCLEX mastery for baccalaureate degree nursing studies during 1981 through 1990 and found that prerequisite and nursing course GPA were the most predictive of student success.

The international studies that were reviewed have a curriculum that is extremely different than the United States in that child branch (pediatrics in the US) is a specialty that is taken after the general nursing courses. Pryjmachuk et al. (2009) reported that Child Branch students had a low retention rate, independent of their pre-nursing qualifications. This finding was consistent with previous research performed by the Department of Health in the United Kingdom.

Pre-Admission Entrance Exams

Most nursing programs require a pre-admission nurse entrance exam. Several articles (Sayles, et al., 2003; Hopkins, 2006; Newton, Smith, Moore, & Magnan, 2007; Johnson, et al., 2008; Stickney, 2008) referred to either the Nurse Entrance Test (NET) by Educational Resources Inc (ERI), Test of Essential Skills (TEAS) by Assessment Technologies Institute (ATI), Personal Background and Preparation Survey (PBPS), or Test of Adult Basic Education (TABE) as valid entrance exams. One might also consider the usefulness of SAT and/or ACT exam scores as an indicator of success but they are not required for entrance into California Community Colleges.

The NET measures student's academic ability, stress levels, learning style, and other nonacademic variables and generates individual student reports on seven subscales

and a composite scale, which are nationally normed annually (Hopkins, 2006). Sayles, et al. (2003) found the NET useful as a diagnostic instrument for “at risk” students as well as the NET composite score, math skills and reading comprehension as predictors of success. Hopkins, in a study investigating retention strategies for a nursing fundamentals course, found the NET exam to correlate with student success. Conversely, Tipton et al. (2008), in their research on 384 associate degree nursing graduates, found no significant relationship between NET scores and student success but found statistical significance between cumulative nursing course grades and student success. Two studies also used SAT and/or ACT scores as variables along with NET and overall GPAs found a correlation with first semester success and passing the NCLEX (Sayles, et al., 2003; Hopkins, 2006).

The Test for Adult Basic Education (TABE) is a scholastic aptitude test for vocational education and does not address non-cognitive variables like stress, learning styles, or personality traits (Stickney, 2008). TABE entrance exams, along with high overall GPAs, were found to have a relationship with increased retention (Stickney, 2008).

The TEAS Exam is a nursing pre-admission test that provides an “objective measure of the extent to which individuals would be able to demonstrate specific knowledge and basic essential skills in the four academic content areas of English and language usage, math, reading, and science” (Assessment Technologies Institute, LLC 2009, p. 5). The sub tests in English and language usage, math, reading, and science assess “functional literacy skills, basic quantitative ability, general science aptitude, and basic English and language usage rules” (Assessment Technologies Institute, LLC 2009,

p. 7). Construct validity and reliability is discussed in Chapter 3. According to Assessment Technologies Institute, LLC (2009), content experts in nursing curriculum were used to ensure the TEAS questions aligned with the entry-level skills needed by students entering nursing programs.

Research indicates TEAS and high overall GPA had a relationship to increased retention and program completion (Newton, Smith, & Moore, 2007; Newton, Smith, Moore, & Magnan, 2007; Hernandez, 2011). Wolkowitz & Kelley (2010) found the TEAS sub score in science to be the most predictive of early success with TEAS sub score in Reading as a second predictor. Both TEAS sub scores in English and math were weak predictors of success in the Wolkowitz & Kelley study. Conversely, Esper (2009) found TEAS sub score in English as a predictor of retention in the first semester for Associate Degree Nurses.

Johnson, et al. (2008), in their study to predict the validity of the Personal Background Preparation Survey (PBPS) on adverse academic status events, gave the PBPS to 375 newly admitted underrepresented minority students and non-underrepresented nursing students during two orientation periods in 2004 and 2005. The PBPS is an assessment instrument with risk categories in personal, familial, academic, self-concept, support, financial, leadership, discrimination, community service, and long-range goal areas (Johnson, et al., 2008). The results concluded that the PBPS proved to be a valid assessment tool for the identification of students at risk for attrition. PBPS assessed very early in the student's course of study who was at risk, the degree of risk, and what the risks were so prescribed interventions to avert academic failure could be instituted (Johnson, et al., 2008).

National Council Licensure Exam (NCLEX) Preparation Exams

More and more nursing programs are using a variety of exit exams to project the probability of NCLEX success. These exams are given to students in their last semester and provide the student with an overall scores as well as scores in different content areas.

For prediction of passing the NCLEX, Higgins (2005) used the Health Education Systems, Inc. (HESI) exit exam and found a significant relationship between the academic grades in Biology and the preadmission test component of science with NCLEX success. The HESI exam tests the knowledge of students who have completed the coursework in nursing and are waiting to take the NCLEX (Higgins, 2005).

The Pre-RN exam by Educational Resource Inc. (ERI), another exit exam for students who have completed their nursing program coursework, also shows a strong correlation between high scores on the exam and first attempt pass rates on the NCLEX (Sayles, et al., 2003).

A retrospective descriptive study of 186 baccalaureate nursing students by Seldomridge & DiBartolo (2004), in an attempt to understand variables that best predict NCLEX, found a positive, significant, and strong relationship between performance on the National League of Nurses (NLN) Comprehensive Achievement Test and mastery of the NCLEX. Crow et al. (2004) also found a significant relationship between standardized entrance exams, SAT scores, and NLN content exams with NCLEX mastery in Bachelor's of Science nursing students.

McGann & Thompson (2008) found the use of an "Academic Improvement Strategies" course with a heavy mentoring component to be helpful with "at-risk"

students and found significant improvement in grades through the final semester and mastery of the NCLEX.

Non-Cognitive Variables

Vincent Tinto's Interactionist Theory identifies academic and social integration of a student into the "college community" as a predictor of retention. Several articles identified non-cognitive variable such as, personal growth, study skills, coping techniques, networking, mentoring, guidance, motivation, achievement tendency, learning styles, personal and financial risks, self concept, and discrimination (Deary, et al., 2003; Sandiford & Jackson, 2003; Sayles, et al., 2003; Hopkins, 2006; Sego et al., 2008; Fowler & Norrie, 2009; O'Donnell, 2009;). Following is a closer look at non-cognitive variables.

Demographics

The common demographics for all research included in this review were age, gender and ethnicity. Some surprising results were found. Not all research that included the demographics of age, gender, and ethnicity reported a relationship either significant or insignificant with success. For the studies that reported age, gender, and ethnicity several studies found that white, older female students were more likely to be successful (Hopkins, 2006; Stickney, 2008; Prymachuk, et al., 2008). There was a significant relationship between non-white males and increased attrition (Sayles, et al., 2003; Higgins, 2005; Prymachuk, et al., 2008; Stickney, 2008). Prymachuk et al. report of non-white attrition rates differed greatly from the Department of Health report from the United Kingdom that states "black students are more likely to complete nursing school than white students" (Prymachuk, et al. p. 157). They go on to say that it may reflect

academic difficulties that are compounded by language difficulties. Of course, English language proficiency was a clear determining factor of success mentioned earlier.

Johnson, et al., (2008) suggested the use of the Personal Background Preparation Survey (PBPS) instrument with non-white students to identify risk of attrition.

Social Predictors

Social factors and the integration of them into the college experience is one of the attributes of success that Vincent Tinto suggests in his Model of Student Retention. Tinto (1993) teaches us that social and academic integration within an institution as a positive experience results in increased retention and progress toward degree. On the other hand, a negative experience with social and academic integration results in a higher likelihood of the student leaving the institution. Two studies (Phillips et al., 2002; Seago, et al., 2008) test dispositional factors in depth but their identification of these factors was somewhat different. Phillips et al. (2002) identified dispositional factors as those factors related to academics (GPA, units, courses, terms, repetitions, percentage of units passed and withdrawn, and demographics) while Seago et al. (2008) identify them as personal characteristics (academic self-assessment, social pressure, goals, and demographics). Seago, et al. (2008) also identifies situational factors including, competing obligations, transportation, family and social support, study environment, role models, and finances. Seago, et al. (2008) suggests that work and financial issues, job characteristics and work style met the criteria for construct validity, cross-loadings, and internal consistency reliability suggesting that the instrument used for their research is reliable and valid. Psychometric analysis is used to ensure that scores on psychology tests and measurements are reliable and valid (AR Media Network, 2007). The dispositional

constructs used in the 2002 Phillips, et al. research were composed mainly of academic factors and as reported earlier in this paper suggest a significant relationship to student success (Phillips, et al. 2002).

Work, finances, and achievement tendency (motivation) was reported by Sandiford & Jackson (2003) to have no significant relationship to attrition. Fowler & Norrie (2009) found the single most significant factor related to success was commitment. The interaction with the instructor, whether positive or negative, is cited as having a great impact on the student's ability to succeed. Deary et al. (2003) found that as stress and burnout increase during the program, attrition also increases. From entry into the program to the first year there is an increase in neuroticism, extraversion, emotionally oriented behavior and avoidance distraction that if not managed with positive coping could lead to burnout and voluntarily leaving the program (Deary, et al., 2003). Hopkins (2006) identified reasoning and analytic thinking as significantly related to student success. Johnson et al. (2008) suggest that, "when using the Personal Background Preparation Survey (PBPS) as a diagnostic and prescriptive instrument, two ethnically diverse groups consistently demonstrated high reliability and significant and substantial predictive validity for nursing students' first and second year adverse academic status events" (p. 612). O'Donnell's (2009) qualitative study was to identify the reasons for voluntary attrition in pre-registration nursing students. The study identified two main themes, excessive academic demands and coping problems, as the impetus for disengagement in the program. These findings were consistent with earlier research and suggest the need for educators to watch students closely for signs of disengagement like class and clinical absence.

Summary

Chapter 2 began with factors identifying the nursing shortage including program access, the shortage of nursing faculty, impacted clinical sites, and the decline in nursing as a career. The issues of open access and student readiness have been explained in the larger social context of the nursing shortage at the local, state, and national levels. Cognitive and noncognitive variables have been examined and found to have a huge impact on retention, program completion and mastery of the NCLEX

As presented in this chapter, it is vital to admit academically ready students into nursing programs to increase the supply of nurses in our country. According to the depth and breath of literature presented, the identification of prior academic achievement in a student can predict student success.

Chapter 3 will address the methodology of the research proposed with a discussion and rationale of the study design and statistical methods used. It will explain, in detail, the population and sample chosen and the data source that will be used. The chapter concludes with the limitations to the research and summary of the chapter.

CHAPTER 3: METHODOLOGY

The broad heading for Chapter 3 is Methodology. This chapter defines the research method of a quantitative approach to examine the predictive relationship between independent variables to the dependent variables using descriptive and inferential statistics. It will restate the research purpose and questions. It will also explain the research setting and the use of a secondary data set. The chapter will describe methods used for data analysis and the justification for their use.

Purpose of Research

The purpose of this research is to examine the predictive relationship between pre-entry prerequisite coursework (English composition, college algebra, anatomy, physiology, and microbiology) GPA and Test of Essential Academic Skills (TEAS) composite and sub scores in English, math, reading, and science with retention, persistence, and NCLEX mastery for nursing students in Associate Degree Nursing Programs in Ventura County, California.

Research Questions

1. How well does the student's pre-entry academic achievement predict nursing student retention, persistence, and mastery of the NCLEX?
2. How well does the nurse entrance exam (TEAS) predict retention?
3. How well does the nurse entrance exam (TEAS) predict persistence?
4. How well does the nurse entrance exam (TEAS) predict mastery of the NCLEX?

Description of Independent and Dependent Variables

The independent variables for this research include one demographic variable, ethnicity. Ethnicity is important because it can serve as a proxy for previous educational experiences and as a predictor on the outcome variable through its effect on some of the academic variables. Age and gender are not included because the majority of students fall into the same age range (under 30, with average age at 24 years) with minimal outliers and the majority of nursing students are female.

