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PERSISTENCE TO AN ASSOCIATE OF APPLIED SCIENCE REGISTERED NURSE  
DEGREE: THE IMPACT OF PLACING INTO DEVELOPMENTAL EDUCATION  
COURSES ON STUDENT SUCCESS

by

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A Dissertation Submitted to the Faculty of  
Old Dominion University in Partial Fulfillment of the  
Requirements for the Degree of

DOCTOR OF PHILOSOPHY

COMMUNITY COLLEGE LEADERSHIP

OLD DOMINION UNIVERSITY  
December 2011

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## **ABSTRACT**

### **PERSISTENCE TO AN ASSOCIATE OF APPLIED SCIENCES REGISTERED NURSE DEGREE: THE IMPACT OF PLACING INTO DEVELOPMENTAL EDUCATION COURSES ON STUDENT SUCCESS**

Caroline Clark Rivera  
Old Dominion University, 2011

Student retention and success in nursing school has gained favor in educational research due to an increasing shortage of Registered Nurses. The purpose of this study is to measure the impact of student placement recommendation into developmental education courses on persistence to an Associate of Applied Science Registered Nurse degree. Using ex post facto research methodology rooted in the retention theories of Tinto, Bean and Metzner, and Jeffreys, this study aims to measure the effect of high school diploma type, age, race/ethnicity, and pre-requisite courses on student placement recommendation in developmental education and persistence to an Associate of Applied Science Registered Nurse degree. This inquiry attempts to fill a gap in the scholarly literature focused on community college Registered Nurse program student retention, specifically in studying the likelihood of success for under-prepared students in nursing programs.

This dissertation is dedicated to my boys, all three of you. I would never have succeeded in this endeavor without your love, support, and patience. My Kiernan, someday you will be more successful than I could ever dream of becoming.

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## CHAPTER I: PROBLEM STATEMENT

Career opportunities in healthcare are among the fastest growing in the nation, projected to add 1.4 million new jobs in the United States between 2006 and 2016 (Dohm & Shniper, 2007; Wyatt & Byun, 2009). Registered Nurses (RN) comprise 2.6 million of the individuals employed in healthcare (BLS, 2011). Despite wide spread employment layoffs and job losses in nearly all industries, the demand for qualified RNs continues to increase, planting the United States in the midst of a nursing shortage (AACN, 2011). The Bureau of Labor Statistics confirms that over 600,000 jobs in the healthcare industry have been added since the recession began in December of 2007 and is expected to increase 22% by 2018 (Norris, 2009; Wyatt & Byun, 2009). The development of healthcare education will aid in tackling the fast paced growth of the healthcare industry (AACN).

The shortage of RNs in the workforce is just the beginning of a complex problem. Nursing school admission has reached a highly competition level, due in part to an insufficient number of qualified nursing school faculty(AACN, 2011). To further complicate staffing difficulties, the pool of students entering college is increasingly under-prepared academically. Although there is great interest in the nursing profession, students often fail to meet the minimum requirements in mathematics and English necessary for nursing school admission. To fill in academic gaps, community colleges provide developmental education for under-prepared students in hopes of helping students to successfully navigate the college level pre-requisite courses (Cohen & Brawer, 2003; Levin & Calcagno, 2008).

This study examines the effect of placement recommendation into a developmental reading and/or writing course on student persistence in an Associate of Applied Science Registered Nurse (AASRN) degree. With a deeper understanding of the characteristics, both academic and personal, that make a successful nursing student, colleges will be better prepared to advise students interested in a career in nursing. An Associate of Applied Science degree is geared towards students who plan to enter the workforce immediately upon graduation, relaxing some of the general education requirements. But even in light of relaxed general education there remains some minimum criteria for admission.

Student retention, persistence, and attrition are subjects that have received a great deal of attention in the research focused in large part on universities and more recently in community colleges. Much research explores the general theoretical approaches to student persistence in community college (Chaves, 2006; Fike & Fike, 2008; McClenney, 2007; Mohammadi, 1996; Pascarella, Terenzini, Wolniak, & Pierson, 2003; Rendon & Matthews, 1989; Walleri, 1981; Webb, 1989), and there is even a great deal of research addresses nursing school persistence (Benda, 1991; Deary, Watson, & Hogston, 2003; Gallagher, Bomba, & Crane, 2001; Jeffreys, 1995, 2001, 2004, 2007a, 2007b; McLaughlin, Moutray, & Muldoon, 2007; Papes & Lopez, 2007). Scant research explores the impact of student under-preparedness to persistence to an AASRN degree (Peters, 2010). Further, there is a large gap in the literature concerning the impact of mathematics, reading and/or writing placement recommendation on student persistence to an AASRN degree. This study will add to the body of research on developmental education, community college nursing education, and student retention through examination of the

effect of mathematics, reading and/or writing placement recommendation on student persistence to an AASRN degree.

### **Background**

The Commonwealth of Virginia is experiencing registered nurse (RN) shortage akin to what the country is facing. In fact, the RN shortage in Virginia is projected to be higher than the shortage projections for the country. Between 2000-2020, the need for RNs in Virginia is estimated to increase between 32-43% (SCHEV, 2004; V.C.U., 2007) as compared to the country's shortage projection of 22% (BLS, 2011). In the Commonwealth of Virginia, there are a disproportionate number of available RN jobs in comparison to the number of potential employable candidates. Virginia.gov posts updated estimations of the number of current job openings for RNs along with the number of licensed, unemployed RNs in the state. Although Virginia averages nearly 3,000 job openings, only 51% of these jobs will be filled based upon the number of potential candidates (Virginia.gov, 2011). In 2004, the State Council for Education in Virginia (SCHEV) projected that the RN shortage would reach 20% by 2010, a number far-surpassed (SCHEV, 2004a; Virginia.gov, 2011).

Addressing the general shortage of qualified nurses is a difficult task in itself, complicating matters further is the impact of an aging population on the healthcare industry. The average age of RNs continues to increase and by 2012 the average age is anticipated to be 44.5; nurses aged in their 50's becoming the largest segment of the RN workforce (AACN). As more nurses near retirement age there are not enough new RN graduates to fill the positions.

Community colleges produce 60% of all RNs, and these institutions will be expected to continue working to help fill the gaps in the nursing shortage through increased enrollments, retention, and program expansion (AACN, 2008). One of the core missions of the community college is to offer economically relevant, locally desired programs. Community colleges are able to tailor programs to fit the needs of the local workforce by offering open-door access. Anyone interested in becoming a nurse may enroll at a local community college and take the pre-requisite courses in hopes of gaining admission into the college's RN program.

The open-door policy of the community college provides everyone access to education, subsequently contributing a large pool of nursing school candidates. Many of the potential candidates are under-prepared for college-level work and not academically ready to succeed in the RN program. As enrollment at community colleges steadily increases, the number of high school graduates that are college-ready decreases (Greene & Winters, 2005). Developmental education is a large part of the community college curriculum with between 29% to 88% of all first-time students enrolling in at least one developmental course, depending upon the state (Cohen & Brawer, 2003). Developmental education courses comprise 29% of all reading and English and 32% of all mathematics course offerings categorized as developmental (Cohen & Brawer, 2003).

Developmental education has been extensively studied with research focusing on student outcomes, economic costs, and pedagogical approaches (Bahr, 2007, 2008; Bailey, 2009; Bailey, Jeong, & Cho, 2010; Bettinger & Long, 2005; Burley, Butner, & Cejda, 2001; Crews & Aragon, 2007; Foote, 1998; Grunder & Hellmich, 1996; D. Z. Hodges & Kennedy, 2004; C. Horn, McCoy, Campbell, & Brock, 2009; Illich, Hagan, &

McCallister, 2004; Kozeracki, 2005; Levin & Calcagno, 2008; Moss & Yeaton, 2006; Perin, 2004; Perin & Hare, 2010; Shaw, 1997; Shore & Shore, 2003; Umoh & Eddy, 1994; Willingham & Price, 2009; Zavarella & Ignash, 2009). Researchers agree that under-represented populations are the most at-risk for placing into developmental courses and eventually dropping out (Bettinger & Long, 2005; Campbell & Davis, 1990; Handel & Herrera, 2003; Illich, et al., 2004; Opp, 2002). Developmental education will remain at the forefront of research as local and federal agencies evaluate public education (Levin & Calcagno, 2008; Shaw, 1997).

### **Addressing the Nursing Shortage at the College Level**

The shortage of nurses in the United States has prompted nursing schools and policymakers to consider new strategies to recruit nursing students and faculty and to help nursing program graduates pass the National Council Licensure Examination-Registered Nurse (NCLEX-RN). Strategies for recruitment include increasing financial investment in nursing school loan and scholarship programs to attract students and to attract nurses to become school faculty. To increase student interest in the nursing field, private employers are investing in students to ensure a continuous workforce and investing in facilities to help improve job satisfaction (Campinha-Bacote, 2003; Papes & Lopez, 2007). It is not enough to increase recruitment, but instead the impending need becomes increasing retention of pre-nursing and nursing students through graduation and successful completion of the NCLEX-RN (Beeman & Waterhouse, 2001; Fowles, 1992; Hawsey, 1997; Higgins, 2005). The shortage of Registered Nurses (RNs) is endemic in the United States, with 50% of the states reporting decreases in the number of nurses.

The Commonwealth of Virginia is not immune to this RN shortage and in response the State Council for Higher Education in Virginia (SCHEV) has developed a strategic plan to meet the nursing shortage. Virginia colleges cite a lack of funding for new faculty and students as the main impediment to increasing the number of nursing graduates to meet the RN shortfall (SCHEV). An additional academic barrier is posed as under-prepared students are placed into developmental education courses, dramatically slowing down students' progress towards the nursing school application process and often preventing students from applying to nursing school.

**Student persistence in nursing school.** The ultimate goals of a prospective AASRN student include graduation from a nursing program and successful completion of the National Council Licensure Examination-Registered Nurse (NCLEX-RN). Students are required to complete several nursing prerequisites, ranging from English to Human Anatomy & Physiology, prior to the application process. Grades in these courses are examined in an effort to select students with the best chance of persistence to a degree and success on the NCLEX-RN. Researchers have identified admission scores, standardized test scores, and GPA as accurate predictors for student success in nursing school (Gallagher, et al., 2001; Higgins, 2005). In response to research, many AASRN programs use a point computation system to include grades in English 111 (college composition), Human Anatomy & Physiology I (BIO141), and Human Anatomy & Physiology II (BIO142)/ or Microbiology (BIO150) to determine admissions eligibility. In addition to the courses used in the point calculation, students must also have completed high school chemistry or an equivalent with a "C" or better.

Nursing programs have high rates of retention only losing about 20% of students to attrition according to the National League for Nursing (NLN, 2010c). Nursing school retention studies have primarily focused on retention during nursing school and NCLEX-RN pass rates. High admissions standards and academic barriers prevent many students from making it through the admissions process. The prospective pre-nursing students ought to be included in a study of AASRN degree persistence in order to determine what characteristics, both academic and social, predict successful completion of an AASRN degree. Persistence to an AASRN degree includes more than simply completing the typical 5-semester program. The nursing school progression truly begins during the pre-requisite phase, before a student even applies to the program, making it difficult to define persistence. A better definition of persistence and success to an AASRN degree may be developed through the exploration of student attrition anytime during the pre-requisite courses through graduation. In response to the national nursing shortage the American Association of Colleges of Nursing, the National League for Nursing Accrediting Commission, and the Commission on Collegiate Nursing Education have each identified and addressed ways nursing programs might improve persistence, but there remains a need to develop a national nursing standard to measure persistence rates (Papes & Lopez, 2007).

### **Purpose Statement and Research Questions**

The purpose of this ex post facto study is to examine the effect of placement into developmental education courses as identified by scores on the computer-adaptive college placement (COMPASS®) test on student persistence to an Associate of Applied Science Registered Nurse degree program at a community college. The independent



variable in the study is course placement recommendation status as identified by COMPASS® test score. The dependent variable is student persistence to an Associate of Applied Science Registered Nurse degree. Attribute independent variables include student attainment of a high school diploma or General Education Development (GED) diploma, age (traditional or nontraditional), course delivery of first semester Human Anatomy and Physiology (face-to-face or online), chemistry course completed, and race/ethnicity (as defined by United States Census Bureau).

The overarching research question guiding this study is as follows:

- Is there a significant difference in persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® test score recommendations place them into a developmental education course and students whose COMPASS® test score recommendations place them in college-level courses?

The overarching research question will be further guided by the following sub-questions:

1. Does attainment of General Education Development diploma or high school Diploma impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® test score recommendations place them in developmental education courses versus college level courses?
2. Does the age (18-24 or 25 & over) of the student impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® test score recommendations place them in developmental education courses versus college level courses?

3. Does the completion of Human Anatomy and Physiology I (BIO141) online versus face-to-face impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® test score recommendations place them in developmental education courses versus college level courses?
4. Does the completion of chemistry (Chemistry 1, Chemistry 111, or Chemistry 121) impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® test score recommendations place them in developmental education courses versus college level courses?
5. Does race/ethnicity impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® test score recommendations place them in developmental education courses versus college level courses?

### **Definition of Terms**

The following key terms will be used throughout this research study:

**Age** will be measured in this study by dividing the subjects into two groups: traditionally aged students (between age 18 and 24) and nontraditionally aged students (over age 24).

**Associate of Applied Science Registered Nurse degree** is a two-year Registered Nurse degree that affords graduates the skills necessary to pass the NCLEX-RN to become a practicing nurse.

**Attrition** is defined as non-completion of degree or certificate (Tinto, 1993).

**COMPASS®** (Computer-adaptive college placement exam) is a preadmission exam designed to evaluate students' math, reading, and English skills (ACT, 2010).

**Community College** is defined as any institution regionally accredited to award the Associate of Art or Associate of Science as its highest degree (Cohen & Brawer, 2003).

**Course delivery of Human Anatomy and Physiology I (BIO141)** is defined by two categories: online (the lecture portion of the course is delivered via Blackboard™) or face-to-face (lecture portion is attended in a traditional classroom setting).

**Developmental education** is defined as courses that are designed to teach basic literacy, study skills, and coping mechanisms (Cohen & Brawer, 2003).

**Developmental reading/writing** is defined as a group of courses that are designed to teach reading and/or writing skills to under-prepared students. These developmental courses include ENG1 (Preparing for College writing I), ENG3 (Preparing for College writing II), ENG4 (Reading Improvement I), ENG5 (Reading Improvement II), ENG7 (Writing and Reading Improvement I), and ENG8 (Writing and Reading Improvement II).

**Developmental mathematics** is defined as a group of courses that are designed to teach math skills to under-prepared students. These developmental courses include MTH 2 (Arithmetic), MTH 3 (Algebra I), and MTH 4 (Algebra II).

**English 111** is defined as college composition and requires placement test.

**Mathematics for Allied Health MTH 126** is defined as college level math for individuals planning on careers in allied health and requires placement.

**NCLEX-RN** is the National Council Licensure Examination for Registered Nurses.

**Persistence** is defined as completion of degree in 150% of the typical time it takes to graduate (Papes & Lopez, 2007). **Persistence** is defined as a measure of retention (Sydow & Sandel, 1998) and/or as completion of the freshman year of college (Pascarella & Terenzini, 1980). For purposes of this study, **persistence** will be defined as completion of AASRN degree and will be used interchangeably with retention.

**Prior Education** consists of two categories: High school diploma or General Education Development diploma.

**Ethnicity** refers to selected cultural and sometimes physical characteristics used to classify people into groups or categories considered to be significantly different from others. This term is often confused with or used interchangeably with race. **Race** is biological subspecies (O'Neil, 2011). This study will address race/ethnicity as one variable. According to the United States Census Bureau race includes: White, African American, American Indian or Alaska Native, Asian, and Native Hawaiian or Other Pacific Islander. Ethnicity is either Hispanic or Non-Hispanic.

**Retention** is defined as having two parts. Persistence (students' enrollment in two consecutive semesters) and academic achievement (completion of 2/3<sup>rd</sup> of courses attempted with a 2.0 or higher) (Sydow & Sandel, 1998). For purposes of this study, **retention** will be defined as completion of pre-requisite courses and AASRN degree at one institution and will be used interchangeably with persistence.