Academic independent variables include prerequisite coursework required for admission into the nursing program. Prerequisite courses include English composition, college algebra, and the core biology courses of anatomy, physiology, and microbiology. A cumulative prerequisite course grade point average will be used. All students completed the TEAS 4.0 prior to entry into the nursing program. The composite score as well as individual sub scores in English, math, reading, and science will also be included as independent variables. TEAS composite and sub scores are reported as equated means and reflect a sample of 26,649 examinees (Assessment Technologies Institute, 2009). Scores used reflect a national mean score for TEAS composite (74.62%), TEAS sub score in English (78.8%), math (63.74%), reading (86.97%), and science (67.04%).

The dependent variables in this research include student retention that will be measured as retaining students through the first semester of school with subsequent enrollment in the next semester. Peterson (2009), in a study conducted on first semester baccalaureate students in an urban northeastern university in the United States, found that 49.3% of students could not continue through the first semester. This low retention was

directly correlated with poor prior academic performance. These results correspond to the majority of research on retention both nationally and internationally and in Associate Degree and Baccalaureate nursing programs (Campbell & Dickson, 1996; Phillips, et al., 2002; Sandiford & Jackson, 2003; Pryjmachuk, et al., 2008; Stickney, 2008; Fowler & Norrie, 2009; Peterson, 2009). The second dependent variable is persistence, defined as completion of the nursing program. Mastery of the NCLEX is the third dependent variable. Retention and persistence of nursing students in nursing programs and mastery of the NCLEX exam will provide the increase in supply of nurses that will impact the nursing shortage.

Reliability and Validity of TEAS and NCLEX

An executive summary provided in the Technical Manual for the TEAS 4.0 describes evidence of reliability and validity of TEAS 4.0. Overall, the reliability estimate for the complete test was 0.92. The validity coefficients, or the correlations between the complete test and ATI's RN Fundamental and PN Fundamentals assessments, were 0.341 and 0.608, respectively (Assessment Technologies Institute, LLC, 2009, pp. 4). Psychometricians use the Spearman Brown prophecy to test reliability on full-length tests and when test lengths change (Creswell, 2008). The Spearman Brown prophecy was used to compare the reliability of the subset tests. The subset reliability scores were; English .92, Math .96, Reading .94, and Science .90 (Assessment Technologies Institute, LLC, 2009).

Using prerequisite coursework grade point averages and TEAS scores should have the capacity to predict the success or failure of student success in the nursing program. Phillips et al. (2002) found that overall GPA, English GPA, and Core biology

(Anatomy, Physiology and Microbiology) were predictive of nursing student success, while core biology repeats had a negative relationship with success. Reading, writing, and math scores as indicators of success were also identified by the majority of research in current as well as older studies (Phillips, et al. 2002; Sandiford & Jackson 2003; Sayles, et al. 2003; Higgins, 2005; Hopkins, 2006; Newton, Smith, Moore, & Magnan, 2007; Johnson, et al. 2008; Seago, et al., 2008; Stickney 2008; Pryjmachuk, et al. 2009). Newton, Smith, Moore, & Magnan (2007) found that the TEAS and high overall GPA had a relationship to increased retention and program completion.

The purpose of the National Council Licensure Exam (NCLEX) “is to determine if a candidate possesses the minimum knowledge and abilities to provide entry-level nursing care that is safe and effective” (Kenward, Woo, Gross, & Liu 2010, p. 1).

Reliability of the NCLEX, according to the National Council of State Boards of Nursing is:

Assessed via a decision consistency statistic. This statistic is used instead of a traditional reliability statistic such as Cronbach’s alpha because it captures the reliability of dichotomous pass/fail decisions rather than the reliability of continuous scores or ability estimates. The decision consistency of the NCLEX examination is psychometrically sound, normally running between .87 and .92 (Lunz & Bergstrom, 1991, p. 15).

Population and Sample

The population of this research includes the nursing students at Moorpark and Ventura colleges, situated in Ventura County, California. Ventura County lies along California’s central/southern coast. In 2010, the general population in Ventura County

was 823,318 people with 50.3% females and 49.7% males. There were 25.7% of people under the age of 18, and 11.7% over the age of 65 years (US Census Bureau, 2010). See Table 1.

Age

The average age of students in the sample is 24 years old with 83% of the student body at Moorpark College less than 30 years old and 77% of students less than 30 years old at Ventura College (Moorpark College Student Profile, 2009; Ventura College Student Profile, 2009). Both colleges have 17% of the student body between 30 and 50 years old. Ten percent of the student body at Moorpark College is older than 50 years while Ventura College has 5.9% over 50 years (Moorpark College Student Profile, 2009; Ventura College Student Profile, 2009). See Table 1.

The distribution of males and female at both colleges are very similar with 45% male and 54% females attending Moorpark College and 43.3% male and 55.8% female attending Ventura College. See Table 1.

Ventura County Ethnicity

Ventura County is culturally diverse with a growing Hispanic population. The ethnicity of Ventura County as of 2010 includes White non-Hispanic persons reporting only one race 57.6%, Hispanic 37.6%, African American/American Indian/Alaskan Native 7.2%, and Asian/Pacific Islander 13.4% (US Census Bureau, 2010). See Table 1.

A.D.N. Program Student Population Demographics

The nursing student body of Moorpark and Ventura Colleges share similarities with Ventura County, including the growing Hispanic population. The ethnic majority at Moorpark College is 53% white, 18% Hispanic, 14% Asian, Filipino, and Pacific

Islander, 1% African American, American Indian and Alaskan Native, and 14% other/unknown. The ethnic majority at Ventura College is 44% White, 29% Hispanic, 22% Asian, Filipino, and Pacific Islander, 2% African American, American Indian and Alaskan Native, and other/unknown 3%. The dominant gender is female. See Table 1.

Table 1-Population Sample

	College		
	Ventura County	Moorpark	Ventura
Age of Students			
Students less than 30 years old		83.0%	77.0%
Students between 30-50 years old		17.0%	17.0%
Students over 50 years old		10.0%	5.9%
Gender of students			
Male	49.7%	45.0%	43.2%
Female	50.3%	54.0%	55.8%
Ethnicity			
White	57.6%	53.0%	44.0%
Hispanic	37.6%	18.0%	29.0%
African American, American Indian, and Alaskan Native	7.2%	1.0%	2.0%
Asian, Filipino, and Pacific Islander	13.4%	14.0%	22.0%
Unknown/Non-respondent		14.0%	3.0%

Student Progress

The Accountability Reporting for the California Community College (ARCC) reports from 2010 will be used to shed some light on college level performance indicators and how Moorpark and Ventura colleges are doing compared to other California colleges. The ARCC report places colleges into peer groupings. Following are definitions for terms used by ARCC; Student progress and achievement: Percentage of first-time students who showed intent to complete and who achieved transfer to a four-year college, earned an AA/AS, earned a certificate, and those who achieved transfer directed or transfer

prepared status within 6 years (Scott & Perry, 2010, p. 686). Persistence rate is defined by percentage of first-time students with a minimum of six units earned in a Fall term and who returned and enrolled in the subsequent Fall term anywhere in the system (Scott & Perry, 2010, p. 686). See Table 2.

Table 2-ARCC 2010 Data for Student Progress/Achievement and Persistence

Indicator	Moorpark College Rate	Peer Group Average	Ventura College Rate	Peer Group Average
Student Progress and Achievement	66.40%	59.70%	55.70%	59.70%
Persistence Rate	77.40%	75.00%	70.00%	66.50%

Retention/Degree Rates for 2005-2009

The Moorpark College retention rate for the 5-year period from 2005-2009 was 68% (personal communication, C. Higashida, February 9, 2009), which is below the self-assigned program benchmark of 80%. The program completion rate during this same period at Moorpark College was 65% (personal communication, C. Higashida, February 9, 2009). Retention and program completion rates at Ventura College are similar to Moorpark College (personal communication, S. Melton, March 6, 2010). Mastery of NCLEX averages from 2005-2009 was 92% for Moorpark College and 91% for Ventura College (NCLEX Pass Rates, 2010).

Research Setting/Context

Moorpark and Ventura Colleges are two of the three colleges in the Ventura County Community College District (VCCCD). The VCCCD Board of Trustees, who has policy-level district responsibility to the general public, governs the District. Five district imperatives have been adopted by the Board and are administered by the Chancellor. The

five imperatives include student success, community needs, diversity, organizational dynamics and communication, and fiscal integrity.

VCCCD services the cities of Simi Valley, Moorpark, Thousand Oaks, Camarillo, Oxnard, Ventura, Santa Clara River Valley (Santa Paula, Fillmore, and Piru), Santa Barbara, and students as far as San Fernando and Los Angeles Counties. All three colleges have Distance Education programs, which opens up enrollment to students nationally and internationally.

The nursing programs at both Moorpark College and Ventura College are similar in that they are both two-year Associate Degree Nursing Programs accredited by the Board Of Registered Nurses. The National League of Nurses also accredits Moorpark College.

Admission into both nursing programs is through open access. Current waitlists (lottery) for admission into each program average 450 students. In 2007, Governor Schwarzenegger signed Assembly Bill 1559 into law allowing a multicriteria-screening process for selection of academically qualified students. All waitlisted students will be admitted to the nursing programs prior to the full implementation of the multicriteria screening process. It is estimated that full screening will be implemented in Fall 2012 (Personal Communication, C. Higashida, 10-15-2010).

Each fall and spring, Moorpark and Ventura College each accept a core of 33 students into their respective nursing programs. Currently, 33 students are accepted into the nursing program by lottery. Additional students, in cohorts of 11, are admitted each semester if grant funding is available. The Multicriteria Screening Selection Process is used to admit the most academically prepared students for the grant-funded cohorts.

Research Sample/Data Source/Data Collection

The research sample includes student cohorts admitted during the Fall 2008 and Spring 2009 semesters at Moorpark College (N=104), and Fall 2008 and Spring 2009 semesters at Ventura College (N=137) for a total sample size of 241. Both colleges used a lottery system for selection into their program, using only a cumulative GPA of 2.5 as admission requirement. The average length on the waitlist for these students was 2.5 years after completing all prerequisite coursework and applying to the program.

Sample Demographics Characteristics

As previously mentioned, the average age of subjects is 24-years-old but the age range is 21 to 60-years. The majority of subjects are females. Ethnicity of the subject population is similar to each college's student body ethnicity, where Moorpark College has white as a majority and Ventura College has non-white as a majority. For the purpose of this research, the ethnicity "non-white" includes African-American, Asian-Filipino, Pacific Islander, Hispanic, Native American, other and unknown.

Sample Academic Characteristics

Students from both Moorpark and Ventura Colleges are required to complete English composition, college algebra, anatomy, physiology, and microbiology as prerequisite courses prior to applying to the Nursing Program. Admitted nursing students were required to complete the Test of Essential Academic Skills 4.0 (TEAS), a 170-item assessment that measures academic preparedness in the areas of English and Language usage, math, reading, and science (Assessment Technologies Institute, LLC, 2009). The national mean scores for each TEAS sub score are as follows: English 78.80%, Mathematics 63.74%, Reading 86.97%, and Science 67.04%. The composite score was

74.62%. Data collected at Moorpark College over the past 5 years shows a direct correlation between high TEAS scores and retention in the first eight weeks of the first semester (C. Woo, personal communication, November 3, 2010).

Data Source

A secondary data set of academic information that is collected upon admission into the program and updated each semester until the student has graduated and been employed in his/her first nursing position, will be the data source for this research. The Nursing Program admission process for each student includes completion of an application including demographic data elements (name, address, phone number, email address, gender, and ethnicity).

Along with demographic data, the application process also includes academic screening by a college counselor to ensure the student has the appropriate prerequisite coursework (English composition, college algebra, anatomy, physiology, and microbiology). Often, the counselor must review transcripts from other educational institutions to ensure correct articulation of these courses. This step will be very important to ensure all data is accurate. All students accepted into the Nursing Programs completed the TEAS 4.0 exam.

Once the application process is complete, demographic and academic data as well as TEAS scores (composite, English, math, reading, and science) are entered into an Access database at Moorpark College and kept in paper files at Ventura College. From this database at Moorpark College many reports can be queried for different purposes. Academic data (English composition, college algebra, anatomy, physiology, microbiology, and TEAS scores) will be collected from these sources as well as the

college Banner system (software management for the student record system including grades and transcripts) at both Moorpark and Ventura College.

Procedure

Ventura College is located in Ventura, California. The files used for the secondary data set are housed as “paper” files in the nursing department at Ventura College.

Moorpark College is located in Moorpark, California. The nursing department houses their files in an Access database. The researcher will travel between colleges to obtain data for all students who entered the nursing program at Ventura and Moorpark College during the Fall 2008 and Spring 2009 semesters. A representative from each college will collect all data, change the unique student identifier to a file number and present it to the researcher. Assigning random file numbers to each printed data sheet will protect student identification. There will be no direct contact with students. All files will remain in a locked file cabinet during the research period and destroyed by the researcher when the research is complete.

Research Design

Quantitative methodology, according to Creswell (2008), includes asking specific, narrow questions, collecting and analyzing information in the form of numbers that measure distinct attributes of individuals or organizations as well as comparing groups or relating factors about individuals or groups in experiments, correlations studies, or surveys. Understanding the relationship between previous academic success and success in the nursing program lends itself to a quantitative model.

A correlational, predictive design is used to measure the degree of relationship between variables and to understand if two variables are related or if one variable can

predict an outcome (Creswell, 2008). In contrast to an experiment, where the research manipulates a variable, a correlational design does not manipulate any variables but only measures them and looks for a relationship between and amongst them (Creswell, 2008). The question of prediction and whether prerequisite coursework and entrance exam score can predict the success of students in a nursing program is the focus of this research. Predictor variables include prerequisite coursework (English, math, anatomy, physiology, and microbiology), and TEAS scores. The criterion variables for this research include, retention, persistence, and mastery of the NCLEX.

Multiple regression is a statistical analysis used to study the relationship between a single dependent variable and one or more independent variables (Creswell, 2008; Salkind, 2010; Allison, 1999). In this predictive research, multiple regression will examine multiple independent variables (e.g. prerequisite GPA and TEAS scores) against one of the criterion variables (e. g. retention).

To further examine the relationship between academic variables and student retention, persistence, and mastery of the NCLEX, logistic regression will be used as the primary analytical technique. Logistic regression, according to Peng, Lee & Ingersoll (2002), is a statistical method that uses the natural logarithm of an odds ratio. Logistic regression is an appropriate statistical method to use for “describing and testing hypotheses about a relationship between a categorical outcome variable and one or more categorical or continuous predictor variables” (Peng, et al., 2002, p. 4). The three dependent variables, retention, persistence, and NCLEX mastery are dichotomous variables, where “yes” was coded as 1 and “no” was coded as 0.

Data Analysis

Data analysis for this quantitative, correlational predictive design will use SPSS v. 19, including descriptive and inferential statistics. Univariate descriptive statistics, for measure of central tendency and variability including the mean and standard deviation, will be used to describe the characteristics and understand the distribution of variables (Salkind, 2010). Bivariate descriptive statistics used in this research will be cross tabulations, which according to Wagner (2010), allows the researcher to explore the relationship between variables by examining the intersections of categories of each of the variables involved (p. 63).

Bivariate correlation will be used to understand if variables influence each other. Multicollinearity, described by Allison (1999), occurs when two independent variables are so closely related that you cannot interpret the unique effect that both variables may have on the dependent variable. A correlation matrix will be run to check for multicollinearity. If there are independent variables identified, the researcher will determine which independent variable to exclude using the tolerance at <1.0 and variance inflation factor above 2.5.

Inferential statistics will be used to deduce a prediction about our sample group of nursing students (cohorts of Fall 2008 and Spring 2009) that can be generalized to all nursing students in Associate Degree Nursing Programs in California.

This research will include running three logistical regressions. The first regression will include the independent variables (predictor variables in a relational way) ethnicity, prerequisite GPA (English composition, college algebra, anatomy, physiology, microbiology), TEAS composite, and TEAS sub scores on English, math, reading, and

science on the dependent or outcome variable, retention. The second regression will include all independent variables of the first regression on the dependent or outcome variable, persistence. The third regression will include all independent variables on the last dependent or outcome variable, mastery of the NCLEX.

First regression formula: $Y(\text{ret}) = \alpha + \text{ethn} + \text{pqgpa} + \text{tc} + \text{te} + \text{tm} + \text{tr} + \text{tsc}$.

Second Regression formula: $Y(\text{per}) = \alpha + \text{ethn} + \text{pqgpa} + \text{tc} + \text{te} + \text{tm} + \text{tr} + \text{tsc}$.

Third regression formula: $Y(\text{nclex}) = \alpha + \text{ethn} + \text{pqgpa} + \text{tc} + \text{te} + \text{tm} + \text{tr} + \text{tsc}$.

Statistical Package for the Social Sciences (SPSS)

Data analysis will be performed using SPSS, version 19.0 software. Model stability for linear regression, according to Hilton, Brownlow, McMurray & Cozens (2004), will be analyzed using R squared (amount of variance in the dependent variable that can be explained by the independent variable), ANOVA (significance of regression model), and bivariate correlation (checking for multicollinearity).

To understand the mode, median, and mean of a variable, central measures of tendency will be examined by running frequencies on all variables. Cross tabulations will be run to understand the association between variables. Bivariate correlations, as explained earlier, will be used to understand if variable influence each other.

Logistic regression will be used to examine the predictive relationship of the independent variables (ethnicity, prerequisite GPA, and TEAS scores) and their relationship with the dependent variables of retention, persistence, and mastery of the NCLEX.

Data Codes/Values

A data code table was created for all variables, Table 3. Nominal and ordinal variables were scored using a value of “1” for the value with the most attributes and a score of “0” for the value with less attributes. Prerequisite coursework grade point averages for English, math, anatomy, physiology, and microbiology were originally coded as a range from 1.0 through 4.0 but later recoded as 1=3.0-4.0 and 0=0=2.99 for cross tabulations purposes. TEAS Composite and sub scores were also recoded with a range of scores from their original coding but then recoded into two categories for cross tabulations, see table 3. Ethnicity was also recoded from 8 different categories to 1=non-white and 0=white. The decision to recode ethnicity was a result of the decision to aggregate data and the fact that the two majority ethnicities were white and Hispanic with Asian, Filipino, Pacific Islanders, African American, Native American, other, and unknown as small percentages. Moorpark college nursing student ethnicity was White 53%, Hispanic 18%, Asian, Filipino, and Pacific Islander 14%, African American and Native American 1%, and other/unknown 14%. Ventura College nursing student ethnicity was White 44%, Hispanic 29%, Asian, Filipino, and Pacific Islander 22%, African American and Native American 2%, and other/unknown 3%.

Table 3-Descriptions of Variables

Variable	Description	Codes/values
id	Student identification file number	1-241
college	Nursing Program attended by student during Fall 2008 or Spring 2009	1=Moorpark College 2=Ventura College
ret	Retention Successful completion of first semester of the nursing program	1=Yes 0=No
ethn	Ethnicity Four dummy variables indicating race of	1=AA 2=Asian/Filipino/Pac Islander

	student (White, Asian American, African American, and Latino). Note: the variable Latino includes Mexican American, Puerto Rican, and other Latinos. The variable Asian American includes Japanese, Chinese, Vietnamese, and Filipino.	3=Hispanic 4=Native American 5=White 6=Other 7=Unknown
Ethn_rev	Recoded Ethnicity into dichotomous variables indicating race of student (African-American, Asian/Filipino/Pacific Islander, Hispanic, Native American, other/unknown, and White).	1=non-white 0=White
per	Persistence Successful completion of the 4 semester nursing program	1=Yes 0=No
nclex	NCLEX Mastery Successful mastery of the NCLEX exam	1=Pass 0=Fail
pqgpa	Prerequisite coursework GPA Averaged GPA from College Algebra, English Composition, Anatomy, Physiology, and Microbiology	1.0-4.0
Pqgpa4	Recoded prerequisite coursework GPA	1= 3.0-4.0 0= 0.0-2.99
tc	Composite Score Percent Based on the 6/22/09 National Mean scores and based on previously determined parameters Equated Mean 74.62% Standard Deviation 10.86	Composite score of student 74.62-100.0
tc3	Recoded TEAS Composite score	1= 74.62-100.0 0= 0.0-74.61
te	English Subscale Score Based on the 6/22/09 National Mean scores and based on previously determined parameters. Equated Mean 78.80% Standard Deviation 10.57	Student's subscale score 78.8-100.0
te3	Recoded TEAS English	1= 78.8-100.0 0= 0.0-78.7
tm	Math Subscale Score Based on the 6/22/09 National Mean	Student's subscale score 63.74-100.0

	scores and based on previously determined parameters. Equated Mean 63.74% Standard Deviation 17.53	
tm3	Recoded TEAS math	1= 63.74-100.0 0= 0.0-63.73
tr	Reading Subscale Score Based on the 6/22/09 National Mean scores and based on previously determined parameters. Equated Mean 86.97% Standard Deviation 10.74	Student's subscale score 86.97-100.0
tr3	Recoded TEAS reading	1= 86.97-100.0 0= 0.0-86.96
tsc	Science Subscale Score Based on the 6/22/09 National Mean scores and based on previously determined parameters. Equated Mean 67.04% Standard Deviation 13.89	Student's subscale score 67.04-100.0
tsc3	Recoded TEAS science	1= 67.04-100.0 0= 0.0=67.03

Limitations to the Research

Although this is a study using nursing programs at two different colleges in one district, the sample is small and may impede statistical significance, which would be a limitation of the research, Salkind (2010) refers to this as effect size. The college district is in one county of California and therefore identified as another limitation for the purpose of generalizing.

A secondary data set will be used solely for this research. Limitations can be associated with using a secondary data set including representativeness of the samples analyzed, and the correct assessment of population variances that form the basis for the identification of statistical effects and hypothesis testing (Thomas & Heck, 2001). The sample frame is very specific to include a cohort of nursing students entering the nursing

programs during the same semesters in the same year but at two different schools. Independent variables collected are the same for all students.

Summary

This research will examine the predictability of prerequisite academic achievement on student success defined as retention, persistence and mastery of the NCLEX for students entering an Associate Degree Nursing Program. The research addresses the larger social context of the national nursing shortage and increasing the supply of the registered nurse. The population for this research includes students at the community college level with the sample, more specifically, including 4 cohorts entering the nursing programs at Ventura and Moorpark Colleges in Fall 2008 and Spring 2009.

The research method includes a quantitative, correlational design using descriptive and inferential statistics. SPSS v. 19 will be used for data analysis. The proposed limitations to this research include the sample size and the fact that only two community colleges are being used among 110 community colleges in California, as well as using a secondary data source. Chapter four will present the research findings.

CHAPTER 4: RESULTS AND FINDINGS

Chapter 4 presents the findings of this quantitative research on the predictive relationship of prerequisite coursework grade point average and entrance exam results on retention, persistence, and mastery of the National Council Licensure Exam.

Presentation of Data

The purpose of this study was to examine the prediction of retention, persistence, and mastery of the National Council Licensure Exam (NCLEX) using prerequisite coursework grade point averages (English, Math, anatomy, physiology, and microbiology) and the Test of Essential Academic Skills (TEAS) composite score and sub scores in English, math, reading, and science.

Chapter 4 will present the findings of this quantitative research using a secondary data set of demographic and academic information from the Fall 2008 and Spring 2009 cohorts at two California Community College Associate Degree Nursing Programs.

Data Collection

Data collection occurred at both colleges using computerized record keeping and paper files. The total number of students was 241, 104 from Moorpark College and 137 from Ventura College. Data was collected using Microsoft Excel and data was analyzed using SPSS v. 19. Descriptive statistics were used to summarize the data set and inferential statistics, including correlation and logistic regression, were used to understand the relationship between variables and to answer the research questions. Challenges to data collection included the inability to obtain complete data. If students took prerequisite coursework from other colleges but the transcripts were not in the student file or entered into the database, data elements were lost.