### **Significance of the Study**

This study adds to the growing body of retention and persistence research by measuring the impact of student placement recommendation into developmental education courses on student persistence to an Associate of Applied Science Registered

Nurse degree. The results of this study will provide community college leaders with empirical evidence of the importance of reading, writing, and mathematics success. Additionally, nursing school administrators will benefit from this study as they continue to develop and refine admissions standards. Nursing program faculty will find relevance in the results of a student persistence study for it will help them to identify the predictors that point to the potential success of a student. Practitioners at the community college will be interested in this study because it will help them to understand some of the academic barriers to student persistence to an AASRN degree. If the majority of students who place into developmental courses are unsuccessful in persistence to an AASRN degree, early interventions might be developed and implemented to either assist at-risk students in pursuing an AASRN degree or assist students in finding a better vocational fit.

Students themselves will want to understand their chances of acceptance to a nursing program as well as their chances of successful completion of an AASRN degree so that they may spend their time and resources efficiently. Finally, community college administrators will take note of the success and persistence of students to an AASRN degree because much financial support is being funneled to colleges to help these institutions meet the increasing needs of the community brought on by the nursing shortage (AACN, 2010; SCHEV, 2004).

This study has immense significance for community colleges, as they are leaders in educating RN's, with 60% of all RN's coming from Associate degree programs (AACN, 2008). The Commonwealth of Virginia can expect to see an increase in the RN shortage by 22% over the next ten years, and the local community colleges can take advantage of the financial gains of this need by increasing the nursing program offerings

(Virginia.gov, 2011). In addition to the role that community colleges play in educating RNs, community colleges also have a significant role in local and state economic development (K. Miller, 2008).

### **Overview of Methodology**

As previously stated, the purpose of this ex post facto study is to examine the impact of placement recommendation in developmental education courses as identified by COMPASS® test scores on student persistence to an Associate of Applied Science Registered Nurse degree program at a community college. An ex post facto design uses existing data in an effort to determine the causes for, or the differences between, existing groups of individuals (Ary, Jacobs, & Sorenson, 2010). This study uses existing data collected at a large, urban community college between the start of fall semester, 2005 through the end of spring semester, 2011. In the fall of 2005, the college implemented the use of Oracle® People Soft Enterprise system to manage, track, and digitize student information. Prior to the implementation of People Soft, procuring accurate student data is difficult. A large sample size is available by including first-time, first-year students, enrolled in the pre-nursing track over multiple semesters.

Participants' demographic information includes COMPASS® placement recommendation level in English and math, prior education (high school diploma or General Education Development diploma), age (traditional or nontraditional), race/ethnicity, gender, course delivery (face-to-face versus online) of Human Anatomy and Physiology I (BIO141), chemistry course (CHEM1, CHEM111, or CHEM121), nursing school acceptance status, and AASRN graduation status. Data used for statistical analyses contains no personal identifiers but instead uses randomly assigned

identification numbers generated by a member of Institutional Effectiveness for each participant.

An analysis of variance (ANOVA) is able to determine the contribution of each variable on the outcome through a comparison of means between groups (Barnes & Lewin, 2005). An ANOVA will discern the effects of COMPASS® placement recommendation scores on student persistence to an Associate of Applied Science Registered Nurse degree. ANOVA will also examine the intervening relationships between the independent and attribute independent variables on student persistence. To corroborate ANOVA results, multiple regression analyses will examine the changes of the dependent variable as associated with changes in the independent variables (Ary, et al., 2010). Multiple regression analyses will also measure the impact of the attribute independent variables on the relationship between the independent and dependent variables.

### **Limitations and Delimitations**

Several limitations of the study have been identified. Due to the nature of a quantitative research design, the scope of the study's outcome is limited to data that can be interpreted through statistical analysis. The type of study also poses limitations because the results of ex post facto research can provide support for any number of different, and possibly contradictory hypotheses (Lord, 1973). Additionally, because the research is conducted after the fact, there may be intervening variables skewing the statistical analysis that were not included. Finally, in ex post facto research there is a risk of post hoc fallacy: mistakenly attributing causation based on a relationship between two variables (Ary, et al., 2010).

Possible delimitations arise because the initial study is limited to one large urban community college. This means that the results may be directly related to the specific culture and characteristics of the institution and surrounding community. Lastly, because data collection includes only students who were accepted into the study institution AASRN degree program students who were accepted into other programs are categorized as not retained.

### **Conclusion**

The nursing shortage is expected to continue over the next few decades as the general population of individuals over the age of 60 continues to rise, requiring more care, and as people continue to live longer lives. The pool of qualified RNs is also continuing to age and there is little indication of a sufficient number of replacement nurses. The increased care necessary for the sustaining the aging population will continue to provide a large economic need for qualified nurses. Furthermore, as a result of President Obama signing into law the Affordable Care Act on March 23, 2010, an additional 32 million United States citizens are now be eligible for healthcare (Healthcare.gov, 2010; Barack H. Obama, 2010). This will exert additional strain on an already weak healthcare system. Community colleges can help to fill in the healthcare gaps while taking advantage of the financial gains of expanding nursing programs to meet increasing community needs. Community college Associate Degree programs generate 60% of all RNs and educate the majority of under-prepared students through developmental courses (Levin & Calcagno, 2008; Viterito & Teich, 2002). This study aims to provide valuable information concerning developmental education and persistence to an Associate of Applied Science Registered Nurse degree program.



## **CHAPTER II: REVIEW OF THE LITERATURE**

This chapter presents a review of the literature relating to the importance of developmental education in community college retention in general and in Associate Degree Registered Nurse program retention specifically. This chapter also presents a review of literature summarizing factors that contribute to student persistence to an Associate of Applied Science Registered Nurse degree. Significant sections of the chapter include a discussion of the Registered Nurse shortage in the United States and in the Commonwealth of Virginia; the theoretical backgrounds of persistence and retention studies; empirical evidence of the role of community colleges in providing developmental education; empirical studies of nursing school retention; and empirical evidence of the link between developmental education and persistence in college and in nursing school. In addition to retention and developmental education, a section of the literature includes a discussion of the differences in student success for high school graduates and General Education Developmental test recipients. Finally, this study will include a theoretical discussion of the importance of delivery method of Human Anatomy and Physiology to nursing school success.

### **Method of Reviewing the Literature**

An extensive search of the nursing, higher education, and community college scholarly databases provided the research background guiding this literature review. Old Dominion University library's education and health sciences databases include access to peer-reviewed, full-text journals through 19 different search engines. Relevant terms were searched in the following education databases: Dissertation & Theses Full Text, Education Full Text, Education Research Complete, Education: A SAGE Full-Text

Collection, and ERIC. Relevant terms were also searched in the following health sciences databases: CINAHL Plus with Full Text, Health Science: A SAGE Full-Text Collection, and Health Source: Nursing/Academic Edition. Reference lists in recent, pertinent articles and dissertations provided additional sources. The American Association of Community Colleges, Virginia Community College System, American Association of Colleges of Nursing, American Nurses Association, Bureau of Labor Statistics, Health Resources and Services Administration, National Center for Education Statistics, National League of Nurses, Virginia Department of Education, and Virginia.gov served as useful Internet websites.

Search terms for retention included but were not limited to the following: retention, persistence, and attrition searched in conjunction with community college or university. Search terms for nursing school retention included nursing student retention, nurse education, minority nursing student retention, nursing diversity, nurse licensure, and NCLEX-RN. Search terms for nursing shortage included Registered Nurse shortage, future of nursing, nurse diversity, and Baby Boomers. Search terms for developmental education included developmental education, remediation, under-prepared students, under-represented students, developmental mathematics, and developmental English cross-researched with community college student success and nursing student success. Other relevant terms included adult learners, first-generation students, high school diploma, General Education Development diploma, COMPASS®, online education, and Human Anatomy and Physiology courses.

### **The Registered Nurse Shortage**

The United States is in the midst of a nursing shortage but despite the projections, nursing schools continue to turn away qualified applicants. The shortage is further exacerbated by attrition in nursing school, failure of the NCLEX-RN, and an inadequate number of qualified nurse faculty. The American Association of Colleges of Nursing (AACN), the National League of Nurses (NLN), the American Nurse Association (ANA), and community college research groups work to develop strategies that will help thwart the shortage. The AACN and other nursing organizations publish student data research results and reported best practices to help guide programmatic decisions and policy changes so that the United States may successfully combat the growing RN shortage. The nursing shortage is a complex problem that reaches beyond the simplicity of a nurse deficit. Instead, the shortage of RNs can be attributed to nursing school admission practices, nursing school faculty shortages, population dynamics, and imminent changes in the way healthcare is managed in the United States

### **The National Nurse Shortage**

The Bureau of Labor Statistics projects Registered Nurse employment to reach 3.2 million by 2018. This projection, if accurate, will add 581,500 new jobs, a 22.2% increase over the course of ten years (BLS, 2011). There are multiple causes contributing to the RN shortage in the United States. The Baby Boomers (born between 1946 and 1964) are the country's most abundant generation with 78 million members. Between 2006 and 2011, 52 million of the 78 million Baby Boomers turn 60-65 years of age (Draper, 2010). By 2030, the number of United States citizens age 65 or older is projected to increase by 30 million (VCU, 2007). The aging Baby Boomers pose great

concern for the healthcare industry simply because the need for healthcare increases with age (Doroszkiewicz & Bień, 2007; Draper, 2010). If the nursing shortage is not solved, there will not be a sufficient healthcare force to care for the Baby Boomers.

The average age of RNs is currently 50, adding another layer to an already complex problem (AACN, 2011; ANA, 2010; HRSA, 2004). In 1980, only 25% of RNs were over 50 years-of-age, by the year 2000, this had increased to 33%. Just four years later, the number of RNs over the age of 50 had increased to 41% (HRSA, 2004). So between 1980 and 2004, the number of RNs over the age of 50 increased by 16% with a prediction that the largest age cohort of nurses to be between the ages of 50 and 69 within 20 years (Buerhaus et al., 2007). This prediction is further complicated by a scarcity of RNs under the age of 30; those who would stand to replace their senior colleagues. In 2004, only 8% of RNs were under the age of 30 as compared to 1980, when 25% of RNs were under the age of 30 (HRSA, 2004). The growth of an aging RN workforce is destined to have a significant impact on the nursing shortage if there remain too few nurses to replace those retiring (Kendall-Raynor & Waters, 2009).

Part of the nursing shortage may be attributed to an unequal distribution of the generations. The Gen-Xers, born between 1965 and 1976 comprise 16.5% of the total United States population (Raines, 2003). The Millennials, born between 1982 and 1998, comprise 24.3% of the United States population (McGlynn, 2005; Oblinger, 2003). According to the 2010 United States Census Bureau, 36% of population fall between 18 and 44 years of age and 40% of the population are 45 years of age or older (Howden & Meyer, 2011). The Gen-Xers and Millennials will be progressively tasked to care for the Baby Boomers without adequate manpower to fulfill the demand. An increased need for

nursing care, coupled with an imbalance in population numbers between the generations, raises valid concerns for an already under-staffed healthcare industry.

Nursing schools are experiencing a shortage of qualified nursing faculty, resulting in programmatic limitations on enrollment and further amplifying the healthcare shortage (AACN, 2011; L. H. Aiken, Cheung, & Olds, 2009; Berent, 2011). Virginia Commonwealth University reports that in 2005, nursing schools turned away nearly 42,000 qualified applicants. The AACN reports that nearly 55,000 qualified applicants were turned away from Bachelor degree and graduate degree nursing programs in 2009 because there is a shortage of faculty. The scarcity of faculty is illustrated by Southern Regional Board of Education (SREB) report that in the 2000/2001 academic year, 432 nurse faculty positions were available and there was a budget for an additional 350 positions (L. C. Hodges & Williams, 2002). There is an obvious problem finding and retaining nurse educator faculty, further aggravated as two-thirds of nursing faculty will reach retirement age by the year 2020 (Williamson & Salmeron, 2010). Approximately 50% of nurse educators who resign go on to work in clinical settings because of salaries differences (L. H. Aiken, et al., 2009; L. C. Hodges & Williams, 2002). Replacing nurse educators as they retire or move on to clinical jobs is difficult because of the lack of master and doctoral level nursing programs. Nursing schools are working to develop innovative ways to address the faculty shortages that include collaborative partnerships between hospitals and schools and the implementation of Teacher's Aides recruited from RN graduates (Velianoff, 2003).

### **The Commonwealth of Virginia Nurse Shortage**

Virginia's population grew 13% between 2000 and 2010. The largest area of growth was among the elderly (65+ years of age) and those near retirement (45-64 years of age), reaching 40% of the Commonwealth's population (USCB, 2011). However, the population of Virginia residents between 18 and 44 years of age grew only 12%, now 37.5% of the Virginia population. It is evident that the population is becoming more uneven in terms of age distribution much like the United States population.

The RN shortage in the Commonwealth of Virginia surpasses the national shortage. Virginia is expected to experience a 23.4% increase in the demand for RNs by 2018 (Virginia.gov, 2011). Virginia Commonwealth University predicts the demand estimated by Virginia.gov to be even higher, approximating a 45% increase between 2000 and 2020. Virginia.gov publishes frequently updated estimates of potential RNs (those who have just graduated or passed the NCLEX-RN) and updated RN positions available and, although these numbers change frequently, the general trend is that there are roughly two-four RN positions for every RN candidate (Virginia.gov, 2011). If enrollments in and graduates from RN programs do not increase, one in three patients in Virginia will not have a nurse to care for them (VCU, 2007).

In Virginia there are a limited number of nursing programs, especially when compared to the demand, adding yet another obstacle to solving the nursing shortage in Commonwealth. There are 55 Licensed Practical Nurse programs, 7 Diploma programs, 15 Bachelor of Science Registered Nurse programs, and 30 Associate Degree (AD) Registered Nurse programs. Of the 30 AD programs, 12 are proprietary (for profit) schools and 18 are community college programs (Virginia.gov, 2011). These programs

simply are not capable of producing an adequate number of RN graduates to fill Virginia's vacancies. There is a need in the Commonwealth to expand the existing nursing programs. Expansion is difficult because there is a deficit in qualified nursing faculty, due in part to the pay discrepancy between healthcare providers (\$10,000-\$15,000 more) and nursing programs and to the small number of graduate programs (SCHEV, 2004a).

In response to the growing demand for RNs the State Council for Higher Education in Virginia (SCHEV) has developed a strategic plan to meet the nursing shortage. In this plan SCHEV addresses four goals: 1) increase number of nursing faculty, 2) expand institutions' capacity to prepare students, 3) increase the number of graduates, and 4) improve retention of Virginia nurses in the workforce. Virginia colleges are challenged to increase the number of graduates from basic and advanced nursing programs by 35% within 15 years, a goal that hopes to meet the estimated shortfall. The strategic plan focuses on the financial barriers to procuring a nursing degree but does not address the academic barriers that students may face. Academic barriers are an important aspect of persistence research because many of the prospective nursing students will initially be placed into developmental courses. Under-prepared students run the risk of not meeting the minimum requirements for admission to a RN program.

### **Healthcare Reform and the Affordable Care Act**

On March 23, 2010, President Obama signed health reform legislation into law (Peterson & Williams, 2010). By 2014, the Patient Protection and Affordable Care Act (PPACA) will be fully implemented (Healthcare.gov, 2010; Peterson & Williams, 2010) and will have far reaching implications in the field of healthcare. Healthcare reform will

guarantee that number of United States citizens entitled to healthcare grows exponentially. A brief discussion of the population's access to healthcare will illustrate this projected growth. In 2007, 253.4 million people in the United States had some form of health insurance; 7 million of these individuals, about 3%, received some form of government healthcare entitlement. An additional 45.7 million United States citizens did not have any type of health insurance (DeNavas-Wait, Proctor, & Smith, 2008).

Approximately 18 million of the uninsured were between the ages of 18 and 34, an age group that is typically new to the workforce and report the fewest illnesses. When the PPACA is fully implemented in 2014, 32 million Americans who did not have health insurance will now have covered (Barack H. Obama, 2010). As a result of all of this, the healthcare industry will be facing an unprecedented increase in the number of United States residents who are eligible for healthcare. With an additional 32 million Americans gaining access to healthcare, an aging United States population, a shortage of qualified RNs, and a shortage of nurse educators, the healthcare industry and the education system are facing a difficult task. The PPACA attempts to address the strain that will be placed on the healthcare industry by outlining several support policies. These policies are described in The Healthcare and Education Reconciliation Act of 2010 and include ways to maximize education availability through scholarships, increase healthcare worker access to education, provide community healthcare education, and to make graduate education more affordable and accessible (NLN, 2010d).

### **Summary and Critique**

The nursing shortage will continue to be a concern for the next several decades as states attempt to develop new ways in which to address the shortage (AACN, 2011;



ANA, 2010; HRSA, 2004; NLN, 2010b; SCHEV, 2004a; VCU, 2007; Virginia.gov, 2011). The aging Baby Boomer population, the aging RN population, shortages of qualified RNs, shortages of qualified nursing school faculty, and unprecedented changes in the United States healthcare system will inevitably have profound consequences on the future of healthcare. Healthcare agency and academic research is concentrated on increasing enrollments in nursing schools through program expansion, student recruitment, faculty recruitment, and financial barriers that both faculty and students face (AACN, 2011; Blegen, Vaughn, & Vojir, 2008; Gebbie, 1999; L. C. Hodges & Williams, 2002; SCHEV, 2004b; VCU, 2007; Velianoff, 2003). While these are significant aspects of the nursing shortage, there are other noteworthy factors contributing to the nursing shortage. Although college-readiness may not be considered to directly cause the nursing shortage, there is a significant correlation. As students enter college without the skills to succeed, the impact can be tracked into nurse education and into the workforce.

### **Persistence and Retention**

With its early roots in psychology, student retention has continued to be an important topic of research for universities. Student success is often measured through an institution's ability to retain students. The works of Astin (1998), Bean and Metzner (1985 and 1987), Glogowska, Young, and Lockyer (2007), Jeffreys (1998), Lau (2003), Maldonado, Rhoads, and Buenavista (2005), Pascarella and Terenzini (1980), and Tinto (1993, 1997, and 2009) exemplify this importance. Community colleges also embrace the importance of student success, as defined in leading retention studies by Bean and Metzner (1987), Calcagno, Crosta, Bailey, and Jenkins (2007), Escobedo (2007), Goldstein and Perin (2008), Mohammadi (1996), Pascarella, Smart, and Ethington

(1986), Pascarella, Terenzini, Wolniak, Pierson (2003), Ortiz (1995), Sydow and Sandel (1998), and Wild and Ebbers (2002). This section describes the theoretical background of retention studies in higher education. And although persistence and retention have distinct definitions, the terms will be considered together in this section.

### **Theoretical Studies of Persistence/Retention at the University**

The success of a university is often measured by the institution's rates of student persistence/retention as defined by graduation rates (Terenzini & Pascarella, 1980). By the early 1970's, American universities had undergone a huge transformation and expansion, enrolling more students than ever before (Altbach, 2001). As public universities continued expanding, competition for funding became more dependent upon accountability measures via student success. In response to the university's growing need for government funding, institutional researchers began developing a theoretical framework through which to measure student success. Spady (1970), Tinto (1975), Pascarella and Terenzini (1980), and Astin (1984) were among the pioneers of student retention research, focusing on student attrition (dropping-out) and the reasons why students dropout. Both Spady and Tinto emphasized models that focused on the specific reasons that students were either integrated into a college or not, purporting academic and social integration processes as the chief influences on student persistence. Both models of student persistence are complex, each including a wide range of students' background factors (e.g., race, gender, socio-economic status) and institutional factors that influence students' decisions to stay in school or dropout (Pascarella, Smart, & Ethington, 1986; Pascarella & Terenzini, 1980).

Spady applied the characteristics of social integration, as identified by Durkheim's suicide theory, to predict which students are at risk for dropping out of school. Social integration, defined as a connection to the society, is not proposed as a direct cause of retention but instead is influenced by other variables, together leading to persistence or attrition (Durkheim, 1979; Spady, 1970). Spady advocates an interdisciplinary approach to student retention research, examining the interaction between individual student and the particular college environment. Building on Spady's model, Tinto developed a longitudinal process to measure the interactions between the individual's levels of social and academic integration (Tinto, 1975). In this model academic integration is defined as the student's academic performance and level of intellectual development as it happens in the classroom. Social integration is defined as the quality of peer-group interactions and student-faculty interactions as it happens in the classroom and outside of the classroom. Academic and social integration are further classified by the student's commitment to the institution and the goals that are associated with graduation and establishment of a career (Tinto, 1975, 1993; Tinto & Goodsell-Love, 1993). Spady's and Tinto's models have been the guiding theory behind many university based persistence studies (Fowler & Walberg, 1991; Glogowska, Young, & Lockyer, 2007; Lau, 2003; Maldonado, Rhoads, & Buenavista, 2005; Pantages & Creedon, 1978; Pascarella & Terenzini, 1980) providing researchers with measures of persistence, retention, attrition and the factors that contribute to each.

Pascarella and Terenzini (1979, 1980) expanded upon the work of Spady and Tinto with the development of a theory-based model of student attrition. This model measures the main and interaction effects of specific aspects of social and academic

integration on student persistence. The authors found that sex, racial/ethnic origin, informal contact with faculty, and parents' educational backgrounds were among the most important factors contributing to freshman persistence (Pascarella & Terenzini, 1979, 1980). Like Pascarella and Terenzini, other researchers have also defined a variety of student attributes including sex, race, ability, precollege experiences, and family backgrounds that when measured with institutional factors and individual goals expand predictive models of student persistence/retention (Astin, 1998; Fike & Fike, 2008; Glogowska, et al., 2007; Hagedorn, 2005; Jeffreys, 1998; Mohammadi, 1996; Pascarella & Edison, 1996; Pascarella & Terenzini, 2005 {Pascarella, 1996 #78}). Results of research indicate that non-traditional age (24+); first-generation college students, females, and under-represented students are at a higher risk of attrition than their peers.

Astin's theory of student involvement provides a simple approach by synthesizing the often-divergent empirical research presented by Spady, Tinto, and Pascarella and Terenzini. The basic premise of involvement theory refers to investment in various objects, occurs along a continuum, and encompasses qualitative and quantitative features. From an educational perspective, involvement includes personal development, student learning, and the educational policies or practices to increase student involvement (Astin, 1984). Astin's work has led to further studies that explore how the college system functions to include under-represented students (Barbatis, 2010; P. Gurin, E.L. Dey, S. Hurtado, & G. Gurin, 2002; Opp, 2002; Swigart & Murrell, 2001a).

Bean and Metzner (1985), Metzner and Bean (1987), Jeffreys (1998), Mayhew, Wolniak, and Pascarella (2008) and Fincher (2010) have compared persistence of traditional and nontraditional students by measuring differences in student success rates.

Traditional students are defined as 18-24 years of age, attend university fulltime, and live in a university residence (Bean & Metzner, 1985; Metzner & Bean, 1987). Nontraditional students are typically adult students (students over the age of 24), who tend to be commuter students, and often have external obligations such as work and family that may draw them away from the institution (Tinto, 1993). Nontraditional students exhibit a higher rate of attrition, which is attributed in part to external obligations (Fincher, 2010; Jeffreys, 1998; Metzner & Bean, 1987; Tinto, 1993). Although universities are experiencing increasing enrollments of nontraditionally aged students, community colleges remain the primary providers of higher education for nontraditional students (Astin, 1998; Cohen & Brawer, 2003).

### **Theoretical Studies of Persistence/Retention at the Community College**

Community colleges are a uniquely American invention that developed because of a societal need to educate the masses while encouraging the development of the country (Cohen & Brawer, 2003). Community college enrollments are projected to reach 8.2 million students by 2019, and the increased enrollments make it imperative to retain students (NCES, 2011). Community colleges serve a distinctive purpose in higher education by specifically and intentionally working to meet the economic needs of the local community. Examining persistence and/or retention at the community college has been problematic because the prevailing theoretical retention models focus on traditionally aged students at residential universities (Mohammadi, 1996; Webb, 1989; Wild & Ebbers, 2002). In response to the increased accountability community colleges are facing, new definitions of retention have been developed. Researchers have found that the ultimate goal of a community college student may not be degree attainment. In fact,

many students who enroll in a community college do so without the intent of degree attainment. These students are taking courses to ready them for college, to transfer to a university, learn job entry skills, or to update skills for their current job (Cohen & Brawer, 2003).

Public, two-year institutions tend to enroll disproportionate numbers of nontraditionally aged students, first-generation college students, and under-represented students (Fike & Fike, 2008; Mohammadi, 1996; Rendon & Matthews, 1989; Schuetz, 2008) who are at-risk for college attrition (Chaves, 2006; Fike & Fike, 2008; Mohammadi, 1996; Pascarella, et al., 1986; Pascarella, et al., 2003; Shugart & Romano, 2008). With high rates of attrition, community college researchers have worked to develop a theoretical basis to predict student success.

Tinto's longitudinal model of student attrition has been found to have some predictive validity for community colleges (Napoli & Wortman, 1998; Pascarella, et al., 1986; Pascarella & Terenzini, 1980). This model posits that students are more likely to persist in four-year institutions if they possess high levels of academic and social integration. In community college, academic integration is a more important predictor of persistence (Halpin, 1990). Although there is some predictive validity in applying Tinto's model to community colleges, researchers have discovered that the theoretical model does not accurately reflect the distinct characteristics and nature of community college students.

A large segment of community college retention research documents the development of retention definitions and models as they may be applied to two-year institutions. Prevailing community college persistence and/or retention research defines

institutional retention as the percent of entering students who persist in reaching their identified goal (Mohammadi, 1996; Sydow & Sandel, 1998; Walleri, 1981, 2001; Wild & Ebbers, 2002; Wyman, 1997). To address increasing funding accountability for community colleges, research has focused on the unique characteristics of community college students and the role these characteristics have in a student's decision to stay in school or dropout. College stakeholders may institute effective interventions through the development of an understanding of the reasons that students persist. The following characteristics dominate the retention literature: students' age, family educational background (first-generation college students), under-represented students, and under-prepared or at-risk students.

**Age: Traditional.** Traditional age students are members of the Millennial generation (born between 1982 and 1998). These students are more ethnically diverse, peer and parent dependent, technologically savvy, and educated than any generation in living memory (Henry, 2008; Howe & Strauss, 2000). The diversity of this generation contributes to the increasing diversity of student populations in two-year and four-year institutions. For example, of the 43% of Millennials enrolled in college, 57% are female, 13% are African American, 11% are Hispanic, and 6% are Asian (Henry, 2008). This racial/ethnic diversity is projected to increase even more with the next generation, the Millennial's children. There is a growing value placed on obtaining a college education among the members of this generation. Between 1998-2008, community college enrollment increased 34% and four-year institution enrollment increased 23% (NCES, 2011; Vaughan, 2006). The next several years are expected to produce a rise in college enrollment but economic downturns will likely result in a disproportionate increase in

low-income families (Greenhow, Walker, & Seongdok, 2009). This means that there will be an increase in financial aid in higher education and likely an increase in community college enrollment. Millennials are the “Baby on Board” generation, more dependent upon their peers and their families than were Baby Boomers or Generation Xers. The significant increase in two-year college enrollment may be attributed, in part, to the number of Millennial students who choose a community college over a university so that they may stay close to their parents. The National Center for Education Statistics corroborates this, reporting that 30% of all 18 to 24-year olds who are enrolled in a higher education institution attend a two-year college.

The impact of the implementation of No Child Left Behind (NCLB) has its effects first in the Millennials. As a result, this generation is accustomed to standardized assessments and expects to receive focused feedback. This act mandates accountability measures for student performance (Bush, 2001) and has resulted in teachers feeling forced to raise test grades. Critics of this newest cohort of students fear that the rote learning style taught during primary and secondary education has led to an absence in critical thinking skills which may translate into a lack of college-readiness (Elam, Stratton, & Gibson, 2007).

**Age: Nontraditional.** According to the National Center for Education Statistics, 33% of full-time students over the age of 24 enroll in a public two-year college (2011). Adult students (or nontraditional students) often work at least 25-hours per week or have minor children (Bean & Metzner, 1985; Ortiz, 1995; Schuetz, 2008). Because of external responsibilities, adult students often feel marginalized during their first college experience and need to be validated as important participants in higher education to help



them achieve academic integration and succeed in college (Chaves, 2006; Halpin, 1990; Rendon & Matthews, 1989; Schuetz, 2008; Tinto, 1993). Part of academic integration is student engagement, which is identified as an important factor in student retention. Astin (1993), Tinto (1993), and Spady (1970) define student engagement as the social and academic ties that a student has to an institution.

Community colleges with Associate Degree Nurse (RN) programs should develop an understanding of the factors that lead adult students to persist or dropout of college for two very important reasons. First, the National League for Nursing reports that 74% of students enrolled in Associate Degree Nurse (RN) programs are over the age of 25 (NLN, 2010e). Second, the American Association for Colleges of Nursing report that 60% of all RN programs nationally are offered community colleges (AACN, 2008).

**First-generation students.** A first-generation college student is one whose parent(s) have not attended any higher education institution (Fike & Fike, 2008; Ishitani, 2006; Rendon & Matthews, 1989; Settle, 2011; Wells, 2008). First-generation students are much more likely to attend community college; currently 45% of the student population in public community colleges are first-generation (Francis & Miller, 2007; Nomi, 2005; Vaughan, 2006). In general, first-generation community college students attend college to improve job skills or to attain an associate degree, but are at higher risk of attrition (Gibson & Slate, 2010; Ishitani, 2006; Settle, 2011; Stieha, 2009). A variety of factors may contribute to the higher risk of attrition among this group: being raised in a family that does not value education and/or understand the skills necessary for college success, lack of educational preparedness, or unstable financial resources (Francis & Miller, 2007; Nomi, 2005; Prospero & Vohra-Gupta, 2007).

The demographic composition of first-generation students is of particular interest. In the American Association of Community Colleges “Faces of the Future”, Nomi describes first-generation college students as 67% females with a median age of 24. Nomi goes on to report that 53% of Hispanic students are first-generation as compared to 43% of Native Americans and 41% of African American students, with White and Asian American students less likely to be first-generation students. Often, first-generation community college students come from lower socioeconomic backgrounds and are underprepared for college level work (Ishitani, 2006; Nomi, 2005; Prospero & Vohra-Gupta, 2007; Schuetz, 2008; Whitaker & Pascarella, 1994). The median annual household income for first-generation college students is \$30,000 and as a result of the income level, 55% of first-generation college students rely on some form of financial aid (Nomi, 2005). The United States Census Bureau defines the poverty threshold as \$17,000 for a family of three, all over the age of 18. The characteristics unique to first-generation community college students have been linked to increased rates of attrition (Prospero & Vohra-Gupta, 2007; Wells, 2008).

**Under-represented students.** Defining under-represented students is a difficult task that is expected to change drastically over the next few decades. Although White individuals are currently considered the population majority, by 2050 the United States Census Bureau projects that only 35% of all United States citizens will identify as *White alone*, making the term minority or under-represented moot. For purposes of the current study and to understand prevailing research, under-represented students will be defined. These students are often part of a racial or ethnic minority group, come from a low socioeconomic background, are first-generation college students, or have graduated from a

high school that was unable to adequately prepare them for college (Handel & Herrera, 2003).

Currently, 46% of all racial/ethnic minority students in higher education are enrolled in community colleges (Cohen & Brawer, 2003) and 41% of the community college student population consists of racial/ethnic minorities (Vaughan, 2006). Opp elaborates on the work of Cohen and Brawer and Vaughn stating that 56% of all Hispanics and 42% of African Americans enrolled in higher education attend community college (2002). Ortiz (1995) corroborates Opp, asserting that Hispanics are more likely to attend community college than African Americans or Whites. Studies indicate that members of racial/ethnic minority groups are less likely to persist in a predominately White institution (Pascarella & Terenzini, 1991; Swigart & Murrell, 2001b) due in part to a lack of the institution's acculturation of under-represented students. Racial/ethnic minorities are also more likely to place into developmental courses (VCCS, 2011).