Missing data included 11 prerequisite grade point averages (four from Moorpark College consisting of four English composition, college algebra, anatomy, physiology, and microbiology grades and seven from Ventura College consisting of four English composition grades and three college algebra grades). There were four incomplete TEAS scores from Moorpark College, and nine incomplete NCLEX results (two from Moorpark College and seven from Ventura College). Missing NCLEX data may have been because the student had not taken the NCLEX at the time of data collection. With a sample size of 241 subjects, 4.6% were missing prerequisite data, 1.7% were missing TEAS data, and 3.7% were missing NCLEX data. Creswell (2008) suggests 30 participants for a correlational study that relates variables. Missing data from this sample does not decrease the statistical significance of this study, nor does it cause limitations to the findings.

Descriptive Statistics

Two community colleges, in a multi-college district, were used in the sample with cohorts of students from Fall 2008 and Spring 2009. The total sample size, as reported earlier, was 241. For the purpose of presenting data, univariate and bivariate descriptive statistics will be used. Table 4 captures the central tendency and standard deviation associated with the dependent variables of first semester retention (ret), completion of the two-year nursing program (per), and mastery of the National Council Licensure Exam (nclex) and the independent variables including ethnicity (non-white students), prerequisite grade point average, and the individual sub scores from the Test of Essential Academic Skills (TEAS) for English (te), math (tm), reading (tr), and science (tsc). Ethnicity reflects the non-white population, Pqgpa reflects the grade point average of

students from 1.0-4.0. Mean scores for sub scores of the TEAS English, math, reading, and science reflect mean scores from the national average scores detailed in Chapter 3.

Table 4-Central Tendencies of Dependent and Independent Variables

	<i>n=241</i>	<i>Mean</i>	<i>Standard Deviation</i>
Dependent Variables			
Retention	180	.7469	.4357
Persistence	150	.6224	.48579
Mastery of NCLEX	137	.5905	.4928
Independent Variables			
Ethnicity (non-white)	241	.5270	.50031
Prerequisite GPA	230	3.0487	.53789
TEAS sub score, English	237	81.19	7.752
TEAS sub score, math	237	65.98	15.730
TEAS sub score, reading	237	88.73	9.920
TEAS sub score, science	237	71.37	11.024

Table 5 is a frequency table for the dependent variables of first semester retention (retention), program completion (persistence), and mastery of the National Council Licensure Exam (Mastery of NCLEX). Dependent variable mean scores reflect students retained in the first semester, completed the two-year program, and mastery of NCLEX.

Frequency, according to Creswell (2008), represents the raw number for each category with the valid percent representing actual percentages including missing values of the total number of students who were either retained or not retained in the first semester, completers or non-completers of the nursing program, and students who either mastered or did not master the NCLEX. The retention of 74.7% of students in the first semester is lower than the self-assigned college program benchmark of 80% for Moorpark College and Ventura College. Retention after the first semester and through program completion is 62.2%, also below both college's program benchmark of 80%. Research shows the largest drop in retention is during the first semester with retention

stabilizing in subsequent semesters (Sandiford & Jackson, 2003; Peterson, 2005; Pryjmachuk, et al., 2008). Of the students who complete the program, mastery of the NCLEX for the sample was 91%.

Table 5-Dependent Variable Frequencies

	Frequency	Valid Percent
Retention		
1st semester, not retained	61	25.3
1st semester retained	180	74.7
Case Total	241	100.0
Persistence		
Students who did not complete the program	30	17.0
Students who completed the program	150	83.0
Total	180	100.0
Mastery of NCLEX		
Monastery	13	8.7
Mastery	137	91.3
Total	150	100.0

Cross Tabulations

Cross tabulations are a descriptive statistic that examines how variables interact with each other. Cross tabulations were explored using the dependent variables of retention, persistence, and mastery of NCLEX to look at the distribution among the recoded independent variables of ethnicity (ethn_rev), prerequisite grade point average (pqgpa4), TEAS composite (tc3) and individual TEAS sub scores including TEAS English (te3), TEAS math (tm3), TEAS Reading (tr3), and TEAS science (tsc3). ATI computed a total equated mean percent correct and standard deviation score from a sample of 26,649 prior examinees to determine total (composite) and sub scores in reading, math, science, and English (Assessment Technologies Institute, 2009).

Retention

Table 6 depicts the findings for the dependent variable retention (successful completion of the first semester and enrollment in the second semester) and the independent variables (ethnicity, prerequisite GPA, TEAS composite and TEAS sub scores in English, math, reading, and science). For the independent variable ethnicity, 82.5% of white students were retained during the first semester compared to 67.7% nonwhite students. Prerequisite GPA showed little difference between students with a GPA above 3.0 (76.6%) and students who's GPA was below 3.0 (73.1%). TEAS composite scores for students who scored at or above the national mean of 74.62% was 81.8% compared to 61.8% of students who scored below 74.62%. The individual TEAS English shows 81.3% of students being retained with scores at or above the national mean of 78.8% compared to 61.0% of students who scored below 78.8%. TEAS math included 83.2% of students being retained with scores at or above the national mean of 63.74%, compared to 63.2% of students with scores below 63.74%. The TEAS reading scores also show that 80.4% of students who score at or above the national mean of 86.97% are retained, compared to 59.4% of students who score below 86.97%. Finally, 80.9% of students scoring at or above the national mean of 67.04% on TEAS science are retained, compared to 62.4% who score below 67.04%.

Persistence

Persistence, defined as completion of the two-year nursing program, was also explored using the same recoded independent variables of ethnicity, prerequisite GPA, TEAS composite score and individual sub scores in English, math, reading, and science. Table 6 depicts the findings of this cross tabulation.

For the independent variable ethnicity, 69.3% of white students persisted compared to 55.9% of nonwhite students. Sixty-six percent of students with a prerequisite GPA above 3.0 persisted compared to 58.1% whose prerequisite GPA was below 3.0. The rate of persistence for students who had a TEAS composite score at or above the national mean of 74.62% was 70.9%, compared to 48.3% whose score was below 74.62%. For students with the individual TEAS English at or above the national mean of 78.8%, 67.1% persisted compared to 53.7% with a score below 78.8%. TEAS math shows 71.8% persist with a score at or above the national mean of 63.74%, compared to 50.9% with a score below. Sixty-seven percent of students who score at or above the national mean of 86.97% in TEAS reading persist, compared to 50.7% who score below. Persistence is higher, 70.4%, for students who score at or above the national mean of 67.04% in TEAS science, compared to 48.2% of students that score below.

MASTERY OF NCLEX

The last cross tabulation includes the dependent variable mastery of the NCLEX and recoded independent variables ethnicity, prerequisite GPA, TEAS composite score, and TEAS sub scores in English, math, reading, and science. Table 6 includes the findings.

White students continues to have a higher rate of success in comparison to non-white students. Sixty-eight percent of white students master the NCLEX compared to 50.8% of nonwhite students. Sixty-six percent of students with a prerequisite GPA above 3.0 master the NCLEX compared to 50.6% of students with a GPA below 3.0. For the TEAS composite score, 70.6% of students who score at or above the national mean of 74.62% master the NCLEX compared to 40% who score below. Sixty-six percent of

students who score at or above the national mean of 78.8% on TEAS English master the NCLEX compared to 46.8% of students who score below 78.8%. The rate of students mastering the NCLEX who have a TEAS math score at or above the national mean of 63.74% is 70.4% compared to 45.6% who score below 63.74%. The rate of students who master the NCLEX with a TEAS reading score at or above the national mean of 86.97% is 65.4% compared to 43.9% of students scoring below 63.74%. And finally, 69.2% of students scoring at or above the national mean of 67.04% on the TEAS science master the NCLEX compared to 41.5% of students who score below.

Table 6-Cross Tabulations

	Retained		Persisted		Mastery of NCLEX	
	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>
Ethnicity						
White	82.5	95	69.3	79	65.7	76
Non-white	67.6	86	55.9	71	50.8	61
Prerequisite GPA						
Above 3.0	76.7	105	65.7	90	65.7	88
Below 3.0	73.1	68	58.1	54	50.6	45
TEAS composite score						
Above 74.62%	81.8	121	70.9	105	70.6	101
Below 74.62%	61.8	55	48.3	43	40.0	34
TEAS English sub score						
Above 78.8%	81.3	126	67.1	104	65.8	98
Below 78.8%	61.0	50	53.7	44	46.8	37
TEAS Math sub score						
Above 63.74%	83.2	109	71.8	94	70.4	88
Below 63.74%	63.2	67	50.9	54	45.6	47
TEAS Reading sub score						
Above 86.97%	80.4	135	67.3	113	65.4	106
Below 86.97%	59.4	41	50.7	35	43.9	29
TEAS Science sub score						
Above 67.04%	80.9	123	70.4	107	69.2	101
Below 67.04%	62.4	53	48.2	41	41.5	34

Summary of Cross Tabulations

Following is a summary of the cross tabulation results between the independent

and dependent variables, highlighting those relationships with notable gaps. While examining the relationship of the dependent variables and the independent variables presented in these cross tabulations the data points to gaps, following is a summary of those gaps. Ethnicity, more specifically the non-white student compared to the white student, shows a wide gap in retention, persistence, and mastery of the NCLEX. Fifteen percentage points exist between the white and nonwhite student for retention, the gap narrows a small amount (13.4% points) for persistence but then widens again for mastery of the NCLEX (17% points). The gap for students with a GPA above 3.0 compared to those with a GPA below 3.0 and retention is small (3.5% points) but widens for persistence (7.6% points) and widens even more with mastery of the NCLEX at 15% points.

When reviewing the difference in TEAS composite scores for students attaining the national mean and those that do not, there is a wide gap (20% points) for retention and a wider gap (22.6% points) for persistence and a progressively wide gap for mastery of the NCLEX (30.6% points). TEAS English and TEAS reading show a wide gap (TEAS English 20% points, TEAS reading 21% points) for retention, a narrower gap (TEAS English 14% points, TEAS reading 17% points) for persistence and a widening gap (TEAS English 19% points, TEAS reading 22% points) for mastery of the NCLEX for students who score at or above the national mean compared to those that score below the national mean. TEAS math and TEAS science show a wide gap that widens as the student progresses and the higher the score for each exam, the more likelihood of retention, persistence, and mastery of the NCLEX.

Bivariate Correlation

Correlation analyses examined the relationship between all of the independent variables (ethnicity, prerequisite GPA, TEAS composite score, and TEAS sub scores in English, math, reading, and science) as well as the correlation between each of the independent variables and each of the three dependent variables (retention, persistence, and mastery of NCLEX). The independent variable TEAS Composite (tc) was highly correlated with the sub scores of the TEAS English, math, reading, and science. After confirming this finding with a multicollinearity diagnostic showing a tolerance level for TEAS composite (tc) of (0.43) and variance inflation factor of (23.032), TEAS composite score as an independent variable was excluded. Typically a tolerance level below 1.0 and a variance inflation factor above 2.50 suggests the presence of multicollinearity, which can affect the results of regression analysis (Allison, 1999). Next, a second bivariate correlation was executed excluding tc. The results of this correlation did not show any further multicollinearity between independent variables. Although the TEAS composite score was used in the cross tabulation analysis, after the discovery of multicollinearity, it was excluded from any other statistical analysis. Table 7 is the final correlation table, excluding TEAS Composite (tc) and including all other variables.

Table 7-Bivariate Correlation Matrix

	Retention	Persistence	Mastery of NCLEX
Non-white ethnicity	-.169**	-.138*	-.173**
Prerequisite GPA	.078	.114	.177**
TEAS English	.254**	.200**	.265**
TEAS math	.141*	.142*	.198**
TEAS reading	.139*	.138*	.167*
TEAS science	.221*	.222*	.259**

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

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

Results

When reviewing the correlation matrix above, the findings show a negative correlation with nonwhite students and all three dependent variables. The correlation between ethnicity and retention and mastery of the NCLEX was statistically significant at the $p=0.01$ level. The strength of the relationship (-.169 with retention and -.173 with mastery of the NCLEX respectively) however, is very weak. At the $p=0.05$ level of significance, a very weak relationship (-.138) was found between persistence and ethnicity. As reported earlier in the cross tabulation tables, the rate of retention, persistence, and mastery of NCLEX is lower for the nonwhite student.

The correlation between prerequisite grade point average (pqgpa), and retention and persistence was positive but very weak. A slightly stronger positive relationship (.177) was found between prerequisite GPA and mastery of the NCLEX.