Studying of the impact of diversity has been largely limited to four-year institutions with the few community college diversity studies limited to individual institutions (Davies, Safarik, & Banning, 2003; Escobedo, 2007). The theoretical models posited by Spady, Tinto, and Astin does not account for how under-represented students are incorporated into the college system. Researchers are interested in develop models that may aid in forecasting variables that contribute to persistence. Barbatis (2010) examined perceptions of community college students who persisted or dropped out from one learning community, Gurin, Dey, Hurtado, and Gurin (2002) explored the impact of diversity on cognitive development, and Maxwell and Shamma (2007) looked at race and ethnic relations of community college students. Each of these studies reports that

diversity in college can manifest both positive and negative results. Acculturation (the continuous exchange between diverse cultural groups) for ethnic majorities and minorities has been linked to improved student persistence (Braxton & Hirschy, 2005), student social integration, and student academic integration (Patricia Gurin, Eric L. Dey, Sylvia Hurtado, & Gerald Gurin, 2002; Maxwell & Shammas, 2007). Conversely, students who identify as minorities may feel marginalized by real or perceived barriers (Davies, et al., 2003; Pope, 2002).

Understanding the racial/ethnic make-up of community colleges is important for stakeholders if they wish to address the lack of diversity in Associate Degree Nurse programs and in the RN workforce. Even though community colleges are considered racially/ethnically diverse institutions, there is a discontinuity between the general community college population and RN population. Vaughan and Nomi state that minority students comprise 40% or more of the current community college population. According to the National League for Nursing, only 29.2% of students enrolled in Associate Degree Nurse (RN) programs are racial/ethnic minorities (2010). The lack of student diversity in ADN programs is exacerbated by a White majority of nurse educators as only 10-15% of nurse educators identify as members of a racial/ethnic minority (NLN, 2009).

**Under-prepared or at-risk students.** Under-prepared students come to college with economic hardships, academic deficiencies, external factors that may hinder attendance, and little time for participation in courses or activities (Opp, 2002; Ortiz, 1995). One study reports 53% of at-risk students also identified themselves as members of a racial/ethnic minority, while only 39% of their White peers qualified as at-risk students (Escobedo, 2007). This group of students face unique problems that include

being blamed for their lack of success, persistence to a degree, or for their failure to transfer to a four-year institution (Davies, et al., 2003). It is evident that secondary education plays a major role in collegial success and differences in Scholastic Aptitude Test (SAT®) scores across public high school students illustrate the impact of high school education on college readiness. Nearly half (45%) of the 2008 public school enrollments were members of a racial/ethnic minority group (NCES, 2011). But only 17% of African American, Hispanic, and American Indian students scored in the top quintile of SAT scores while 79% of this racial/ethnic minority group scored in the bottom quintile (Handel & Herrera, 2003). Further, students from high-poverty schools averaged lower SAT® scores than students from low-poverty schools. The National Center for Education Statistics also reports that the public schools with the highest poverty had the lowest populations of Whites and the highest populations of African American and Hispanics. In fact the majority (88%) of students in high-poverty, public, secondary schools in city and suburban areas are members of a racial/ethnic minority (NCES, 2011). Defining at-risk students and developing interventions to increase college readiness will help to prevent attrition among at-risk students and will help to increase persistence in minority pre-nursing students.

At-risk students come to college without the background to succeed. One group that is at risk is high school dropouts who have received a General Education Development diploma (GED). A high school diploma is a state-administered official document awarded upon successful completion of secondary school requirements (Education.com, 2010). But amid that very basic definition of a high school diploma are vast differences in the quality of education students receive. In 2001, President Bush

signed into law the No Child Left Behind Act (NCLB) mandating statewide standardized testing to measure student success (Bush, 2001) in a effort to close the gap between disadvantaged minority students and their peers. In response to NCLB, more than half of the states have implemented a high school completion exam (D'Agostino & Bonner, 2009; Thurlow, Cormier, & Vang, 2009) with results indicating that high school standards have fallen below college level requirements. Scores on standardized exams and inflated grades as a result of NCLB have given students a false belief that they will be successful in college when, in fact, they are not college ready (D'Agostino & Bonner, 2009).

According to the National Center for Educational Statistics (NCES) three million 16 to 24-year-olds were counted as high school dropouts in 2008. Although there are many factors that lead to students to dropout of high school, family income is one of the most influential reasons students report for dropping out; with decreased family income comes increased drop-rates. If an individual wishes to earn a high school equivalency certificate after dropping out, they must demonstrate that they possess the same academic skills as a high school graduate. The most common of the high school equivalencies is the General Education Development diploma (GED), 5.2% of those with high school credential have a GED (ED.gov, 2004). The comprehensive GED tests are developed by the American Council on Education to include writing, reading, science, social studies, and mathematics. In addition to the GED another high school equivalency test is the Individual Student Alternative Education Plan (ISAEP). The ISAEP is designed for students age 16-18 who have difficulty finding success in a regular classroom (Virginia.gov, 2010).

Because family income is reported to be the most crucial factor in student persistence to a high school diploma the NCES has gathered socioeconomic data on GED recipients. According to the National Center for Educational Statistics in 2001, 11% of GED recipients were from low income, 5% from middle income, and 2% from high-income households (NCES, 2011). In addition to reporting low income, the NCES states that foreign-born and under-represented students exhibit higher dropout rates than those in the majority. Virginia students persist to a high school diploma at a slightly higher percentage than the national average of 73.9%. In the 2008/2009 academic year Virginia public schools retained 77% of the incoming 2005/2006-freshman class. Of the 88,000 reported 2008/2009 Virginia high school graduates, approximately 1% received a GED on or before the 2008/2009 graduation (VDOE, 2010). An additional 3% of the 2008/2009 graduating class earned an ISAEP.

The number of General Education Development diploma (GED) recipients that require remediation is likely to be higher than students with a traditional high school diploma. Investigating these differences has historically, been difficult as states were allowed to group high school graduates and GED recipients together. However, the implementation of the federal No Child Left Behind Act put a stop to (Thurlow, et al., 2009). The separation in state reporting will allow researchers to study the impact of a GED or high school diploma on college persistence. Additionally, researchers will be able to develop strategies for interventions that specifically target either high school graduates or GED recipients.

### **COMPASS® Test Role**

Community colleges require that first-time students take an assessment exam to guide the student in planning a course of study. The American College Testing Program (ACT) has developed an assessment called the Computer-Adaptive College Placement test (COMPASS®). The COMPASS® test evaluates incoming students' skill levels in reading, writing, and mathematics. Once scores are generated, courses are suggested based upon the results. Table 1 displays the recommended cutoff scores for the various English and reading courses, Table 2 displays the cutoff scores used by the study institution, and Table 3 displays the suggested mathematics cutoff scores. The VCCS is currently implementing a new approach to developmental math with a new placement test that was designed for the Virginia Community College System. During the tenure of this study, the COMPASS® placement test was still the placement test of choice.



Table 1

*Suggested COMPASS Stage 1 Cutoff Scores Based on National Data*

COMPASS Scores	Course Recommendations
Reading	
0-60	Reading Developmental 1
61-80	Reading Developmental 2
81-100	No reading Required
Writing Skills	
0-37	Developmental English 1
38-69	Developmental English 2
7-100	Freshman English
COMPASS e-Write 2-8	
2-4	Developmental English 1
5	Developmental English 2
6-8	Freshman English
COMPASS e-Write 2-12	
2-5	Developmental English 1
6-7	Developmental English 2
8-12	Freshman English

*Note.* Adapted from “COMPASS® placement test cutoff scores” by ACT, 2010, <http://www.act.org/compass/resources.html>.

Table 2

*COMPASS Stage 1 Cutoff Scores*

COMPASS Scores	Course Recommendations
Reading	
0-64	Reading Developmental 1
65-75	Reading Developmental 2
76-80	English 108 Recommended
81-99	No reading Required
Writing Skills	
0-47	Developmental English 1
58-68	Developmental English 2
69-75	Decision Zone (Readers involved)
76-99	Freshman English
COMPASS e-Write 2-8	
2-4	Developmental English 1
5	Developmental English 2
6-8	Freshman English
COMPASS e-Write 2-12	
2-5	Developmental English 1
6-7	Developmental English 2
8-12	Freshman English

*Note. Personal communication with college English faculty member.*

Table 3

*COMPASS Cutoff Scores*

ACT math	COMPASS Scores	Course Recommendations
		Pre-Algebra
0-17	0-43	Arithmetic Review experiences
18-20	44-100	Elementary Algebra or courses with arithmetic prerequisite
		Algebra
18-20	0-45	Elementary Algebra or courses with arithmetic prerequisite
21-22	46-65	Intermediate Algebra or courses with elementary algebra prerequisite
23-25	66-100	College Algebra or courses with intermediate algebra prerequisite
		College Algebra
23-25	0-45	College Algebra or courses with intermediate algebra prerequisite
26-27	46-100	Trigonometry or Business Calculus or courses with college algebra prerequisite
		Trigonometry
26-27	0-45	Trigonometry or Business Calculus or courses with college algebra prerequisite
28-36	46-100	Calculus I or courses with college algebra and trigonometry prerequisites

*Note.* Adapted from “COMPASS® placement test cutoff scores” by ACT, 2010, <http://www.act.org/compass/resources.html>.

### **Developmental Education and Community College**

The Virginia Community College System's (VCCS) mission, as posted on their website, is "We give everyone the opportunity to learn and develop the right skills so lives and communities are strengthened." An important part of the community college mission is to prepare students for college level courses by teaching them basic reading, writing, and math skills. Students are placed into developmental courses for reasons not necessarily reflective of a student's intellectual ability but instead may be attributed to a lack of preparedness. More and more students reach college unprepared for the rigors of the course requirements and load, the magnitude of which is exemplified by the sheer number of community college students enrolled in developmental courses (Cohen & Brawer, 2003; Vaughan, 2006). The importance of higher education (certificate, degree, or job skill) has grown substantially since the 1970's and so too have the number of students who are not college-ready. Of the 6.6 million community college students, approximately 50% of all first-time students enroll in at least one developmental course (Bailey, et al., 2010; Burley, et al., 2001; Cohen & Brawer, 2003; C. Horn, et al., 2009). By the late 1990's, 29% of all community college reading and writing courses and 32% of math courses were offered at developmental level (Cohen & Brawer, 2003). Within the Virginia Community College System, local community colleges list up to 35% of English courses and 43% of math courses at developmental level illustrating the current status of this phenomenon.

Although the research on developmental education is vast, much of it is focused on student outcomes; completing developmental courses and then moving on to college-level courses. The VCCS report on college readiness among first-time, first year college

students who graduated from high school within the previous 12 months states that 18.5% enrolled in developmental courses (K. W. Miller, 2008). Current explorations of student outcomes suggest that first-year community college students who enroll in developmental courses are less likely to persist to their second year of school and are less likely to achieve college-level competencies in those areas in which they need remediation (Bahr, 2007; Bailey, 2009; Bettinger & Long, 2005; Burley, et al., 2001). There is both a social and a financial price to developmental education and student attrition for community colleges: researchers have long understood that the price of retaining a student is far less than the price of recruitment.

### **College-Readiness and Developmental Education**

A high school diploma should indicate that a student is ready of college or work (Pritchard, 2010). Nationally, only 34% of high school graduates are considered college-ready (Wehling, 2008). The Commonwealth has a slightly higher rate of college-readiness among high school graduates at 40%. In response to the Spellings Commission Report, the Virginia Community College System (VCCS) has begun to address the academic weaknesses of its recent high school graduates. The VCCS reported that only 14% of incoming students in a 2006 cohort were college-ready in both English and math.

President Bush enacted no Child Left Behind (NCLB) in 2001 to standardize education through the implementation of common accountability measures (Nichols-English & Guion, 2008). In Virginia these criteria came in the form of “Standards of Learning” forcing teachers to teach so that students do well on the assessments, i.e. teach to a test, or the school may face funding cuts. High school seniors report receiving “A”’s and “B”’s after studying only two or three hours per week in what seems to be a result of

the pedagogical shift in public schools (Spencer, Macdonald, & Archer, 2008). This gives students a false sense of ability so when they arrive at the front door of college they are unprepared.

More troubling is the disparity of college-readiness among racial/ethnic groups. According to Greene and Winters, 40% of Whites, 23% of African Americans, and 20% of Hispanics are eligible for college right out of high school. In response to a declining number of high school graduates prepared to enter college, the Bill and Melinda Gates Foundation has invested in several initiatives for low-income and minority youth. The Foundation hopes to help ensure that a high school education will result in college readiness and that post-secondary education results in the attainment of a degree or certificate (Gates & Gates, 2009). The Gates Foundation is focusing much effort on low-income and minority youth attesting that education is the most powerful equalizer.

### **Empirical Studies in Developmental Education**

Prevailing research measures student success in developmental education by computing the developmental courses together as a single study variable, differentiating only between developmental and non-developmental students (Bailey, 2009; Bailey, et al., 2010; Bettinger & Long, 2005; Burley, et al., 2001; D. Z. Hodges & Kennedy, 2004; Illich, et al., 2004; Perin, 2004). Additional research focuses specifically on mathematics remediation; measuring both direct and indirect effects (Bahr, 2007, 2008; Umoh & Eddy, 1994; Zavarella & Ignash, 2009). Other research investigates the impact of placing into developmental reading or writing on student success (Crews & Aragon, 2007; Moss & Yeaton, 2006; Perin & Hare, 2010; Willingham & Price, 2009). More recently, researchers have acknowledged the importance of early identification of at-risk students

as an important area of research in developmental education (Gordon & Copes, 2010; Jeffreys, 2007a, 2007b; Poorman, Mastorovich, & Webb, 2008; Shelton, 2003; Stokes, 2003). Very few studies, however, consider the impact of student placement recommendation into developmental education on persistence to and retention in nursing school (Hawsey, 1997; Peters, 2010; Shore & Shore, 2003).

**Student outcomes.** Developmental education is estimated to cost community colleges up to \$2 billion but the number of students who took at least one developmental course and went on to receive a college degree is only 25% (Collins, 2010). The disparity between developmental education and degree attainment has generated interest among community college stakeholders. Bahr examined the effectiveness of remediation in students who have a severe skill deficiency finding that they fare as well as students who have a moderate skill deficiency. Bahr also examined the difference in success rates of students who have multiple skill deficiencies compared to students with a single skill deficiency. The findings of this research indicate that if a student is successfully remediated, no matter the skill deficiency, they will attain degrees at the same rates as those students who required no remediation (Attewell, Lavin, Domina, & Levey, 2006; Bahr, 2010). Other research claims that developmental education has a negative effect on students on the margin of needing remediation (Boatman & Long, 2011). The cost/benefit of developmental education is a controversial topic because only one-in-four remedial students will graduate from a two-year college and only 50% of remedial students will graduate from a four-year school (Attewell, et al., 2006). Efforts to address the costs of remediation include the restricting of courses to accelerate student progression through the developmental sequences (Edgecombe, 2011).

**Developmental students compared to non-developmental students.** Data obtained from the Achieving the Dream initiative (funded in part by LUMINA) indicates that approximately 34% of all entering college students are referred to some level of developmental reading course, numbers that are even higher in mathematics remediation. According to Bailey, 68% of students successfully complete the developmental writing courses in which they enroll, 71% complete the developmental reading courses in which they enroll, and 30% complete the developmental mathematics courses in which they enroll. Bailey has stressed the significance of measuring student progression through developmental course sequences, finding that roughly half of the students referred for remediation do not successfully complete their first course. Corroborating the results of the Bailey studies, Hodges & Kennedy (2004), Illich, Hagan, & McCallister (2004), and Perin (2004) report that 50% students do not complete the developmental courses in which they are placed.

Researchers agree that developmental students are at a higher risk of attrition, but inquiries in this field are limited as most studies compare developmental to non-developmental students, paying little attention to the impact of the students' background characteristics (Bailey, 2009; Bailey, et al., 2010; Bettinger & Long, 2005; Kolajo, 2004). The results of several studies have begun to lend credence to the roles that age, gender, and socio-economic status play in the need for remediation. Bettinger and Long, conducting a longitudinal study of community college students, report that demographic characteristics play a significant role in student placement recommendation into developmental courses. The authors assert that women and minority (under-represented) students are more likely to place into developmental courses than men and non-minority



students, statistics that are consistent to the VCCS study on developmental education. Earlier studies yield similar results, reporting that in addition to the role of gender and racial/ethnic identity, age (non-traditional) is a critical predictor of placement recommendation into and success in developmental courses (Burley, et al., 2001; Kolajo, 2004).