TEAS sub score in English (te) is statistically significant at $p=0.01$ level with all dependent variables. The strength of the relationship for retention (.254), persistence (.200), and mastery of NCLEX (.254) is weak but still among the strongest compared to all other variables. TEAS sub score in math (tm) has a very weak relationship with all dependent variables (retention .141, persistence .142, and mastery of NCLEX .198), however was significant at the $p=0.05$ level with retention and persistence, and statistically significant at the $p=0.01$ level with mastery of the NCLEX. TEAS sub score in reading (tr) was significant at the $p=0.05$ level with all dependent variables, although the strength of the relationship is very weak for retention (.139), persistence (.138), and mastery of NCLEX (.167). TEAS sub score in science (tsc) is significant at the $p=0.05$ level with retention. The strength of the relationship is weak (.221). For persistence and

mastery of the NCLEX, TEAS science is statistically significant at the $p=0.01$ level, however the strength of the relationship is also weak (persistence .222, mastery of NCLEX .259).

It is important to note that while some relationships are weak and some are stronger, they represent a bivariate analysis between two variables and do not account for additional factors that may explain why some students are retained and persist in nursing school, and master the NCLEX. The following section on inferential statistics, more specifically logistic regression, will examine the predictive relationship of all independent variables on the dependent variables.

Inferential Statistics

Inferential statistics, according to Salkind (2010) are used to draw conclusions from a sample to a larger population. They are also used to understand if a difference between two variables or groups occurs by chance or not. In this study, logistic regressions will be used to examine the predictability of the independent variables on the dependent variables of retention, persistence, and mastery of the NCLEX.

Logistic Regression

Logistic regression is a statistical model using the natural logarithm of an odds ratio to “describe and test hypothesis about relationships between a categorical outcome variable and one or more categorical or continuous predictor variables” (Peng, et al., 2002, p. 4). In this study it was used to determine the predictability of the independent variables on the dependent variables of retention, persistence, and mastery of the NCLEX.

Retention

Retention, for the purpose of this study, was defined as completion of the first semester of the nursing program and enrollment in the second semester. Independent variables used to predict retention include ethnicity (ethn_rev), prerequisite grade point average (pqgpa), and TEAS sub scores for English (te), math (tm), reading (tr), and science (tsc).

As mentioned earlier in this study, students entering the nursing program are required to take English composition, college algebra, anatomy, physiology and microbiology. The grade point average of each of these prerequisite courses was averaged together for the Prerequisite grade point average (pqgpa). Students also take the Test of Essential Academic (TEAS) exam prior to entering the program. The TEAS examines four areas including English, math, reading, and science.

Research Questions One and Two

To gain an understanding of the predictability of pre-entry academic achievement and the TEAS exam on success of students entering the associate degree nursing program, the research questions one and two asks, “How well does the student’s pre-entry academic achievement and TEAS sub scores predict nursing student retention?”

Model Summary

Measuring the usefulness of the model is important to investigate how close values predicted by the model are to the observed values (Bewick, Cheek, & Ball, 2005). The Cox & Snell and Nagelkerke R square indices are descriptive measures of goodness of fit. The Nagelkerke R Squared statistic is an adjusted Cox & Snell R square indices, and covers the full range from 0 to 1 (Bewick, et al., 2005). The model, as a whole,

explained between 7% (Cox & Snell R Squared) and 11% (Nagelkerke R Squared) of the variability of this data and includes three relationships at the .10 significance level.

Logistic Regression results

The findings of the logistic regression for retention can be found in Table 8. Six independent variables including ethnicity (ethn_rev), prerequisite grade point average (pqgpa) consisting of English, math, anatomy, physiology, and microbiology and TEAS sub scores in English (te), math (tm), reading (tr), and science (tsc) were used to predict retention.

Of the six independent variables, TEAS English (te) was significant for prediction at the $p=0.05$ level of confidence. This predictive relationship suggests that for students entering the nursing program, a one-unit increase in their TEAS English score would increase their odds of retention by 5%. At the confidence level of 0.10, two independent variables, TEAS science (tsc) and non-white students (ethn_rev), showed some significance. TEAS sub score in science (tsc) shows significance at .060. With a one-unit increase on the TEAS sub score in science, the probability of retention would increase by 3.4%. This finding supports the reasoning that to comprehend science it is necessary to have a solid understanding of English.

With a significance level of .096, ethnicity shows a negative predictive relationship with retention. Entering the nursing program as a non-white student has a negative impact on the prediction of success. This finding suggests that if you are a non-white student, your chances of retention in the first semester are reduced by 43%. This finding was not surprising since Students of Color historically tend to have lower retention rates. The other independent variables, prerequisite grade point average and

TEAS sub scores in math and reading, had no significance in predicting retention.

Table 8-Retention Regression

		Variables in the Equation			
		B	Wald	Sig.	Exp(B)
Step 1 ^a	ethn_rev	-.566	2.768	.096	.568
	pqgpa	-.204	.362	.547	.816
	te	.048	3.873	.049	1.049
	tm	-.001	.004	.949	.999
	tr	.000	.000	.985	1.000
	tsc	.034	3.530	.060	1.034
	Constant	-4.118	4.035	.045	.016

Step 1a Variable(s) entered on step 1: ethn_rev, pqgpa, te, tm, tr, tsc.

Persistence

Persistence, for the purpose of this study, is defined as completion of the two-year Associate Degree Nursing Program. Retention in the program is lowest in the first semester (75%) according to descriptive statistics presented earlier in this chapter, however only 62.2% of students persistent and complete the program. The persistence rate is lower than the self-assigned program goal of 80%. Investigating the variables that predict persistence will allow the researcher to better understand the needs of students who have been successful in the first semester but cannot finish the program.

Research Questions One and Three

To gain an understanding of the predictability of pre-entry academic achievement and the TEAS exam on the completion of the nursing program, research questions one and three asks, “How well does the student’s pre-entry academic achievement and TEAS sub scores predict nursing student persistence?”

Model Summary

Goodness of fit for the second regression equation indicates that between 6% (Cox & Snell R Squared) and 8% (Nagelkerke R Squared) of the model explains variability of the data with one relationship significant at the 0.10 level.

Logistic Regression Results

Results of the persistence regression can be found in Table 9. Of the six independent variables analyzed, none of the variables were statistically significant at the $p=0.05$ interval of confidence level. One variable, TEAS science (tsc), was significant at the $p=0.10$ level, suggesting that for every one unit of increase in the tsc score the probability of persistence increased by 3%.

Ethnicity (non-white student), although not statistically significant, had a negative impact on persistence, which was not a surprise since it also had a negative impact on retention. The other four variables (Prerequisite grade point average, TEAS sub scores in math, reading and English) were not predictive of persistence for this regression equation. Surprisingly, TEAS English (te), which was statistically significant for retention was not significant predictor for persistence.

Table 9-Persistence Regression

		Variables in the Equation			
		B	Wald	Sig.	Exp(B)
Step 1 ^a	ethn_rev	-.388	1.714	.190	.678
	pqgpa	.058	.038	.846	1.060
	te	.022	.960	.327	1.022
	tm	.000	.000	.985	1.000
	tr	.006	.174	.677	1.006
	tsc	.029	3.184	.074	1.030
	Constant	-3.840	4.183	.041	.021

Step 1a. Variable(s) entered on step 1: ethn_rev, pqgpa, te, tm, tr, tsc.

NCLEX Mastery

At the completion of the Associate Degree in Nursing Program, the student should be prepared to master the National Council Licensure Exam (NCLEX). It is the main objective of the program and the rigor of the coursework should prepare the student to pass the exam on the first try. Although that is not always the case, this research examined mastery of the NCLEX on the first try.

Research Questions One and Four

To gain an understanding of the predictability of pre-entry academic achievement and the TEAS exam on mastery of the NCLEX, research questions one and four asks, “How well does the student’s pre-entry academic achievement and TEAS sub scores predict mastery of the NCLEX?”

Model Summary

The model, as a whole, explains between 10% (Cox & Snell R squared) and 13% (Nagelkerke R squared) of the variability of data in the last regression equation for mastery of the NCLEX, making it the strongest of the three models.

Logistic Regression results

The results of the last regression equation are displayed in Table 10. Of the six independent variables analyzed in the NCLEX regression, only TEAS science (.095) was significant at the $p=0.10$ level of confidence. This finding suggests that for every unit of increase in the tsc score, the probability of mastery of the NCLEX increases by 2.8%.

All other independent variables showed no significant predictability for mastery of the NCLEX and ethnicity (non-white student) continued to have a negative

relationship. One surprise throughout this research was the lack of the predictive ability of Math. Nurses use math throughout their day from calculating the weight of the patient to dosage calculations, intravenous drip rates, and cardiac rhythms.

Table 10-NCLEX Regression

		Variables in the Equation			
		B	Wald	Sig.	Exp(B)
Step 1 ^a	ethn_rev	-.443	2.175	.140	.642
	pqgpa	.231	.562	.454	1.260
	te	.038	2.496	.114	1.038
	tm	.004	.104	.747	1.004
	tr	.008	.276	.599	1.008
	tsc	.028	2.783	.095	1.028
	Constant	-6.037	9.164	.002	.002

Step 1a. Variable(s) entered on step 1: ethn_rev, pqgpa, te, tm, tr, tsc.

Summary of Findings

Chapter four has provided the results of descriptive and inferential statistics including measures of central tendency, cross tabulations, and bivariate correlations, as well as inferential statistics in the form of three logistic regression analyses. Ethnicity, prerequisite grade point average, TEAS composite and TEAS sub scores in English, math, reading, and science were independent variables that examined possible predictive relationships with retention, persistence, and mastery of the NCLEX in Associate Degree Nursing Programs.

Throughout the regressions it was evident that only a small percentage (less than 13%) of variability of data came from the independent variables that were presented, leading the researcher to understand that a multi-factorial influence of other variables exists for the prediction of retention, persistence, and mastery of the NCLEX.

The most statistically significant independent variable for the prediction of retention was the TEAS sub scores in English. This was a not surprising result as English

and English comprehension is the foundation for all learning especially in subjects like the science courses required for the nursing program. The second strongest predictor was TEAS science. Nursing is a science and the science courses taken as prerequisites provide the inductive and deductive reasoning needed in nursing. Ethnicity (non-white student) was consistently a negative predictor of retention, persistence, and mastery of NCLEX while not surprising, this understanding can be used to increase retention strategies for this population of students.

It was surprising TEAS math, TEAS reading, and prerequisite GPA, as independent variables, did not have some predictive relationship with retention, persistence, and mastery of the NCLEX given the heavy emphasis of science, math, and reading in nursing programs.

Next, Chapter 5 will present the summary of this research including a discussion of the results in response to each research question. The chapter will provide a conclusion that will relate the importance of these findings to strategies to better prepare students for entrance into the nursing program and retention once admitted. The findings will also support legislative policy to continue to enable community colleges to academically screen applicants for admission into their programs. Limitations and suggestions for further research will be included.

CHAPTER 5: DISCUSSION/CONCLUSIONS

Chapter Five provides the discussion and interpretation of this quantitative research exploring the predictive relationship of academic preparation and retention, persistence through an Associate Degree Nursing program, and mastery of the National Council Licensure Exam. A review of the nursing shortage and demand for registered nurses along with the research purpose will be presented. The research questions and methodology will be reviewed with the research findings fully disclosed in relation to the questions. The chapter will summarize the study by analysis and synthesis of the findings in relation to the breath of literature about nursing student success. Recommendations regarding the use of this data in the admission process will be explored as well as the implications for public policy in the reauthorization of AB 1559. Limitations of the study and suggestions for future research of this nature will conclude the chapter.

Overview of the Problem

This research addresses the larger social context of a nursing shortage and the supply of registered nurses by exploring the predictive nature of prerequisite grade point averages and entrance exam scores on nursing school retention and completion, and mastery of the National Council Licensure Exam on the first try.

A nursing shortage in California and the nation has been in effect since the 1960's with periods of stability during economic recessions like that which is being experienced currently. The recession has caused an influx in the supply of registered nurses as "stay at home moms" went back to work, part time nurses took on full time employment, and nurses scheduled to retire in 2010 and 2011 postponed their retirement. The "pseudo" increase of nurses will dramatically change as the recession wanes and the shortage of

nurses will be more critical than any other time since the 1960's (Buerhaus, et al., 2009). As the nursing shortage looms, it is important that each candidate for admission into nursing programs is the most academically prepared and has the best chance of success.

Review of the Literature

With the use of multiple databases to obtain scholarly work on the subject of student's academic success, retention, program completion, NCLEX mastery and the nursing shortage in California and the nation, the literature reviews the cognitive and non-cognitive issues of student success in nursing programs in the larger social content of a state and national nursing shortage.

The impact of the nursing shortage on society is serious. The reasons for the shortage are multifactorial including; the population changes, Healthcare Reform Bill, nursing program impaction, program access specifically at the community college level, the nursing faculty shortage, and the image of nursing as a profession to name a few. The California nursing shortage also has the challenge of nurse to patient ratios, increasing the need for the registered nurse.

Nursing program access into Associate Degree Nursing programs in California presents another problem. Open access allows any student with the minimal requirement of a 2.5 grade point average into the program. The inability to screen students has resulted in low retention and program completion rates and seats being taken away from the more academically prepared student.

Cognitive variables identified by the literature as strong indicators for success in nursing programs include English language proficiency, science, overall GPA in pre-nursing courses, and nursing entrance exams including the Nurse Entrance Test and Test

of Essential Academic Skills (Campbell & Dickson, 1996; Phillips, et al., 2002; Sandiford & Jackson, 2003; Higgins, 2005; Newton, Smith, & Moore, 2007; McGann & Thompson, 2008; Ukpabi, 2008; Fowler & Norrie, 2009; Peterson, 2009; Wolkowitz & Kelley, 2010).

As a predictor for passing the National Council Licensure Exam (NCLEX), many studies (Sayles, et al., 2003; Seldomridge & DiBartolo, 2004; Newton & Moore, 2009; Wolkowitz & Kelley, 2010) agree that various science and math courses, program admission exams mentioned earlier, and program completion exams including the TEAS RN Predictor exam, HESI exit exam, and NLN Comprehensive Achievement Test as useful.

The literature (Sandiford & Jackson, 2003; Deary, et al., 2003; Sayles, et al., 2003; Higgins, 2005; Hopkins, 2006; Johnson, et al., 2008; Sego et al., 2008; Tipton, et al. 2008; Fowler, et al., 2009; Pryjmachuk, et al., 2009) found several non-cognitive and social variables including academic and social integration into college as a predictor of success, although this research did not explore those variables.

The literature review suggested the demographics of ethnicity, age, and gender to have an effect on student retention and most research concluded that older, white, females were more successful (Hopkins, 2006; Stickney, 2008; Pryjmachuk, et al., 2009).

Overview of the Research

In an attempt to ensure the best selection criteria for the most academically prepared student, this quantitative, correlational, predictive design has explored the use of prerequisite coursework grade point average, and the Test of Essential Academic Skills (TEAS) sub scores in English, math, reading, and science to predict retention in the first

semester, program completion, and mastery of the NCLEX for two Associate Degree Nursing programs in a multicollge district in Ventura County, California.

Research Questions

1. How well does the student's pre-entry academic achievement predict nursing student retention, persistence, and mastery of the NCLEX?
2. How well does the nurse entrance exam (TEAS) predict retention?
3. How well does the nurse entrance exam (TEAS) predict persistence?
4. How well does the nurse entrance exam (TEAS) predict mastery of the NCLEX?

Summary of the Findings

Two cohorts of nursing students from Moorpark and Ventura colleges during the Fall 2008 and Spring 2009 semesters were used as subjects in this quantitative research (n=241). The data was the aggregate of two separate nursing programs/colleges in one college district. A secondary data set was used to obtain the cumulative grade point average of English composition, college algebra, anatomy, physiology, and microbiology as well as the Test of Essential Academic Skills (TEAS) sub scores in English, math, reading, and science of each student. While the majority of this research sample was female and the average age was 24, the sole demographic of ethnicity was collected and analyzed.

Analysis of Current Demographic Data

As the United States continues to grow in diversity, it is important that culturally competent nurses care for the diverse population. In the most recent registered nurse survey conducted by the Health Resources and Services Administration (HRSA) titled, "The Registered Nurse Population: Findings from the 2008 National Sample Survey of

Registered Nurses” it was found that there are over 3 million registered nurses in the United States today. Of those 3 million nurses, 83.4% are white, 3.6% Hispanic, 5.4% African American, 5.8% Asian, Native Hawaiian, and Pacific Islanders (non-Hispanic), 0.3% American Indians and Alaskan Natives, and 1.7% of nurses who identified with two or more races. See Table 11 for comparison of the diversity of the United States population to the diversity of registered nurses practicing in the United States (Health Resources and Services Administration, 2010). More alarming than the population distribution is the percent of registered nurses who have language competency. Only 5.1% of nurses speak Spanish, while 3.6% speak Tagalog or another Filipino language, 1.1% speak French, and less than 1% speak Chinese, German, American Sign Language or another language (Health Resources and Services Administration, 2010). The ethnic disparity in nursing is a concern. The impact of adequate healthcare diversity on the quality of patient care would be astounding.

Table 11-Ethnicity in the United States and of Registered Nurses

	% of the U.S. Population	% of Registered Nurse
White	65.5	83.2
Hispanic	15.4	3.6
African American	12.2	5.4
Asian, Native Hawaiian, Pacific Islander non-Hispanic	4.5	5.8
American Indian, Alaskan Native	0.8	0.3
2 or more races	1.5	1.7

Martinez & Martinez (2004) reported that African Americans, Hispanic’s, American Indians, and Alaskan Natives receive less prenatal care, lower vaccinations rates, less cancer screening, worse control of diabetes and hypertension and overall less effective healthcare than their white counterparts. Daniels (2011) found that when

provider and patient share the same race, patients reported a more participatory experience. Daniels (2011) concludes by saying, “diverse patient needs and race-related health disparities necessitate cultural competence” (p. 1).

Ethnicity and Academic Success

It has been reported, and is supported by research (Seago & Spetz, 2005; Hopkins, 2006; Salamonson & Andrew, 2008; Stickney, 2008; Prymachuk, et al., 2009) that the under-represented minority student has more academic challenges than the white majority. Seago & Spetz (2005) found that African American and Asian, non-Filipino students had lower on-time nursing program completion rates. It was speculated that poor high school preparation and financial barriers contribute to this finding. Kozman (2008) supports the finding for poor academic preparation and found that only 12% of African American and 15% of low-income students were proficient on the 2007 National Assessment of Education Progress (NAEP) exam. While NAEP is a high school assessment, the average age of nursing students in this research are 24 years old. Stickney (2008) conducted research on factors affecting practical nursing student attrition and found that minority students did not perform as well academically and performed lower on all Test of Adult Basic Education (TABE) subject area’s of math, verbal, and reading. Prymachuk, et al. (2009), while studying factors associated with attrition in the United Kingdom, found that more male and black/minority students resigned involuntary from the “child branch” (pediatrics) than female, white students. In another study in the United Kingdom, Salamonson & Andrew (2006) found a negative relationship between ethnicity and academic performance in pathophysiology and nursing practice subjects.

Findings of Ethnicity and Dependent Variables

Although this research did not intend to examine the possible predictive relationship between ethnicity and student success, the bivariate correlation suggested a relationship and will be reported here. Ethnicity, more specifically the non-white student, showed a negative statistically significant, albeit weak (-.169 retention, -.138 persistence, -.173 NCLEX), relationship at the $p=0.01$ level with retention and mastery of the NCLEX, and significance at the $p=0.05$ level with persistence (see Table 7). As reported earlier in Chapter 4, the cross tabulation of ethnicity and the dependent variables showed a wide gap in percentage points between the white and nonwhite student with respect to retention, persistence, and mastery of the NCLEX (see Table 6). The logistic regression for ethnicity and retention also suggests a negative predictive relationship with the non-white student. In fact, the non-white students chances of retention in the first semester are reduced by 43% (See Table 8). This finding supports previous research completed on retention and the under-represented minority in nursing programs. The logistic regression for persistence and mastery of NCLEX did not show statistical significance for the variable, ethnicity (See Tables 9 and 10).

Research Question One

Research question one asks, “How well does the student’s pre-entry academic achievement predict nursing student retention, persistence, and mastery of the NCLEX?” To answer this question, a logistic regression analyzed the independent variables of prerequisite grade point average (an average of English composite, college algebra, anatomy, physiology, and microbiology) on retention, persistence, and mastery of NCLEX. The three models explain very little of the overall variance for retention,

persistence, and mastery of NCLEX. Other factors to consider that may explain prior academic achievement in relation to the dependent variables not included in this research but found in other studies include; high school GPA, socioeconomic status, parental involvement, parental education, number of hours worked outside of school, and the student's support system. One must also consider the influence of integration and socialization of students in a cohort moving through a program, as a factor.

The results of the logistic regression suggested that prerequisite GPA was not a predictor of retention, persistence, or mastery of NCLEX (See Tables 8, 9, and 10). This finding was surprising as one would think it logical that the better a student does academically coming into a rigorous nursing program the more likely they would be to be retained, persist, and master the NCLEX. Cross tabulation analysis showed a small difference in retention of students who were admitted with a GPA above 3.0 compared to those admitted with a GPA below 3.0. There continued to be a wider gap for these students with persistence and even wider for mastery of the NCLEX (See Table 6). The bivariate correlation did not show a significant relationship with retention or persistence (See Table 7). Although prerequisite GPA was not predictive of student success, the cross tabulation suggested students with a prerequisite coursework GPA above 3.0 were more successful than students who scored below 3.0 (See Table 6). Bivariate correlation analysis also suggested a positive, significant, although weak relationship with mastery of NCLEX (See Table 7).

Ukpabi (2008), who studied students preparing to take the NCLEX from North Carolina Central University, found similar results with prerequisite GPA and retention. Campbell & Dickson (1996) found cumulative GPA and standardized tests predictive of

retention and mastery of the NCLEX, while Benfiel (2011) found pre-nursing GPA predictive of NCLEX. Peterson (2009) found a positive correlation with past academic success and nursing school success. Sandiford & Jackson, 2003; Higgins, 2005; and Hopkins, 2006 all found prenursing GPA as a predictor for retention. Fowler & Norrie (2009) found “B” grades in prerequisite courses a good indicator of program completion, while Newton & Moore (2009) found prerequisite GPA predictive of NCLEX readiness. My findings appear to suggest prerequisite GPA has a relationship to mastery of the NCLEX, which would support the findings of Campbell & Dickson, Benfiel, and Newton & Moore.

Research Question Two

Research question two asks, “How well does the nurse entrance exam (TEAS) predict retention?” To answer this question, a logistic regression analyzed the independent variables of TEAS sub scores for English, math, reading, and science and retention. As mentioned earlier in Chapter 4, TEAS composite demonstrated multicollinearity with the sub scores and was excluded from the regression. The model, as a whole, explains very little (7-11%) of the variability for retention. Other possible factors for retention not explained by this research but found in other studies include those expressed in the first research question as well inclusion in tutoring programs or retention strategies by the schools, and peer support.

The findings of this research suggest TEAS sub score in English was a statistically significant ($p=.049$) predictor of retention in the first semester (See Table 8). This finding is further supported by the bivariate correlation suggesting a positive, significant ($p=0.01$), but weak (.254) relationship with retention (See Table 7). The cross

tabulation analysis also shows that students admitted with a TEAS English score at or above the national mean are more likely to be retained during the first semester (See Table 6).

TEAS English, as a predictor of retention, was not surprising as an understanding of English is the foundation for learning and a necessity for success in prerequisite coursework required for admission into the program. The use of the TEAS exam for all incoming nursing students and the finding of TEAS English as a predictor of retention supports previous work by Sandiford & Jackson, Esper, Sayles, et al., Stickney, and Newton, Smith, Moore, & Magnan. Sandiford & Jackson (2003), while studying predictors of first semester attrition and their relation to retention of Associate Degree nursing students, found that students assessed at college language level had higher retention rates. Esper (2009), in her study of predictors of first semester success in an Associate Degree in Nursing Program, also found TEAS English as a predictor. The use of entrance exams (NET, TEAS, TABE, and PBPS) as criteria for admission or identification of “at risk” students are used in most nursing programs and are found to be significant in predicting success (Sayles, et al., 2003, Newton, Smith, Moore, & Magnan, 2007; Stickney, 2008).