**Developmental mathematics and student success.** Mathematics remediation continues to captivate researcher interest in developmental education because of the financial and social implications associated with the cost of remediation. Umoh, Eddy, and Spaulding (1994) applied Tinto's model of institutional departure to student retention in developmental mathematics. The authors found that pre-enrollment characteristics like age, gender, GPA, parents' education, had no direct statistically significant influence on student retention in developmental mathematics. These results are analogous to Bean and Metzner's premise that pre-enrollment characteristics exhibited an exclusively indirect effect on retention. Zavarella and Ignash measured the impact of the type of instructional delivery in developmental mathematics courses considered with student pre-enrollment characteristics. The results of the Zaverella and Ignash study were similar to the Umoh, Eddy, and Spaulding study. Although pre-enrollment characteristics were not influential on attrition, the authors did find that course delivery method had a significant impact on retention. Students enrolled in online or hybrid developmental mathematics courses were more likely to withdraw than students enrolled in a traditional course (Zavarella & Ignash, 2009).

Research has revealed that developmental education exhibits the "Matthew Effect": students who need remediation the most are the least likely to succeed and those

who need remediation the least are the most likely to succeed (Bahr, 2007; Integrating cultural competence awareness into allied health education, 2008). In his 2007 study, Bahr hoped to disprove the “Matthew Effect” phenomenon by measuring the success of remediated students as compared to non-remediated students. He found that math remediation is compounded negatively when coupled with a need for English remediation. When a student has strong English skills, math remediation is able to resolve the academic disadvantage of math skills deficiency. These results are in contradiction to critics’ arguments that remediation wastes tax dollars, diminishes academic standards, and demoralizes faculty (Bahr, 2008).

**Developmental reading, writing, and student success.** Reading and writing skills are imperative for student success in any course. Few studies have compared academic achievement of developmental English participants and non-participants (those who place into developmental English but do not enroll in the developmental course) a gap in the literature that Crews and Aragon attempted to fill. In their comparison between developmental writing participants and nonparticipants, the authors found that participants had a significantly higher percentage of credit hour completion. The authors compared students who enrolled in the developmental English course during their first semester to students who enrolled in the developmental course during a later semester. When later participants were compared to nonparticipants the authors found no significant difference in the number of credit hours completed (Crews & Aragon, 2007). The results indicate that the earlier the remediation occurs, the better the students’ chances of success.

Moss and Yeaton conducted a study exploring the effectiveness of a developmental English program and found that developmental students were being adequately prepared for college-level work. The authors further explain that those students who were most in need of English remediation benefitted the most, contradictory to the claims of the “Matthew Effect” (Moss & Yeaton, 2006). Perin and Hare report similar results from their study of students participating in a writing intervention. Students who were in need of writing remediation received contextualized skills based upon real-life situations. Through the use of a pre-test/post-test design, the authors determined that the strategies implemented successfully prepared students for college level writing (Perin & Hare, 2010). The overarching theme of these studies reveals that students who place into a developmental course and complete this course during the first semester of college are more successful in their academic endeavors than those students who place into a developmental course but do not take the class before enrolling in college level courses.

Willingham and Price investigated the influence of vocabulary instruction on the growth of reading skills among developmental students. The authors base their study on three theories: “schema theory”, “zone of proximal development”, and “Matthew effect” (Willingham & Price, 2009). Each of these theories professes the importance of both where a student is academically when they arrive at college and the student’s academic potential. The results of their research indicates that the most effective way in which to remediate students in reading is through a combination of instructional methods, helping students to gain an appreciation of reading through increasing their vocabulary.

**Developmental education and nursing school persistence.** There is an abundance of research in the areas of developmental education and nursing school persistence but there is limited research that brings these two subjects together. Although nursing schools are turning away qualified applicants, there is a growing concern with educating a diverse workforce. Educators are slowly realizing the importance of cultivating the needed skills in underprepared or at-risk students in increasing diversity (Noone, Carmichael, Carmichael, & Chiba, 2007). Shore and Shore attempted to development a math remediation program specifically targeting health science students. The results of their study yielded significant results indicating that when teaching remedial math to health sciences majors, using health-related applications (Shore & Shore, 2003). Peters is among those who sought to determine the impact of needing remediation on student success in nursing school. Results of the study suggest that fewer Associate Degree nurse graduates were required to take developmental courses than the college population (Peters, 2010). Similar to previous studies that identify age, race/ethnicity, socio-economic status, and academic preparedness as predictors of nursing school persistence, Peters found these variables to be helpful in predicting academic skill level. An additional result of Peters study that warrants attention is the impact of the type of remedial coursework a student is required to take on student's final GPA in the nursing program and on NCLEX-RN pass rates.

### **Developmental Education Success in the VCCS**

The Virginia Community College System (VCCS) released a developmental education report as part of the Chancellor's Achieve 2015 initiative. The report indicates that in the Commonwealth, only 20% to 52% of students successfully completed

developmental math on their first attempt. Of those students who were not successful in their first attempt of a developmental math course, approximately 33% re-enrolled in the same course and 33% of those were successful (VCCS, 2011). Student success in developmental English was higher, between 69-75%. In addition to the low success and retention, graduation rates and transfer rates to four-year institutions were low, 39%, among students placing into developmental courses. Developmental students had a low community college graduation rate (within 4 years) of 12%. The VCCS also found that students who placed into developmental math were less likely to succeed than their college-level peers (VCCS, 2011). Further, 61% of students defined as low-income (Pell grant status) placed into developmental courses while only 45% of students not on Pell grants placed into these courses. As part of the VCCS's Achieve 2015 initiative, community colleges in the state are implementing redesigns of both developmental math and English.

### **Developmental Education Redesign**

In response to meager gains made in student success, there has been a national movement to redesign the way in which developmental courses are taught. Some of the keys identified as best practices include effective faculty, accurate placement tests, and program evaluations (Boatman & Long, 2011; Collins, 2010; Levin & Calcagno, 2008; Mellow, Woolis, & Laurillard, 2011). Other studies advocate for a holistic approach to assessing and advising students, placing the students in courses and experiences that will foster the most personal and academic growth (Boylan, 2009). The VCCS has recently undergone a massive redesign project for developmental courses, outlined by the Developmental Education Task Force. Because so many students are being required to

enroll in developmental math courses, this seemed a logical place to begin. The new developmental math curriculum divides developmental math into 9 modules instead of the four developmental math courses that had been traditionally offered and has been adopted by a number of colleges in the VCCS. Developmental English redesign involves replacing the six developmental courses with a three-tiered system that will offer the opportunity for faculty to recommend students for placement in English 111 upon completion.

### **Nursing School Retention**

Retention has been studied at length at both the university and community college level. An extensive search of the literature in nursing and higher education uncovered a number of conceptual models that explain undergraduate attrition but only one model was specifically designed for nontraditional students. Further, no conceptual models had targeted nursing students exclusively. The conceptual retention models of Tinto (1975) and Bean and Metzner (1985) have been applied to nursing student retention with some success, but a large gap in retention studies continued to exist. In response to this gap in theoretical models, Jeffreys (2004) established a model for examining nontraditional undergraduate nursing student retention and success (NURS).

### **Tinto's Conceptual Model of Student Retention**

Nursing school administrators, practitioners, and researchers understand the importance of student retention when considering the nurse shortage. It is especially important for nursing schools to understand the unique set of barriers that nontraditionally aged, under-represented, under-prepared students face before they can even apply to nursing school. The National League for Nursing reports that 74% of all

ADN students are of nontraditional age, 28.2% are racial/ethnic minorities, and many students are underprepared for the nursing school prerequisites. Benda (1991) and Courage and Godbey (1992) applied Tinto's conceptual model of student retention to Bachelor's Degree Registered Nurse (BSRN) students and found that pre-entry variables like math background, high school GPA, and the number of years of natural sciences taken during high school all significantly impact persistence to a BSRN degree. Retained students exhibited more confidence in their math skills, ability to pay, they placed a higher value on education, and they possessed a higher cumulative GPA than those students who departed (Benda, 1991; Courage & Godbey, 1992). These studies report that pre-entry variables, academic integration, and social integration were each significant to student retention. De Lima, London, and Manieri (2011), Fowles (1994), Sayles, Shelton, and Powell (2003), and Tipton et al. (2008) observed similar results reporting that ACT scores, grade in Human Anatomy and Physiology, and GPA of introductory nursing courses were the best predictors of successful completion of the NCLEX-RN.

Sadler (2003) added another layer to the nursing student retention research by measuring the effectiveness of student admission essays in predicting persistence. The author found that the majority of nursing school completers reported some personal or family care-giving situation that sparked their interest in nursing while the students who dropped out did not report such situations (Sadler, 2003). Perspective students cited an investment in becoming a nurse because of a desire to serve society and help others (Buerhaus, Donelan, Norman, & Dittus, 2005; Sadler, 2003). Coupled with a personal motivation to become a nurse, students are also more likely to succeed in nursing school

if they develop an emotional tie to the institution through their relationships with other students and faculty (Courage & Godbey, 1992; Poorman, et al., 2008).

### **Jeffreys' NURS Model**

Bean and Metzner studied nontraditional students, and their theoretical premise may easily be applied to nursing students, as many are nontraditional. Bean and Metzner propose that three variable sets influence a student to persist in college: 1) background and defining variables, 2) academic variables, and 3) environmental variables. Jeffreys applied Bean and Metzner's model as the conceptual framework for several studies through which she developed the Model of Nursing Undergraduate Retention and Success (see Appendix A for reproduction of model). The Model of Nursing Undergraduate Retention and Success (NURS) model asserts that retention decisions are based on a combination of the following factors: student profile characteristics, student affective factors, environmental factors, professional integration factors, academic outcomes, psychological outcomes, and outside factors (2004). Jeffreys notes the importance of developing interventions and programs that are specific for nontraditional nursing students (Jeffreys, 1995, 1998, 2001, 2004, 2007a, 2007b).

**Traditional and non-traditional undergraduate nursing students.** Empirical nursing school retention studies have been limited to traditional, baccalaureate nurse programs. Jeffreys presents a multi-dimensional model to measure nursing student retention and success. A traditional undergraduate nursing student is defined as any student enrolled in an undergraduate nursing program (diploma, associate degree, or baccalaureate) who is under the age of 24, female, enrolled full-time, identifies as White, has no dependent children, has a high school diploma, and required no remediation. A



nontraditional undergraduate nursing student is defined as a student enrolled in an undergraduate nursing program (diploma, associate degree, or baccalaureate) who meets one or more of the following criteria: over 25 years of age, male, enrolled part-time, required remediation, identifies as a member of a racial or ethnic minority group, has dependent children under the age of 18, or has a GED (Hawsey, 1997; Jeffreys, 2004).

The National League of Nursing publishes data that reports the age, race/ethnicity, and retention status of nursing students. This data can be used to develop an overall picture of the typical nursing student. Because age is often correlated with student persistence, it is an important student characteristic in any retention study. In 2008/2009, 68% of Licensed Practical Nursing (LPN) students were over the age of 26, 74% of Associate Degree Nurse (ADN) students were over the age of 26, and 87% of Bachelor Science Registered Nurse (BSRN) students were over the age of 26. NCES (2011) reports 38.7% of all college students enrolled in degree-granting institutions are over the age of 24 and Vaughan (2006) reports that nearly 50% of community college students are over the age of 24. Age, as a predictor of persistence, is complex because the impact of age on persistence is frequently tied to other student characteristics. Jeffreys points out that nontraditionally aged students are subject to common misconceptions such as being poorly equipped to succeed in higher education. Often, older students who are in a minority on a college campus feel as if they receive differential treatment, which adds to feelings of low confidence. On campuses where there are larger groups of nontraditional students, older students will exhibit higher rates of success.

**Under-represented nursing students.** Race/ethnic identity also receives a great deal of attention in retention studies. Existing studies explore the recruitment, retention,

and completion rates of under-represented nursing students. Among successful nursing student recruitment strategies are those that involve peer-to-peer interaction (Anderson, 1991). Once recruited, racially/ethnically diverse pre-nursing and nursing students face both tangible and perceived barriers to success (L. C. Aiken, Cervero, & Johnson-Bailey, 2001; Amaro, Abriam-Yago, & Yoder, 2006). African American women have reported differential and unfair treatment during the course of their respective nursing programs, inevitably leading to attrition (L. C. Aiken, et al., 2001; Gardner, 2005). Hispanic students cite a lack of Hispanic role models in health care, lack of family support, low socio-economic status, and poor educational attainment as barriers in nursing education (Amaro, et al., 2006; Zalaya, Alpert, Xu, & McDonough, 2011). Under-represented students frequently face barriers that they report as loneliness, lack of support from teachers, insensitivity, and discrimination (Gardner, 2005) all of which may hinder success. Because of the high attrition rate of under-represented students in nursing school or before, there is little diversity in the nurse workforce as White nurses account for 90% of all RNs in the United States (Amaro, et al., 2006; Gardner, 2005; Jeffreys, 2004; Noone, et al., 2007; Sayles, Shelton, & Powell, 2003).

The lack of diversity in the workforce is not reflected in the pre-nursing curriculum and nursing school enrollments. In LPN programs, 35.5% of enrolled students identified themselves as a racial/ethnic minority, 28.2% of enrolled ADN students, and 23.6% of BSRN students identified themselves as members of a racial/ethnic minority group. Between 23% and 36% of all students enrolled in a nursing program identify themselves as members of a racial/ethnic minority group but only 10% of working RNs identify themselves as members of a minority group, an inconsistency that warrants

attention. This disparity in racial/ethnic diversity may be a result of high rates of NCLEX-RN failure among African Americans and other under-represented groups (Sayles, et al., 2003; Sutherland, Hamilton, & Goodman, 2007).

Men are another minority group in nursing programs that merit consideration. Nursing has historically been a female dominated field, exemplified by the fact that only 6% of graduates from basic RN programs in 1989 were men. By 1995, the number of male Nurse graduates doubled to 12%, dropped about 2% in in 2003, and then rose again slightly to 12% in 2007 (NLN, 2010a). Recruiting and retaining men in RN programs has been difficult because of the societal label of nursing as a feminine profession. Men who attempt to break the gender barrier do not receive the same support as women who do the same (Jeffreys, 2004). Often men feel as though the pedagogy associated with nursing programs is geared towards women (Ierardi, Fitzgerald, & Holland, 2010).

**Under-prepared and at-risk nursing aspirants.** Under-prepared or at-risk students are those students who come to college without the pre-requisite skills to enroll in college level courses. Many nursing aspirants come to college with academic deficiencies requiring remediation; the students requiring remediation are considered to be at-risk. Several studies indicate that the largest numbers of at-risk students are also members of a racial/ethnic minority group (Campbell & Davis, 1990; Sutherland, et al., 2007). An extensive search of the literature uncovered very little research connecting developmental education and student success in nursing programs. Of the existing research, one study found that nursing aspirants who were unsuccessful in developmental courses were less likely to persistent to a nursing degree (Perin, 2006). Campbell and Davis (1990) reported similar trends in their study of at-risk nursing students uncovering

reading remediation as one of the most critical determinants for successful persistence to a nursing degree.

Under-prepared students are often also nontraditional or under-represented students. In the Commonwealth 61-63% of developmentally placed (under-prepared) students are classified as low-income, minority students (VCCS, 2011). As described previously, there is currently a lack of diversity in the RN workforce. Perin (2006) reports that only 4.9% of working RNs are African American, 2% are Hispanic, and close to 90% are White. Nursing programs are working to increase diversity within the programs in order to help bridge the diversity gap in the workforce. Although there has been a rise in the enrollment of African American students in nursing programs, no increase has been noted in Hispanic student enrollment (Jeffreys, 2004). Between 23.6-35.5% of all nursing students identify themselves as members of a racial/ethnic minority group compared to the 10% of racial/ethnic minorities currently working as RNs. In pre-nursing curriculums, the number of minority students can be as high as 63%.

Part of the diversity disparity within nursing program enrollments and among working nurses might be explained by the disproportionate numbers of under-represented students placing into community college developmental education courses (community colleges produce 60% of all RNs. With theoretical evidence of the high rates of attrition among under-represented and under-prepared students coupled with the competitive nature of nursing programs, preparation in pre-nursing programs needs attention (Escobedo, 2007; Opp, 2002). Despite the importance of increasing diversity in nursing programs and in the nurse workforce, there is little in the research literature concerning the nature and progress of students who hope to be in the nursing field (Perin, 2006).