TEAS science also suggests significance ($p=0.060$) as a predictor of retention (See Table 8). The bivariate correlation analysis suggested a positive, significant ($p=0.05$) although weak (.221), relationship with retention, further supporting this finding (See Table 7). The cross tabulation analysis showed that students who score at or above the national mean for TEAS science have a higher likelihood of retention (See Table 6). The lack of predictability of TEAS science for retention was surprising. Science is a

foundational course for nursing and one would expect that a student coming into the nursing program academically strong in science would be more likely to be successful in the first semester. This finding supports past as well as recent research on science as a predictor of retention.

Campbell & Dickson's work reviewing 10 years of data on retention, showed science courses as one of the greatest cognitive predictors of student success (Campbell & Dickson, 1996). Wolkowitz & Kelley (2010) also found the TEAS sub score in Science as the "strongest predictor of early program success" (p. 500). Several studies (Newton, Smith, More & Magnan, 2007; Ukpabi, 2008; Newton & Moore, 2009) found the TEAS composite score (composite of English, math, reading, and science) to be a significant predictor of retention.

The findings for the TEAS sub scores for math and reading did not show any predictive relationship to retention (See Table 8). The bivariate correlation analysis suggested a positive, significant ($p=0.05$) albeit weak (.141 math, .139 reading) relationship with retention (See Table 7). The cross tabulation showed both TEAS math and reading as having a wide gap in percentage points for students who have attained scores at or above the national mean and their increased likelihood of retention (See Table 6). The findings for math were very surprising because math is used in dosage calculations, patient weights, vital signs, and other calculations students use on a regular basis. A sound understanding of math is elementary for medical calculations.

TEAS math and reading as non-predictors of retention was supported by most research that found other aspects of the TEAS exam to be more predictive. Wolkowitz & Kelley (2010) found the TEAS sub score in math to be the least predictive of early

program success compared to the sub scores of English, reading, and science. One reason for these findings might be that students coming out of high school are ill prepared in math. Kozman (2008) reports NAEP results show low numbers of high school students proficient in math.

Research Question Three

Research question three asks, “How well does the nurse entrance exam (TEAS) predict persistence?” Persistence, for this research, is defined as completion of the two-year program. It would be logical to assume that the predictors of retention would also be predictors of persistence or at least have some significance. To answer this research question, a logistic regression was used to analyze the predictive relationship between TEAS sub scores in English, math, reading, and science on persistence. The model, as a whole, explains very little (6-8%) of variability for persistence. Cognitive factors that could account for persistence that were not studied, but found in other research include grades in pathophysiology, pharmacology, nutrition, as well as nursing coursework. Non-cognitive factors that could be attributed to persistence in nursing programs include motivation, commitment, family and peer support, understanding of program requirements because the student had been in the program for at least a semester, mentoring, and student support services (Seago et al, 2008; Fowler & Norrie, 2009).

The findings of this regression, found in Table 9, suggest a predictive relationship with TEAS science ($p=.074$). To further support this finding, the bivariate correlation analysis suggested a positive, significant ($p=0.05$) although weak (.222) relationship between persistence and TEAS science (See Table 7). The cross tabulation analysis for TEAS science showed a gap that progressively widened for retention, persistence, and

mastery of the NCLEX (See Table 6). These results explain that students who are admitted with TEAS science scores at or above the national mean are more likely to persist through the nursing program. These findings support recent work by Rogers and Wolkowitz & Kelley and older work by Campbell and Dickson.

Nursing has a deep affiliation with science, so this finding was not surprising. Rogers (2009) found TEAS science and science courses predictive of program completion and Wolkowitz & Kelley (2010), as reported earlier, found TEAS science as the strongest predictor of early nursing program success, while Campbell and Dickson (1996) found science classes had a positive relationship with student success.

It was surprising that TEAS English was not a predictor of persistence given its predictive relationship for retention as well as its importance in understanding complex concepts that require analytical and critical thinking. TEAS math and reading were also not predictive of persistence, which is surprising for all the same reason English was not predictive of persistence. Rogers (2009) found TEAS reading to be predictive of NCLEX mastery but not program completion. The rigor of the nursing program requires an exorbitant amount of reading that includes complex theoretical concepts, so it is surprising that TEAS reading was not predictive of persistence.

The depth and breath of literature on student success in nursing does not specifically look at persistence, but rather retention and mastery of NCLEX. It makes sense to consider that predictors of retention could also be predictors of persistence.

Research Question Four

Research question four asks, “How well does the nurse entrance exam (TEAS) predict mastery of the NCLEX?” Again, a logistic regression was used to analyze the

TEAS sub scores in English, math, reading, and science on mastery of the NCLEX. This model was the strongest (10-13%) of the three logistic regressions, although still explained little of the overall variability in relation to NCLEX mastery. Other factors not analyzed in this research but found in other studies that might have a prediction for mastery of the NCLEX include, standardized exit exams (TEAS RN Predictor test, HESI exit exam, and NLN Comprehensive Achievement exam) and students who participate in NCLEX preparatory seminars.

The findings of this regression suggested TEAS science ($p=0.95$) as having a predictive relationship with mastery of the NCLEX (See Table 10). The finding was further supported by the bivariate correlation analysis that suggested a significant ($p=0.01$) and positive relationship (See Table 7). The strength of the relationship was weak (.259) although one of the strongest for all variables studied. This finding was not surprising, one would speculate that if a student has a strong foundation and understanding of science as it applies to nursing and persisted through the program, the student would also successfully master the NCLEX. Other variables, based on correlation analysis, that were are positive, significant and weak included prerequisite GPA (.177), TEAS math (.198), and TEAS English (.265). TEAS reading also suggested a significant ($p=0.05$) positive, weak (.167) relationship (See Table 7). Also supporting the finding of TEAS science as a predictor of mastery of the NCLEX was the cross tabulation analysis for TEAS science which showed the widest gap (28% points) between students who scored at or above the national mean on the TEAS science sub score with those that scored below the national mean (See Table 6). The finding of TEAS science, as a predictor of mastering the NCLEX, is consistent with current research by Rogers,

Benfiel, and Hernandez. Although other TEAS sub scores in English, math, and reading did not have a predictive relationship they all showed some correlation with mastery of the NCLEX. These findings are also supported by prior research.

Ukpabi (2008) found TEAS English as a predictor for passing the NCLEX. Conversely, Rogers (2009) found TEAS science as a predictor of NCLEX, while Benfiel (2011) and Hernandez (2011) found TEAS science and reading as best predictors of NCLEX success. TEAS composite scores were also found to be predictors of NCLEX success by Rogers (2009) and Benfiel (2011). In contrast to these studies, Newton & Moore (2009) found scholastic aptitude (pre-entry GPA) was predictive of NCLEX readiness but nursing aptitude (TEAS exam) was not. Other research examining the usefulness of preadmission entrance exams found them as predictors of NCLEX success (Campbell & Dickson, 1996; Sayles, et al., 2003; Crow, et al., 2004; Seldomridge & DiBartolo, 2004).

Conclusions

The purpose of this correlational, predictive research was to find the best predictor of academic readiness to ensure the best candidates for admission into nursing programs. This research addressed the larger social context of a nursing shortage that is multifaceted.

Using logistic regression, the findings suggest the independent variable ethnicity, specifically the non-white student, has a negative predictive relationship with retention. Prerequisite GPA has no predictability with retention, persistence, or mastery of the NCLEX. The independent variables TEAS English and TEAS science have predictability for retention. The findings also suggest TEAS science has predictability for both

persistence and mastery of the NCLEX.

Based on the bivariate correlation analysis, it is worth mentioning that although prerequisite GPA and TEAS sub scores in math and reading were not predictive of retention, persistence, or mastery of the NCLEX, all of them had varying degrees of correlation with the dependent variables so therefore should not be discounted as useful criteria for screening students for admission. Moreover, the cross tabulations for TEAS English, math, reading, and science showed that students who score at or above the national mean are more likely to be retained, persist, and master the NCLEX. Following is a discussion of recommendation based on these conclusions.

Recommendations

In this final section, recommendations will be discussed by independent variable. The application of these findings to the current admission policies for nursing programs in community colleges as well as the reauthorization of AB 1559 will conclude the chapter. It should be noted that although these are general recommendations for the findings of this research, each nursing program has its own unique characteristics, demographics, student needs, and curriculum that must be taken into account.

Ethnicity

Historically, minority students have been plagued with poor academic success especially in healthcare professions like nursing. Social inequality is an underpinning for the educational struggle of some ethnicities, while immigration to a country speaking a different language and acculturation to the “norm” may be reasons why other ethnicities struggle to meet the standards of academic success.

To bridge the gap in minority nursing disparities, the focus of educating potential

nurses must start early in the education pipeline. Cohen, Gabriel, & Terrell (2002) describe the need for a shift in the education system through education reform to target students in primary and secondary education with an interest in healthcare. All students must have access to high-quality education. Their recommendations include creating minority-focused community partnerships between academic medical centers, K-12, and pipeline colleges. Boggs (2010) agrees stating, “community colleges will have to increase their role in K-12 reform and in preparing elementary and secondary school teachers” (p. 4).

In the Ventura County Community College District, with two colleges that have nursing programs, bridging the diversity gap in nursing could include developing “healthcare academies” with local high schools and hospital or alternative care settings like physician offices and clinics. The three-way partnership would consist of job shadowing, academic counseling to ensure a smooth articulation into the community college nursing programs, and mentoring between minority registered nurses and minority high school and nursing students. Guidance counseling and mentoring at this stage would also be paramount to nurture the student. Connecting young interested minority students with minority nurses would also provide excellent role modeling. Realistically, there is no state funding in community colleges today to create these programs but that does not mean that mentoring cannot be developed with minority nurses, students who have graduated from our programs, and minority-nursing faculty. Recently, grant funding has been made available for enrollment growth and is one funding source to look into. Boggs (2010) reports 50% of registered nurses and over 43% of undergraduates are educated in the community college system; however, they receive

only 27% of federal, state, and local higher education funding.

Prerequisite GPA

Although this research did not find prerequisite GPA as a predictor for retention, persistence, or mastery of the NCLEX, others have found it to be a predictor for student success (Phillips , et al., 2002; Sandiford & Jackson, 2003; Newton, Smith & Moore, 2007; Tipton, et al., 2008; Newton & Moore, 2009; Peterson, 2009). The bivariate correlation analysis (Table 7) suggests a positive, significant, although weak (.177) relationship with mastery of the NCLEX and should not be discounted.

We cannot ignore the importance of the student's academic achievement in prerequisite nursing courses, as they are foundational for theories and concepts throughout the nursing program. Because students enter the nursing program at different stages in their education, one attributing factor to the finding of this research might be the time between completing prerequisite course (English composition, college algebra, anatomy, physiology, and microbiology) and admission into the program. A recommendation for the Ventura County nursing programs would be to institute a "recency" requisite that requires all prerequisite courses to be taken within five years of admission to the program. Future researchers might consider this as a variable in their study.

Academic counseling, by the nursing department counselor, from the point of entry into the community college system is also a strong recommendation. The findings of this research found TEAS English and science sub scores to be predictors of success. Counselors can assist the student to understand the importance of taking this preadmission exam seriously. Students have confided that they did not study for the exam

and thought it was a general placement exam similar to the English and math exams taken earlier in their education. Potential nursing students need to understand the rigor of the program, the time commitment, and the importance of a strong academic foundation as attributes for success. Another recommendation for “pre-nursing” students is participation in the Moorpark and Ventura College Student Nurse Associations. Participation would provide insight into the “life of a nursing student” as a way to prepare for the changes to their lives and the lives of their families.

TEAS Admission Exam

Preadmission scholastic aptitude exams have proven to be a benefit in identifying the “at-risk” students but until recently have not been used in the criteria for selection of students. TEAS sub scores in English and science were found to be predictive of student success in this study as well as other similar research (Newton, Smith, Moore, & Magnan, 2007; Newton & Moore, 2009; Ukpabi, 2008; Rogers, 2009; Wolkowitz & Kelley, 2010; Benfiel, 2011). Although TEAS math and reading did not suggest a predictive relationship with student success, a bivariate correlation suggested a positive significant, albeit weak (.198 math, .167 reading) relationship with student success (Table 7). More importantly, other researchers have also found value in using preadmission exams (Newton, Smith, More & Magnan, 2007; Ukpabi, 2008; Newton & Moore, 2009; Rogers, 2009; Benfiel, 2011).

A recommendation for the use of TEAS exams at both Moorpark and Ventura colleges would be that students understand the importance of this exam as a reflection of their knowledge base entering the nursing program and their potential success throughout the program. The bivariate correlation suggests a positive significant, although weak,

relationship with all TEAS sub scores and retention, persistence, and mastery of the NCLEX (see Table 7). The cross tabulations also showed a wide gap for all TEAS sub scores and student success for students scoring at or above the national means (see Table 6). Although only TEAS English and science were predictors of success, other components should not be ignored as criteria for admission.

Providing information about the TEAS exam on the college website would provide exposure of the exam to potential students including study aids to prepare them to take the exam. The exam components could be explained during guidance counseling including the importance of the results, as an indicator of success but also as a way to identify possible remedial needs. Exam scores are available prior to admission and “at-risk” students can be identified and provided with a learning contract that details the students remedial needs, and information about student services like Writing and Math centers, supplemental instruction, and tutoring. Mentoring for at-risk students could be implemented prior to admission and continued through the program. Retention strategies for “at-risk” students are very effective, one study by Gardner (2005) found 100% retention in minority students after the implementation of a retention program that included a dedicated retention coordinator, mentoring, language partnerships, minority support groups, health seminars, faculty updates, and minority pre-nursing student outreach. Many studies suggest retention strategies similar to these to increase the success rates of nursing students (Higgins, 2005; Johnson, et al., 2008; McGann & Thompson, 2008; Stickney, 2008; Gordon & Copes, 2010).

Support of AB 1559/Multicriteria Screening

The main implication of this research was to assess the predictive relationship of

the student's pre-entry academic achievement and student success in the Associate Degree Nursing programs at Moorpark and Ventura colleges. The research has also given some insight into the practical use of the multicriteria screening process for admission into both programs. Criteria of the screening process include prerequisite grade point average and TEAS composite and sub scores. Students receive points on each criterion and are placed in rank order where 85% are admitted into the program and the residual applicants are pooled and randomly chosen to make up the remaining 15% of the total class.

The findings of this research support the use of both prerequisite GPA and the TEAS exam as criterion for the screening of potential candidates for the nursing program. While prerequisite GPA was not predictive in any model, bivariate correlations suggest a positive, significant although weak, relationship with mastery of the NCLEX and should not be ignored. The bivariate correlation suggested positive significance, although weak, between all TEAS sub scores and retention, persistence, and mastery of the NCLEX. See Table 7. Moreover, the cross tabulations also support the use of prerequisite GPA and the TEAS exam. Although the prerequisite GPA gap was narrow for retention and persistence, it widened for mastery of the NCLEX. All TEAS sub scores had wide gaps for students who scored at or above the national mean for retention, persistence, and mastery of the NCLEX, see Table 6. Students who scored at or above the national means on each exam were more likely to be successful.

The findings should also provide support for the possible reauthorization of AB 1559 in 2016. AB 1559 provided the ability to implement a merit-based selection process in nursing programs at California Community Colleges, where previously there was open

access. It will be vital to increase the supply of nurses in the near future. The ability to admit students on merit versus open access will be critical to obtaining this goal.

Contributions, Limitations and Future Research

This research contributes to the greater body of knowledge of research on predictive indicators of student success in Associate Degree Nursing programs. The limitations of this research include a small sample size, in two nursing programs, in one community college district in California making it difficult to generalize the findings to the greater population of nursing programs in the country. Replication of this research in all California Community College ADN programs would further confirm or negate this research. Other limitations to this research include the aggregation of ethnicity, which did not allow for a pure picture of how each ethnicity might have correlations with the dependent variables. The aggregation of prerequisite coursework GPA was also a limitation because it did not allow each course to be examined for correlation or predictability with the dependent variables. Following are implications for future research.

Although the findings of this research are consistent with current research, each nursing program has its own unique characteristics (demographics, teaching style, curriculum, etc), so duplication of this research is important in other programs. Other research should consider including non-cognitive variables (commitment and motivation) that might influence retention in order to gain a better understanding of student's perception of rigor in a nursing program. Additionally, future research should investigate nursing course grades as a prediction of persistence and NCLEX mastery as well as the importance of peer support throughout the program. Another recommendation is the use

of program exit exams (TEAS RN Predictor, HESI exit, and NLN RN Comprehensive Achievement) to determine their potential in predicting NCLEX mastery. Future research should consider disaggregating prerequisite coursework grade point average to gain a better understanding of individual courses as predictors of student success. Another recommendation is comparing data from fall and spring semesters to investigate a difference in the timing of admission to the program. Placement strategies could be implemented according to the findings. To provide the student with academic support, the Nursing Study Skills course, offered at Moorpark College but also offered at a variety of institutions should be examined for its usefulness in predicting student success. Finally, as more male students are entering nurses it will be important to study how gender influences retention, persistence, and mastery of the NCLEX.

Final Thoughts

As our economy struggles and federal funding for public education continues to dwindle, it is vital to admit the most academically qualified students with the greatest probability of success in completion of our programs and mastery of the NCLEX. Increasing the supply of registered nurses will be fundamental in our quest to provide safe, quality care in our changing and ageing population.

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APPENDIX A

Moorpark College ADN Program Admission Criteria-Effective for Fall 2012 admission and forward

Criteria	Points	Required Supporting Document
1. Previous Academic Degrees, diplomas or relevant certificates (if any) BA/BS Degree	Max Points 10	BA/BS Degree Official transcript from regionally accredited U.S. colleges or universities with degree posted.
AA/AS Degree or Licensed Health Care Worker: LVN, Psych Tech, Red Tech, Paramedic	8	AA/AS Degree – OR – Licensed healthcare worker requires a copy of your current license with your license number, date of issue and date of expiration. Certificate healthcare worker requires a copy of your current California certificate with your certificate number, date of issue and expiration.
Certified Nurse Attendant/Aide	5	
2. GPA in relevant coursework-	Max points =50	
2 A. Minimum 2.5 GPA in Science prerequisites (Anatomy, Physiology, Microbiology) 4.0 3.5-3.99 3.0-3.49 2.50-2.99 Failure to submit transcripts with all grades posted will result in disqualification for applicant.	40 35 30 25	2 A. Official transcripts (in original sealed/unopened envelope) for all lower and upper division courses completed at any and all regionally accredited U.S. institutions, regardless of applicability to nursing requirements will be required. No foreign transcripts are accepted. Unofficial transcripts are acceptable for courses completed at Moorpark College, Ventura College and Oxnard College. Failure to submit transcripts with all grades posted will result in disqualification. Prerequisite courses completed at other regionally accredited United States colleges or universities must be equivalent to Moorpark College courses. For determination of course equivalency, official transcripts AND course descriptions for prerequisite courses will be required. All prerequisite courses must be completed with a grade of “C” or better and the final grade must be posted to the transcript. Course

		descriptions for prerequisite courses only must accompany the academic transcript for the purpose of determining course equivalency. Course descriptions must come from the specific catalog year in which the course was taken and may be obtained from the college catalog where courses were taken or may be available at http://www.collegesource.org/ .
Criteria	Points	Required Supporting Documentation
<p>2 B. Minimum 2.5 GPA in remaining prerequisites: Written Composition (Eng 1A) and Math M03</p> <p>4.0 3.5-3.99 3.0-3.49 2.50-2.99</p>	<p>10 8 6 4</p>	The same documentation listed in 2 A will be required for 2 B.
<p>2 C. Repeats (W, D, F, I) in Science and English Prerequisite (Anatomy, Physiology, Microbiology, Math 3, and English 1)</p> <p>1 repeat 2 repeats 3 repeats 4 or more repeats</p>	<p>-3 -5 -7.5 -10</p>	The same documentation listed in 2 A will be required for 2 C.
<p>3. Work or volunteer experience in healthcare (if any)</p> <p>More than 200 hours working in healthcare</p>	<p>5</p>	Work: Letter from current/former employer verifying employment. The letter must be on organization letterhead with an original signature and include the applicant's name (must match name on application), start date and end date (if applicable), employment status (full-time/part-time), number of hours worked per week (or total hours worked from/to date), job title, department if applicable, and examples of duties including patient interaction.
<p>4. Life experiences or special circumstance (if any)</p>	<p>Max points =2.5</p>	Documentation will only be required for one that may apply. Applicant may have one or more in this category but maximum points awarded is 2.5.

<p>A. Disabilities: Same meaning used in Section 2626 of the Unemployment Insurance Code.</p> <p>B. Low family income</p> <p>C. First generation to attend college</p> <p>D. Need to work (Need to work means student is working at least part-time while completing academic work that is prerequisite for the Nursing Program)</p> <p>E. Disadvantaged social or educational environment</p> <p>F. Difficult personal and family situation/circumstances</p> <p>G. Refugee status</p> <p>H. Veteran Status/Veteran's spouse</p>		<p>A. Documented disability from college Learning Disability Program or Disability Support Programs & Services</p> <p>B. Proof of Eligibility or receipt of financial aid under a program that may include, but not limited to, a fee waiver from the Board of Governors, the Cal Grant Program, the federal Pell Grant program or CalWORKs)</p> <p>C. Complete the ADN Admission Supporting Documentation Form explaining situation or circumstances</p> <p>D. Paycheck stub during period of time enrolled in prerequisite courses or letter from employer (must be on organization letterhead) verifying employment was at least part-time while completing prerequisite courses</p> <p>E. Participation or eligibility for Extended Opportunity Programs & Services (EOPS)</p> <p>F. Complete ADN Admission Supporting Documentation Form explaining situation or circumstances</p> <p>G. Documentation or letter from USCIS</p> <p>H. Copy of DD-214. Service in the active military, naval, or air service, and discharge under conditions other than dishonorable. Active service includes full-time duty in the National Guard. An eligible spouse would include the widow/er of a veteran that otherwise meets this criteria.</p>
<p>5. Proficiency or advanced level coursework in languages other than English (if any). Credit for high-frequency languages as identified by the Chancellor's Office but not limited to:</p> <p>American Sign Language</p> <p>Arabic Chinese</p> <p>Farsi Russian</p> <p>Spanish Tagalog</p> <p>Languages of Indian Subcontinent and Southeast Asia</p>	<p>Max points =2.5</p>	<p>Official transcript from a U.S. regionally accredited college or university verifying two (2) semesters of foreign language – OR –</p> <p>Verification of proficiency – Complete the ADN Admission Supporting Documentation Form.</p>

6. Approved diagnostic assessment too, ATI Test of Essential Academic Skills (TEAS)-TEAS Nursing Assessment Test	Max Points =30	TEAS scores are due within 4 months of application submission. TEASS taken at Moorpark College – Applicants do not need to submit their results; the results will be accessible.
Composite Score >95%	6	TEAS taken at any other location within the past 12 months – you must go to the www.atitesting.com online store and request that your official TEAS results are sent to Moorpark College.
>90%	5	
>85%	4	
>80%	3	
>75%	2	
>67%	1	
<67%	Not admitted	
English Sub score		
>95%	6	
>90%	5	
>85%	4	
>80%	3	
>75%	2	
<70%	0	
Math Sub score		
>90%	6	
>80%	5	
>75%	4	
>70%	3	
>65%	2	
<64%	0	
Reading Sub score		
>95%	6	
>90%	4	
>85%	2	
<85%	0	
Science Sub score		
>95%	6	
>85%	5	
>80%	4	
>75%	3	
>70%	2	
<65%	0	

	Total Max Points =100	