Peters (2010) explored the impact of the type and number of remedial courses in predicting student success on the NCLEX-RN. In this study gender, age, and ethnicity showed a statistically significant correlation with final cumulative GPA and NCLEX-RN pass rates. The number and type of developmental courses a student enrolled in prior to the nursing program did not have a statistical significance in predicting NCLEX-RN pass rates (Peters, 2010). In contrast to Peters' findings, Hawsey (1997) found no significant differences in LPN graduation rates of remediated and non-remediated students. Notwithstanding the few empirical studies, there remains a gap in the literature relating to the direct impact of placement into developmental courses on persistence in an AASRN program.

**The impact of personality traits on persistence to a nursing degree.** In addition to tangible pre-entry variables like high school GPA, researchers have also attempted to measure less tangible factors like personality to help predict nursing school retention. Several studies measure innate stress, personality traits, and coping mechanisms of nursing students to determine if there exists a correlation among these variables and attrition. Deary, Watson, and Hogston conducted a longitudinal study of first-year nursing students to measure burnout and attrition (2003). The authors found that pre-existing personality traits, cognitive abilities, and coping mechanisms all contribute to student attrition. Students with lower cognitive ability scores, poor coping mechanisms, and a tendency towards neuroticism were more likely to dropout. Dreary, et al. found that personality was a much better indicator of attrition risk than was cognitive ability.

Expanding upon the earlier work of Deary, Watson, and Hogston researchers McLaughlin, Moutray, and Muldoon conducted a similar longitudinal study examining the role of personality and self-efficacy in nursing student retention (2007). Like Deary, et al., the authors found that personality traits are among the most important factors in predicting academic success in nursing school (McLaughlin, et al., 2007). Students with neurotic or psychotic tendencies were less likely to persist to a degree in nursing likely due to the fact that the nursing profession requires self-confidence, critical thinking abilities, and empathy to achieve success. Students who do not possess these attributes at an innate level are less likely to successfully become healthcare professionals.

### **NCLEX-RN**

The early identification of students who may be at-risk for failure of the National Council Licensure Examination for Registered Nurses (NCLEX-RN) is stressed throughout nursing literature with an emphasis on developing educational and supportive strategies. The NCLEX-RN pass rates are commonly used to procure funding and recruit students. Current research focuses primarily on predicting success on the licensing exams for Bachelor degree RNs and very little research addresses the barriers to success for Associate Degree Nurse students (Peters, 2010). Studies fail to consider persistence rates with the same level of importance as first-time pass rates on the NCLEX-RN (Giddens, 2009). Three categories have been identified for predicting success on the NCLEX-RN: pre-admission variables, pre-clinical variables, and clinical variables. Pre-admission variables include high school GPA, Scholastic Aptitude Test (SAT) scores, American College Test (ACT) assessment scores, presence of a full-time nursing program director, and National League for Nursing accreditation (Abdur-Rahman, Femea, & Gaines, 1994;

Gallagher, et al., 2001; Grzegorzcyk, 1995). Pre-clinical variables include GPA in lower division or pre-requisite courses such as basic science courses, English courses, and mathematics courses (Higgins, 2005; Romeo, 2010). Clinical variables include grades in various nursing courses including didactic, theory, and practicum (Fowles, 1992).

There are two widely administered nursing entrance exams, the Nurse Entrance Test (NET) and the Registered Nurse Entrance Exam (RNEE). Studies have attempted to use student scores on these admissions exams as predictors of NCLEX-RN success. These exams are similar in that both the NET and the RNEE measure math skills and reading comprehension. The RNEE includes sections that aim to measure student knowledge of physical sciences, life sciences, and chemical sciences. In addition to academic variables, the NET also examines student's stress level, social interaction, test-taking skills, and learning style. Abdur-Rahman, Femea, and Gaines reported that the Nurse Entrance Test (NET) was significantly correlated with academic outcomes of first-year nursing students. Students with poor testing-taking skills, inadequate educational preparation, and social stressors performed worse academically during their first year than did their more prepared peers.

Gallagher, Bomba, and Crane conducted a study to compare the NET and the RNEE as predictors of success on the NCLEX-RN (2001). Nursing faculty in this ADN program had relied on RNEE scores to assist them in their evaluation of potential applicants. Because the RNEE measures only academic achievement, faculty were interested in the NET's evaluation of nonacademic indicators. Gallagher, et al. found that the RNEE was a good predictor of success in the basic nursing courses but did not significantly predict success on the NCLEX-RN. Further, results of the NET academic

subsets indicated no significant difference between the successful and unsuccessful students. Based upon the results of the Gallagher, et al. study, the RNEE is a better predictor of Nursing school GPA than the NET. The RNEE and NET proved to be equally predictive of the academic abilities and success of nursing students. The NET has an additional value in identifying nonacademic deficiencies. Neither exam accurately predicts student success on the NCLEX-RN (Gallagher, et al., 2001).

Nursing school faculty and administrators are interested in reporting high success rates on the national licensing exam. Some nursing programs use an exit exam called the Health Education Systems, Inc. (HESI) Exit Exam to help predict student success on the NCLEX-RN. Researchers have validated the HESI, reporting that it is 96.36% to 98.30% accurate in predicting NCLEX-RN success (Higgins, 2005; Nibert et al., 2006). Using an exit exam like the HESI can help faculty and administrators identify at-risk students for remediation prior to the NCLEX-RN. In addition to student scores on the entrance and exit exams, success rates increased when a full-time nursing program director was present. Student success also increased when the ADN program was fully accredited by the National League for Nursing (Grzegorzcyk, 1995).

### **Human Anatomy and Physiology**

Nursing school retention studies emphasize the importance of prerequisite courses on student success. Student performance in undergraduate biology courses has been linked to student persistence in nursing programs (Beeber & Biermann, 2007; Beeman & Waterhouse, 2001; Fowles, 1992; Higgins, 2005; Peters, 2010; Spahr, 1995; Stuenkel, 2006; Waterhouse & Beeman, 2003; Wong & Wong, 1999). Studies tend to include biology courses as a single variable without accounting for the different types of biology



courses or the delivery method of the courses. Studies specifically identify Human Anatomy and Physiology as a variable to predict success on the NCLEX-RN (Beeman & Waterhouse, 2001; Fowles, 1992) and in predicting nursing school success (Fowles, 1992; Griffiths, Bevil, O'Connor, & Wieland, 1995; Grzegorzczak, 1995; Wong & Wong, 1999).

**Online learning.** There has been a great deal of research over the last several years concerning the effectiveness of online courses. In a three-part forum, Dykman and Davis explore why there has been an increase in online education, the differences between online and conventional teaching, and the importance of quality in online educational experiences. Online education provides access to education that will contribute to the development of the modern world, making education available to anyone with a computer and access to the Internet (Dykman & Davis, 2008c; Legg, Adelman, Mueller, & Levitt, 2009). In the beginning of the online education revolution, most schools were primarily concerned with establishing growth in the number of courses offered. As online education continues to be a large part of higher education, the quality of the course design will become a more important aspect of the virtual course (Dykman & Davis, 2008a; Fish & Wickersham, 2009; Glahn & Gen, 2002).

**Online learning in science.** Although there is a plethora of research comparing the student success outcomes in online courses versus face-to-face courses, there is little research that specifically examines the effectiveness of online science courses. One study examines student success in an online soil science lab versus a hands-on lab finding that there is not a difference in the student success rates between the delivery methods (Reuter, 2009). Another study explored online learning modules in a kinesiology course

finding that the online modules improved student success (McFarlin, Weintraub, Breslin, Carpenter, & Strohacker, 2011). The key to online course success for both the student and the professor is the implementation of best practices (Dykman & Davis, 2008a, 2008b, 2008c; McFarlin, et al., 2011; K. W. Miller, 2008; Reuter, 2009).

**Online learning in nursing courses.** Nursing programs, much like the larger institutions of which they are a part, are taking advantage of online learning. Online course delivery is especially attractive to RNs because career advancement is often tied to education (Legg, et al., 2009). Several studies address the use of online technology in the education of RNs. Important areas of research include the user-friendliness of online learning, the role of faculty in online learning, student and faculty perceptions of online instruction, and engagement of online learners (Gyrko, 2010; Jones & Wolf, 2010; Legg, et al., 2009; Leski, 2009; Levitt & Adelman, 2010; Oldenburg & Hung, 2010). There are no studies that explore the impact of success rates in online pre-nursing courses on later success rates of those same RNs enrolled in online continuing education courses.

### **Summary and Critique**

Persistence and retention will remain important aspects of research at the university and community college level. The prevailing theories of Spady, Tinto, and others have provided researchers with measurable definitions of variables accepted as impacting student persistence or retention including the student's age, background, and educational preparedness. Persistence and retention have been studied extensively at the university level and at the community college level, but there is a large gap in the literature concerning specific variables that encourage retention in nursing schools or prior to nursing school.

## Conclusion

Community colleges will continue to enjoy enrollment increases as the value of higher education climbs. Retention of community college students, while predicted to be low, remains difficult to measure because of their unique characteristics. Academically under-prepared students are also on the rise and are enrolling in community colleges first because of the open admissions policy of the institutions (Bailey, et al., 2010; Bettinger & Long, 2005; Levin & Calcagno, 2008). Two-year institutions are the leading providers of developmental education for under-prepared students (Cohen & Brawer, 2003).

Considering that 50% of all community college students enroll in at least one developmental course, there remains little understanding of the impact of remediation on student outcomes, especially among nursing students (Peters, 2010). A disproportionate number of under-represented students enroll in community college, having arrived with academic deficiencies (Campbell & Davis, 1990; Davies, et al., 2003; Escobedo, 2007; Patricia Gurin, et al., 2002; Handel & Herrera, 2003).

Nursing literature focuses on remediation of students at risk for failing the NCLEX-RN but the literature does not account for the impact of student placement recommendation into developmental courses on persistence. Improving under-represented student retention will remain at the forefront of research as the diversity of the country continues to widen. The healthcare industry embraces the importance of increasing the diversity of its nursing workforce in response to disparities in healthcare access. The nursing shortage in the United States will persist for the next several decades. Research suggests that developmental courses can help academically under-prepared students persist to an AASRN degree and pass the NCLEX-RN.

### CHAPTER III: METHODOLOGY

This study employs a quantitative, ex post facto research approach. A quantitative approach fits well with ex post facto research because existing, numeric data can be analyzed to investigate cause-and-effect relationships. An ex post facto research design allows the investigation of relationships among variables after the variation in the variable of interest has already been determined (Ary, et al., 2010). However, because of the retroactive design of the study, there may be several interpretations of the outcomes. Rooting the research questions in theory will help to establish validity of the selected interpretation.

There are three steps in the design of an ex post facto study as described by Ary, Jacobs, and Sorenson (2010). The first step is to state the research problem; in this study the overarching research question asks, “Is there a significant difference in persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® test score recommendations placed them into a developmental course and students whose COMPASS® test score recommendations placed them in college level course?” Existing research indicates that students who are under-prepared will have a lower chance of persistence to a degree. The second step in ex post facto research is to select two or more groups to compare; in this study the two groups will be those students who persist to an AASRN degree and those students who do not persist to an AASRN degree. The final step in ex post facto research is to determine if the research question requires a proactive or retroactive design; this study will employ a retroactive approach that will allow the investigation of possible causes of variation of the dependent variable between groups (Ary, et al., 2010).

### **Purpose Statement**

The purpose of this ex post facto study is to examine the effect of placement recommendation in a developmental course as identified by scores on the computer-adaptive college placement (COMPASS®) test on student persistence in an Associate of Applied Science Registered Nurse degree program at a large, urban community college. The independent variables in the study are reading, writing, and math placement recommendation status as identified by the COMPASS® score, and the dependent variable is student persistence to an Associate of Applied Science Registered Nurse degree. This study also employs several attribute independent variables. The attribute independent variables are characteristics that the subject(s) possessed before the study began (Ary, et al., 2010). The attribute independent variables include if student reports having a high school diploma or General Education Developmental diploma, age at the time of first enrollment (traditional or nontraditional), course delivery of Human Anatomy and Physiology I (online or face-to-face), chemistry (Chemistry 1, Chemistry 111, or Chemistry 121), and race/ethnic identity.

### **Research Questions**

The overarching research question guiding this study is as follows:

- Is there a significant difference in persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® test score recommendations placed them into a developmental education course and students whose COMPASS® test score recommendations placed them in college-level courses?

The overarching research question will be further guided by the following sub-questions:

1. Does attainment of General Education Development diploma or high school diploma impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them in developmental education courses versus college level courses?
2. Does the age (18-24 or 25 & over) of the student impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them in developmental education courses versus college level courses?
3. Does the completion of Human Anatomy and Physiology I online versus face-to-face impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them into developmental education courses versus college level courses?
4. Does the completion of chemistry (Chemistry 1, Chemistry 111, or Chemistry 121) impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them in developmental education courses versus college level courses?
5. Does race/ethnicity impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them in developmental education courses versus college level courses?

## **Setting and Sample**

### **Study Context**

To study the effect of placement recommendation into developmental courses as defined by COMPASS® scores on student persistence to an Associate of Applied Science Registered Nurse degree, the study's context must be defined. The study was conducted at a large, Virginia, Community College that serves more than 45,000 individuals annually. The college's Associate of Applied Science Registered Nurse degree program accepts students in cohorts of 32-36 students four times a year. Admission to this college's nursing school is based on a review of the required application documentation with special attention to grades received in English 111 (College Composition/Freshman English), Human Anatomy and Physiology I (BIO141), and Human Anatomy and Physiology II (BIO142)/or Microbiology (BIO150). The letter grade "A" in one of these courses earns the student four points, a "B" earns the student three points, a "C" earns the student two points, and a "D" earns the students one point. Applicants must have a minimum of nine points in the three classes (ENG111, BIO141, and BIO142 or BIO150) in addition to a minimum Grade Point Average (GPA) of 2.5 on a 4.0 scale to be considered for admission. However, because of the competitive nature of program admissions, students often need a point score higher than nine for the three required prerequisite courses.

### **Variables**

This study includes one dependent variable (outcome or result of the influence of the independent variables), two independent variables (variables that cause or effect

outcomes), and several attribute independent variables (variables that represent characteristics a subject possessed prior to the study) (Ary, et al., 2010; Creswell, 2003).

**Dependent variable.** The dependent variable in this study is defined as student persistence to an Associate of Applied Science Registered Nurse degree. For the purpose of this study, persistence to an Associate of Applied Science Registered Nurse degree is defined as completing an AASRN degree at the study institution. In order to complete an AASRN degree, students must follow several steps: 1) student applies to the college declaring a pre-nursing track, 2) student takes placement exams or is placed in courses based upon previous college credits or ACT/SAT scores, 3) student completes all of the nursing prerequisites, 4) student applies to and is admitted into the college's AASRN degree program, and 5) student completes the required coursework of the AASRN degree (graduation). Attrition during any one of the aforementioned steps is considered non-persistence.

**Independent variables.** The independent variables are defined as student placement recommendation into developmental reading, writing, math or student placement recommendation into college level courses as specified by COMPASS® test scores. Once a student completes the COMPASS® exam, a Student Advising Report (SAR) is generated which includes students' scores on each part of the test and a course recommendation based on these scores. College counselors are then able to use the scores and data provided by the COMPASS® placement test to advise students as to the course(s) that are most appropriate.

There are several developmental English courses designed to address specific academic deficiencies. Preparing for College Reading I (ENG4) helps students improve



reading processes to increase their overall understanding of reading material. The course includes word forms and meanings. Preparing for College Reading II (ENG5) teaches students to read critically. This course guides students in making inferences, drawing conclusions, interpretation of graphics, and using a library. Preparing for College Writing I (ENG1) prepare students for entrance into their respective programs by improving their writing proficiency. ENG1 teaches students how to start, compose, revise, and edit a writing project. Preparing for College Writing II (ENG3) helps students further improve their clarity of writing. Finally, Writing and Reading Improvement I (ENG7) provides students with an integrated approach to developing writing and reading skills through comprehensive writing and reading strategies. Students do not receive college credit for these developmental courses. College Composition I (ENG111) introduces students to critical thinking and to the fundamentals of academic writing. Students learn to develop and support ideas using appropriate references for a variety of contexts, audiences, and purposes (VCCS, 2010).

There are also several developmental math courses. Developmental Math (MTH 1) is designed to bridge the gap between a weak mathematical foundation and the knowledge necessary for the study of mathematics courses in technical, professional, and transfer programs. Topics may include arithmetic, algebra, geometry, and trigonometry. Arithmetic (MTH 2) covers arithmetic principles and computations including whole numbers, fractions, decimals, percentages, measurement, graph interpretation, geometric forms, and applications. Develops the mathematical proficiency necessary for selected curriculum entrance. Algebra I (MTH 3) covers the topics of Algebra I including real numbers, equations and inequalities, exponents, polynomials, Cartesian coordinate

system, rational expressions, and applications. Develops the mathematical proficiency necessary for selected curriculum entrance. Algebra II (MTH 4) expands upon the topics of Algebra I including rational expressions, radicals and exponents, quadratic equations, systems of equations, and applications. Develops the mathematical proficiency necessary for selected curriculum entrance (VCCS, 2010).

**Attribute independent variables.** Attribute independent variables include the following: 1) the type of high school degree earned: High school diploma or General Education Development diploma, 2) age (traditional or nontraditional), 3) the method of course delivery of first semester Human Anatomy and Physiology: online or face-to-face, 4) chemistry preparation: Chemistry 1, Chemistry 111, or Chemistry 121, and 5) race/ethnic identity.

***Attribute independent variable 1.*** A high school diploma is awarded to a student for the satisfactory completion of the state requirements for high school completion. A General Education Developmental diploma is awarded to students who did not complete the minimum standards outlined by the state in order to receive a high school diploma but who have demonstrated attainment of equivalent knowledge/skills.

***Attribute independent variable 2.*** Traditional age is defined as falling within a range between 18 and 24 years of age and nontraditional age is any age over 24 years of age.

***Attribute independent variable 3.*** This study will consider two methods of course delivery of Human Anatomy and Physiology I. For this study, Human Anatomy and Physiology I online is defined as the student enrolling the lecture portion of their course online and the lab portion in a traditional setting. Human Anatomy and Physiology I face-

to-face is defined as student enrolling both the lecture and lab portion of their course in a traditional classroom/laboratory setting.

*Attribute independent variable 4.* The students' chemistry course is the final attribute independent variable. There are four ways a student may complete the chemistry prerequisite. First, a student may have completed High School chemistry with a "C" or better within 10 years prior to applying to nursing. Second, a student may complete Chemistry 1, designed for students who have had little or no chemistry, during which they learn the basic principles of organic and inorganic chemistry. Third, students may complete College Chemistry (CHEM111) exploring the fundamental laws, theories, and mathematical concepts of chemistry. Finally, students may complete Health Science Chemistry (CHM121) during which they learn concepts of inorganic, organic, and biological chemistry as applicable to the allied health profession.

*Attribute independent variable 5.* Race/ethnic identification is defined by one of seven groups: White, African American, Hispanic, Asian, American Indian/Alaskan Native, Pacific Islander, and Other.

## **Data Collection and Analysis**

### **Data Collection**

Each semester student placement recommendation scores, demographic information, and other pertinent data are acquired and stored in a college-wide software program. The data can then be managed with a Student Information System (SIS) software program called People Soft ® (ORACLE, 2010). SIS tracks students' COMPASS® scores, declared major, academic progress, demographics, and grades. The data set includes information from students who took the COMPASS® placement test

anytime between the fall semesters of 2005 through the fall semester of 2009 and tracks students through the spring semester of 2011. Theoretically, students who took the COMPASS® placement test in the fall of 2009 will either be in the process of applying to nursing school or will have just started nursing school. The dataset includes those students with a declared major of pre-nursing at the time of students' initial enrollment at the college. A pre-nursing student is one who has applied to the college and has declared their major as pre-nursing (application code of 156.01).

The Office of Institutional Effectiveness has access to all student records and has the ability to generate unique identifiers for each student. The unique personal identifiers allow accurate tracking of individual's progress while keeping their identities confidential. The researcher only has access to data supplied by the Office of Institutional Effectiveness. The data set will include the study's defined dependent, independent, and attribute independent variables for all students with a declared pre-nursing major beginning with those students who completed the COMPASS® placement test in the fall semester of 2005.

### **Ethical Protection of Subjects**

Data used in this study does not include students' personal information. The data is coded with random, unique identifiers to ensure confidentiality of the subjects. All confidential data was stored on a password protected desktop computer off-campus.

### **Data Analysis**

All data was entered into Statistical Program for Social Science (SPSS) Mac© version 19.0 for analyses employing both descriptive and inferential statistics. Descriptive statistics enable the organizing, summarizing, and describing of observations.

Inferential statistics help the researcher to determine how accurately inductive reasoning may be used to apply observations from small populations to larger populations (Ary, et al., 2010). Two methods of inferential statistics are applied in this study in order to answer the research questions. First, an analysis of variance (ANOVA) measured the variance between groups and the variance within groups. Second, multiple regression analysis helped the researcher to learn more about the relationships between the independent variables and the dependent variable.

**Placement in developmental courses and persistence.** Descriptive statistics provides the frequency of students who place into developmental reading that persist to an AASRN degree, the frequency of students who place into developmental writing that persist to an AASRN degree, the frequency of students who place into English 111 that persist to an AASRN degree. Descriptive statistics also include the frequency of students who placed into Arithmetic that persist to an AASRN degree, frequency of students who placed into Algebra I that persist to an AASRN degree, frequency of students who placed into Algebra II that persist to an AASRN degree, and frequency of students who placed into college level math that persist to an AASRN degree.

An ANOVA measures if there is a difference among the four English COMPASS® placement recommendation groups and the four math COMPASS® placement recommendation groups to persistence to an AASRN degree. The COMPASS® placement recommendation groups serve as the independent variables and are tested against the dependent variable, persistence to an Associate of Applied Science Registered Nurse degree. A multiple regression further examined relationships between the independent variables and dependent variable in an effort to determine how well

COMPASS® placement recommendation predicts student persistence to an AASRN degree.

**Sub-question analyses.** The sub-questions attempt to determine the relationship between the independent variables, attribute independent variables, and the dependent variable. The sub-questions are interested in examining the impact or influence of the attribute independent variables on the relationship between the independent variables and the dependent variable. Descriptive and inferential statistics for each of the sub-questions aid the researcher in determining the cause and effect relationships among the variables. A multifactor ANOVA measures the main effects (effect of each of the independent attribute variables on the dependent variable) and the interaction effect (effect of different combinations of the attribute independent variables on the dependent variable) at the  $p > .05$  level of significance (Ary, et al., 2010). The attribute independent variables in each sub-question were then examined through ANOVA to explore any differences among the means in the groups. A multiple regression analysis defines the contribution of each attribute independent variable relative to the other attribute independent variables. Finally, multiple regressions examine the relationships among the independent variables and attribute independent variables as well as the probability of these variables to predict the dependent variable (Meyers, Gamst, & Guarino, 2006).

### **Limitations of the Research Design**

Several limitations have been identified in this study and the researcher has attempted to address these limitations to avoid possible threats to internal validity. Due to the nature of a quantitative research design, the scope of the study's outcome is limited to data that can be interpreted through statistical analysis. The results of research can

provide support for any number of different, and possibly contradictory hypotheses because of the nature of ex post facto research (Lord, 1973). By design, an ex post facto study does not provide the safeguards that are necessary to infer causal relationships. There is a risk of post hoc fallacy, erroneously assigning causation based upon the relationship between variables. Additionally, because the research is conducted after the fact, there may be intervening variables skewing the statistical analysis a phenomenon referred to as a spurious relationship (Ary, et al., 2010). In order to decrease the likelihood of a spurious relationship, all possible extraneous or intervening variables must be considered. One final limitation of this study is the fact that students who are not accepted into the AASRN program at the institution of interest may be accepted into a similar program at another institution. This will make it impossible to accurately track all students with a declared pre-nursing major.

### **Conclusion**

The quantitative, ex post facto study design allows the researcher to draw inferences concerning the impact on students of placing into developmental courses on persistence to an Associate of Applied Science Registered Nurse degree. The study allows the researcher to compile information concerning the effect of pre-existing characteristics such as the students' educational background, age, race/ethnic identity, and pre-requisite courses on student persistence to an AASRN degree.

## CHAPTER IV: FINDINGS

The purpose of this ex post facto study is to examine the effect of placement into developmental courses as identified by scores on the computer-adaptive college placement recommendation (COMPASS®) test on student persistence in an Associate of Applied Science Registered Nurse degree program at a large community college. This study aspires to explore the impact of several independent and attribute independent variables on student persistence to an AASRN degree. The following research question serves to guide the study:

The overarching research question guiding this study is as follows:

- Is there a significant difference in persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® test score recommendations placed them into a developmental education course and students whose COMPASS® test scores placed them in college-level courses?

The overarching research question will be further guided by the following sub-questions:

1. Does attainment of General Education Development diploma or high school diploma impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them in developmental education courses versus college level courses?
2. Does the age (18-24 or 25 & over) of the student impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them in developmental education courses versus college level courses?



3. Does the completion of Human Anatomy and Physiology I online versus face-to-face impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them into developmental education courses versus college level courses?
4. Does the completion of chemistry (Chemistry 1, Chemistry 111, or Chemistry 121) impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them in developmental education courses versus college level courses?
5. Does race/ethnicity impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them in developmental education courses versus college level courses?

This chapter presents the analysis of data procured from the Office of Institutional Effectiveness that includes all dependent, independent, and attribute independent variables contained in the research questions. Data collection includes all first time students registered in the pre-nursing track beginning in the fall of 2005 through fall of 2009. Admissions and graduation information tracks the study participants through the spring of 2011.

The college at which this study took place utilizes PeopleSoft Campus Solutions, a student information system that allows the institution to connect all of a student's demographic information, placement recommendation test results, transcripts and transfer credits, course grades, and progress towards goal completion (ORACLE, 2011). The current study includes student demographic information, status of admission to the

Associate of Applied Science Registered Nurse program, COMPASS® placement recommendation test scores, high school completion type, delivery method of Human Anatomy and Physiology I, and chemistry course completed.

A total of 1,524 first-time students enrolled in the pre-nursing track were included in the study. Of the students included in this study:

- 50 students were admitted to the college's AASRN program
- 640 students placed into English 111 for reading and writing
- 355 students placed into developmental reading and writing
- 213 students placed into developmental writing and English 111
- 87 students placed into developmental reading and English 111
- 177 students placed into college math
- 82 students placed into Algebra II
- 537 students placed into Algebra I
- 515 students placed into Arithmetic
- 1,338 students held High School Diplomas
- 1,134 were of traditional (18-24) age
- 390 were nontraditional (25+) age
- 679 of these students attempted Human Anatomy and Physiology I (BIO141)
- 234 attempted chemistry at the college

Data was provided in numerical and string form. Numeric data contains numbers while string data refers to non-numeric data; typically data with labels. To standardize the study data for analysis, string data was recoded into numerical data and assigned a unique

number to quantify qualitative data. For example, high school diploma (string) was recoded into a variable that identifies high school diploma as 1 and General Education Development diploma as 2. Not all of the 1,524 students who indicated intent to pursue a pre-nursing curriculum took the prerequisites necessary for matriculation.

## **Results**

### **English Placement and Persistence**

Statistical analyses were employed to explore the overarching research question. Descriptive statistics present the frequencies of students who placed into developmental reading and writing, developmental reading and English 111, developmental writing and English 11, and English 111 for reading and writing. Students are further classified either by persistence to AASRN degree or non-persistence to an AASRN degree (see Table 4). Of the 50 students who persisted to an AASRN degree, two placed into developmental reading and developmental writing, five placed into developmental writing and English 111, and 39 placed into English 111 for reading and writing.

Table 4

*Summary of Study Participants Persistence to AASRN Degree*

English Placement	Total = 1,524			
	AASRN: Persistence		AASRN: Non-Persistence	
	n = 50	% = 3.3	n = 1,474	% = 96.7
Developmental reading & writing	2	4	353	24
Developmental reading & English 111*	0	0	87	6
Developmental writing & English 111**	5	10	208	14
English 111 reading & writing	39	78	601	41
No English reported	4	8	225	15

\* *English 111 for writing*

\*\**English 111 for reading*

**ANOVA.** A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between persistence to an AASRN degree and English placement recommendation. The independent variable, English placement recommendation, included four levels: developmental reading and writing (DR&DW), developmental reading and English 111 (DR&ENG111), developmental writing and English 111 (DW&ENG111), and English 111 (ENG111BOTH) for both reading and writing. Students were classified into one of the four groups and each group was tested against the dependent variable (persistence to an AASRN degree). The ANOVA yielded significant results,  $F(4, 1319) = 30.10, p < .01$ . The strength of the relationship between persistence to an AASRN degree and English placement recommendation, as assessed by  $\eta^2$ , was

weak with English placement recommendation accounting for 2% of the variance of persistence to an AASRN degree.

Because the ANOVA yielded a significant *F* test, follow-up tests were conducted to evaluate the pairwise differences among the means. The standard deviations for the four English placement recommendation groups ranged from 0.08-0.24 and the variance among these groups ranged from 0.00-0.57 lending to the assumption of unequal variance. Post hoc comparisons using Dunnett's *C* test to control for Type I error across multiple pairwise comparisons indicated a significant difference between the group that placed into English 111 for both reading and writing and the remaining three placement recommendation groups. The 95% confidence intervals for the pair-wise differences, as well as the means and standard deviations for the four English placement recommendation groups are reported in Table 5.

Table 5

*95% Confidence Intervals of Pairwise Differences in Mean Persistence English Placement*

English Placement Groups	<i>M</i>	<i>SD</i>	ENG111BOTH	DW&ENG111	DR&ENG111	DR&DW
DR&DW	0.01	0.08	0.03 to 0.08	-0.01 to 0.05	-0.02 to 0.01	
DR&ENG111	0.00	0.00	0.04 to 0.09	-0.01 to 0.05		-0.01 to 0.02
DW&ENG111	0.02	0.15	0.00 to 0.08		-0.05 to 0.01	-0.05 to 0.01
ENG111BOTH	0.06	0.24		-0.08 to 0.00	-0.09 to -0.04	-0.08 to -0.03

**Multiple regression.** Next, a multiple regression analysis was conducted to assess how well English placement recommendation predicted student persistence to an AASRN degree. The predictors for the multiple regression included the four English placement recommendation levels and the criterion (dependent) variable was persistence to an AASRN degree. The combination of English placement recommendation categories was significantly related to persistence to AASRN degree,  $F(1, 1322) = 19.65, p < 0.01$ . The sample multiple correlation coefficient was 0.02 indicating that 1.5% of the variance of persistence to an AASRN degree was accounted for by English placement recommendation. The results of the ANOVA and multiple regression exhibited significant results, indicating that student persistence to an AASRN degree is directly related to English placement recommendation.

### Math Placement and Persistence

Descriptive statistics present the frequencies of students who placed into developmental math, Arithmetic, Algebra I, Algebra II, or college math who persist to an AASRN degree (see Table 6). Of the 50 students who persisted to an AASRN degree, 16% placed into Arithmetic (MTH 2), 34% placed into Algebra I (MTH 3), 8% placed into Algebra II (MTH 4), and 30% placed into college level math.

Table 6

#### *Summary of Study Participants Persistence to AASRN Degree*

Math Placement	Total = 1,524			
	AASRN: Persistence		AASRN: Non-Persistence	
	n = 50	% = 3.3	n = 1,474	% = 96.7
Arithmetic	8	16	507	34.3
Algebra I	17	34	520	35.4
Algebra II	4	8	78	5
College math	15	30	162	11
No math reported	6	12	207	14



**ANOVA.** A one-way ANOVA was conducted to examine the relationship between math placement recommendation and persistence to an AASRN degree. Math placement, the independent variable, included four levels: MTH 2, MTH 3, MTH 4, and college level math. The ANOVA was significant,  $F(3, 1307) = 6.78, p < 0.01, \eta^2 = 0.02$  indicating that there is a relationship between math placement recommendation and persistence. Follow up tests were conducted to evaluate pairwise differences in means, assuming that the means are unequal. Results of the Tukey HSD indicated significant differences between students who placed into Arithmetic and Algebra I (see Table 7).

Table 7

*95% Confidence Intervals of Pairwise Differences in Mean Persistence Math Placement*


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Math Placement Groups	<i>M</i>	<i>SD</i>	College math (COLL)	Algebra II (MTH 4)	Algebra I (MTH 3)	Arithmetic (MTH 2)
Arithmetic (MTH 2)	0.02	0.12	-0.11 to -0.03	-0.09 to 0.02	-0.04 to 0.01	
Algebra I (MTH 3)	0.03	0.18	-0.09 to -0.01	-0.07 to 0.04		-0.01 to 0.04
Algebra II (MTH 4)	0.05	0.22	-0.10 to 0.03		-0.04 to 0.07	-0.02 to 0.09
College Math (COLL)	0.08	0.28		-0.03 to 0.10	0.01 to 0.09	0.03 to 0.11

---

**Multiple regression.** Next a multiple regression was performed to substantiate the outcomes of the ANOVA. The predictors for the multiple regression included the five math placement recommendation levels and the criterion (dependent) variable was persistence to an AASRN degree. The multiple regression yielded significant results,  $F(1, 1309) = 19.73, p < 0.01$ , indicating that math placement recommendation appears to be a good predictor of persistence to an AASRN degree.

Attribute independent variables (variables that represent characteristics a subject possessed prior to the study) need to be considered to further investigate the impact of English and math placement recommendation on persistence to an AASRN degree.

### **High School Diploma or General Education Development diploma**

When applying to the college, students indicate if they have received a traditional High School Diploma (HS) or a General Education Development diploma (GED) diploma. Of the study participants, 1,338 students reported having a HS diploma, 162 students reported having a GED, and 24 students did not respond. Table 8 indicates the percentages of students with each type of diploma and their persistence status.

Table 8

*Persistence to AASRN Degree Percent of HS Diploma versus GED*

Diploma	Total = 1,524			
	AASRN: Persistence		AASRN: Non-Persistence	
	n = 50	% = 3.3	n = 1474	% = 96.7
HS	40	80	1091	74
GED	6	12	137	9.3
No diploma indicated	4	8	20	1.4

A one-way ANOVA was conducted to measure the relationship between high school diploma and persistence to an AASRN degree. The results of the ANOVA were not significant,  $F(2, 1521) = 1.93, p = 0.15$ . High school diploma does not have a significant impact on persistence to an AASRN degree. An ANOVA further tested the impact of diploma type on English placement recommendation without significance,  $F(3, 1266) = 0.02, p = 0.89$

**ANOVA: English placement.** To determine if high school diploma and English placement recommendation together had a significant impact on persistence to an AASRN degree, an additional statistical analysis was performed. A multi-factor ANOVA was conducted to determine if main and interaction effects of English placement recommendation and high school diploma on AASRN degree persistence. The main effect of English placement recommendation on persistence to an AASRN degree was not significant,  $F(3, 1309) = 0.56, p = 0.69$  nor was the main effect of diploma,  $F(2,$

1309) = 0.06,  $p = 0.94$ . The interaction effect measured variance in the means on persistence to an AASRN degree among the four English placement recommendation groups as a function of high school diploma and was not significant,  $F(8, 1309) = 0.23$ ,  $p = 0.99$ .

**Multiple regression: English placement.** To corroborate the ANOVA results, a multiple regression measured how accurately English placement recommendation and high school diploma predict persistence to an AASRN degree. The first regression analysis was conducted to evaluate how well English placement recommendation and diploma predicted persistence to an AASRN degree. The linear combination of English placement recommendation and diploma was significantly related to persistence to an AASRN degree,  $F(2, 1321) = 9.99$ ,  $p < 0.01$ . The multiple correlation coefficient, 0.12, indicated that 1.5% of the variance of persistence to an AASRN degree can be accounted for by the linear combination of English placement recommendation and diploma.

To further explore the results of the first multiple regression, an additional analysis was conducted on two unordered sets of predictors. The first set of predictors included the four English placement recommendation groups and the second set of predictors included high school diploma. The regression equation with English placement recommendation as a predictor of persistence was significant,  $R^2 = 0.02$ ,  $F(1, 1322) = 19.65$ ,  $p < 0.01$ . However the regression equation with diploma as a predictor of persistence was not significant,  $R^2 = 0.02$ ,  $F(1, 1321) = 0.34$ ,  $p = 0.56$ . Based upon the results of the unordered pairs multiple regression English placement recommendation is a better predictor of persistence to an AASRN degree than diploma.

**ANOVA: Math placement.** A multi-factor ANOVA was conducted to determine if main and interaction effects of math placement recommendation and High school diploma had a significant impact on AASRN degree persistence. The results indicate that there were not significant main or interaction effects between math placement recommendation, HS diploma, and persistence to an AASRN degree (see Table 9 for results).

Table 9

*Means, Standard Deviations, F Ratios, and Significance for Math Placement and Diploma Type*

Main and Interaction Effects	<i>M</i>	<i>SD</i>	<i>F</i>	Sig.
Math	2.94	1.00	1.65	0.18
High School Diploma Type	1.09	0.35	2.70	0.07
Math * High School Diploma Type			1.20	0.31

**Multiple regression: Math placement.** A multiple regression measured how accurately math placement and high school diploma type predict persistence to an AASRN degree. The results of the multiple regression were significant,  $R^2 = 0.02$ ,  $F(2, 1308) = 10.16$ ,  $p < 0.01$ . Math placement was a better predictor of persistence to an AASRN degree than was high school diploma. The results of the multiple regression of two unordered sets of predictors indicate that high school diploma type was not significant,  $F(1, 1309) = 0.15$ ,  $p = 0.7$ .

### **Traditional or Nontraditional Age**

Students report their age in the demographic section of the college admissions application when they first apply and select the pre-nursing track. For this study students were categorized, by their age at the time of admissions, into one of two groups, traditional age (18-24) or nontraditional age (25+). Traditional age students comprised 74.4% of the study population and nontraditional age students comprised 25.6%. A one-way ANOVA evaluated the relationship between age and persistence to an AASRN degree and yielded significant results,  $F(1, 1522) = 9.25$ ,  $p < 0.01$ ,  $\eta^2 = 0.01$ . The strength of the relationship between age and persistence to an AASRN degree is weak with less than 1% of the variance in persistence accounted for by age.

**ANOVA: English placement.** A multi-factor ANOVA was then conducted to determine the combined effect of English placement recommendation and age on persistence to an AASRN degree. The multi-factor ANOVA generated significant results,  $F(4, 1314) = 5.44$ ,  $p < 0.01$ ,  $\eta^2 = 0.02$ . The outcomes of the multi-factor ANOVA suggested a significant main effect for English placement recommendation,  $F(4, 1314) = 10.79$ ,  $p < 0.01$ , partial  $\eta^2 = 0.03$ , and a significant interaction between English placement

recommendation and age,  $F(4, 1314) = 5.44, p < 0.01$ , partial  $\eta^2 = 0.02$ . There was not a significant main effect for age  $F(1, 1314) = 0.29, p = 0.59$ .

Post hoc tests to measure English placement recommendation main effect consisted of all pairwise comparisons among the four English placement recommendation groups. The Tukey HSD procedure controlled for Type I errors across the pairwise comparisons, and the results exhibited significant differences between the group that placed into English 111 for both reading and writing with each of the three other placement recommendation groups (see Table 10 for the means and standard deviations).

Table 10

*Means and Standard Deviations of Persistence: Age and English Placement*

English Placement Groups	Traditional Age		Nontraditional Age	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
DR&DW	0.01	0.08	0.00	0.00
DR&ENG111	0.00	0.00	0.00	0.00
DW&ENG111	0.03	0.18	0.00	0.00
ENG111BOTH	0.04	0.19	0.13	0.39



Follow-up to the post hoc test included a simple main effects analysis which revealed significant results,  $F(9, 1314) = 28.33, p < 0.01$ . The English placement recommendation main effect indicated that students placing into English 111 for reading and writing were more likely to persist to an AASRN degree.

An additional follow-up test was conducted to examine the interaction effect of age and English placement recommendation on persistence to an AASRN degree with significant results,  $F(3, 1287) = 7.00, p < 0.01$  (see Appendix B for SYNTAX). The alpha was set at 0.001 ( $0.05/6 = 0.001$ ) according to Bonferroni method to control for Type I error over the six pairwise comparisons (see Table 11 for hypotheses).

Table 11

*Hypotheses Tested for Interaction Comparisons*

Hypothesis	
H <sub>1</sub>	Assumes unequal variance in persistence to an AASRN degree for traditional and nontraditional students who place into developmental reading& developmental writing versus developmental reading& English 111.
H <sub>2</sub>	Assumes unequal variance in persistence to an AASRN degree for traditional and nontraditional students who place into developmental reading& developmental writing versus developmental writing & English 111.
H <sub>3</sub>	Assumes unequal variance in persistence to an AASRN degree for traditional and nontraditional students who place into developmental reading& developmental writing versus English 111 for both reading and writing.
H <sub>4</sub>	Assumes unequal variance in persistence to an AASRN degree for traditional and nontraditional students who place into developmental reading& English 111 versus developmental writing & English 111.
H <sub>5</sub>	Assumes unequal variance in persistence to an AASRN degree for traditional and nontraditional students who place into developmental reading& English 111 versus English 111 for both reading and writing.
H <sub>6</sub>	Assumes unequal variance in persistence to an AASRN degree for traditional and nontraditional students who place into developmental writing & English 111 versus English 111 for both reading and writing.
H <sub>0</sub>	Assumes equal variance in persistence to an AASRN degree for traditional and nontraditional students among English placement recommendation groups.

Based upon the results of the custom hypothesis follow-up tests, the null hypothesis assuming equal variance in persistence to an AASRN degree for traditional and nontraditional students among the English placement recommendation groups was rejected. A significant difference occurred in (H3) persistence to an AASRN degree between traditional and nontraditional age for students who placed into developmental reading and developmental writing and students who placed into English 111 for both reading and writing,  $F(1, 1287) = 11.78, p < 0.01$ . There was also a significant difference in (H6) persistence to an AASRN degree between traditional and nontraditional age students who placed into developmental writing and English 111 and students who placed into English 111 for both reading and writing. The interaction effects of the other hypotheses were rejected (see Table 12 for means, standard deviations, and 95% confidence intervals).

Table 12

*95% Confidence Intervals of Pairwise Differences in Means: Age and English Placement*

English Placement	Age							
	Traditional		Nontraditional		Traditional		Nontraditional	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	95% Confidence Intervals			
DR&DW	0.01	0.04	5.56	0.02	-0.01 to 0.03		-0.04 to 0.04	
DR&ENG111	0.00	0.02	-2.78	0.05	-0.04 to 0.04		-0.11 to 0.11	
DW&ENG111	0.03	0.01	1.11	0.02	0.00 to 0.06		-0.05 to 0.05	
ENG111BOTH	0.04	0.01	0.13	0.01	0.02 to 0.05		0.10 to 0.16	

**Multiple regression: English placement.** A multiple regression was performed to substantiate the results of the ANOVA tests and to determine how well age and English placement recommendation predict persistence to an AASRN degree. The unordered predictors age and English placement recommendation accounted for 2.4% of the variance in persistence to an AASRN degree. The linear combination of age and English placement recommendation exhibited a significant impact on persistence,  $F(2, 1321) = 16.22, p < 0.01$ . Next, a multiple regression was conducted to predict persistence to an AASRN degree based upon the ordered predictors age and English placement recommendation. The results indicated that age and English placement recommendation were significant predictors of persistence to an AASRN degree,  $R^2 = 0.03, F(1, 1321) = 18.88, p < 0.01$  (see Table 13 for regression analysis results). Age explained 1% of the variance of persistence to an AASRN degree and English placement recommendation, 1.6% of the variance deeming English placement recommendation a better predictor of persistence to an AASRN degree.

Table 13

*Summary of Regression Analysis: Age and English Placement Predicting Persistence*

Variable	Model 1			Model 2		
	<i>B</i>	<i>SEB</i>	$\beta$	<i>B</i>	<i>SEB</i>	$\beta$
Age	0.04	0.01	0.10	0.04	0.01	0.10
English Placement				0.01	0.00	0.12

**ANOVA: Math placement.** A multifactor ANOVA was then conducted to evaluate the main and interaction effects of math placement recommendation and age on persistence to an AASRN degree. Traditional versus nontraditional age did not have a significant main effect on persistence to an AASRN degree,  $F(1, 1303) = 4.18, p = 0.04$  (see Table 14 for 95% confidence intervals). Math placement recommendation, as a main effect, exerted a significant influence on persistence to an AASRN degree,  $F(3, 1303) = 11.52, p < 0.01$ . The interaction effect between age and math placement recommendation also yielded significant results  $F(3, 1303) = 4.24, p < 0.01$ . The results of these analyses imply that placing into a college level math course has a positive effect on persistence to an AASRN degree for traditionally and nontraditionally aged students.

Table 14

*95% Confidence Intervals of Pairwise Differences in Mean Persistence: Age and Math Placement*

Math Placement	Age					
	Traditional		Nontraditional		Traditional	Nontraditional
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	95% Confidence Intervals	
MTH 2	0.01	0.01	0.03	0.02	-0.01 to 0.03	0.01 to 0.06
MTH 3	0.02	0.01	0.08	0.02	-8.42 to 0.03	0.05 to 0.11
MTH 4	0.05	0.02	5.55	0.09	0.01 to 0.09	-0.17 to 0.17
COLL	0.06	0.01	0.24	0.04	0.04 to 0.09	0.16 to 0.31

Because there was a significant interaction effect of age and math placement recommendation on persistence to an AASRN degree,  $F(3, 1303) = 4.24, p < 0.01$ , an additional follow-up test was conducted to analyze the main and interaction effects (see Appendix B for SYNTAX). The alpha was set at 0.001 ( $0.05/4 = 0.013$ ) according to Bonferroni method to control for Type I error over the six pairwise comparisons (see Table 15 for hypotheses). The null hypothesis assuming equal variance in persistence to an AASRN degree for traditional and nontraditional students among the math placement recommendation groups was rejected. There were no significant differences in persistence for traditional and nontraditional students who placed into Arithmetic versus Algebra I, Arithmetic versus Algebra II, or Algebra II versus college level math. There was a significant difference in persistence to an AASRN degree between traditional students who placed into Algebra I versus college level math,  $F(1, 1303) = 6.25, p = 0.013$ . A significant difference was discovered for traditional and nontraditional student persistence to an AASRN degree that placed into Arithmetic versus college level math,  $F(1, 1303) = 11.05, p < 0.01$ .



Table 15

*Hypotheses Tested for Interaction Comparisons*

Hypothesis	
H <sub>1</sub>	Assumes unequal variance in persistence to an AASRN degree for traditional and nontraditional students who place into Arithmetic versus Algebra I.
H <sub>2</sub>	Assumes unequal variance in persistence to an AASRN degree for traditional and nontraditional students who place into Arithmetic versus Algebra II.
H <sub>3</sub>	Assumes unequal variance in persistence to an AASRN degree for traditional and nontraditional students who place into Arithmetic versus college level math.
H <sub>4</sub>	Assumes unequal variance in persistence to an AASRN degree for traditional and nontraditional students who place into Algebra I versus Algebra II.
H <sub>5</sub>	Assumes unequal variance in persistence to an AASRN degree for traditional and nontraditional students who place Algebra I versus college level math.
H <sub>6</sub>	Assumes unequal variance in persistence to an AASRN degree for traditional and nontraditional students who place into Algebra II versus college level math.
H <sub>0</sub>	Assumes equal variance in persistence to an AASRN degree for traditional and nontraditional students among math placement recommendation groups.

**Multiple regression: Math placement.** To further explore the results of the ANOVA, math placement recommendation as a predictor for persistence to an AASRN degree was tested via multiple regression. The combination of math placement recommendation levels was significantly related to persistence,  $F(1, 1309) = 19.73, p < 0.01$ . The sample multiple correlation coefficient was 0.122 indicating that 1.5% of the variance in persistence is due to math placement recommendation. Next, a multiple regression using math placement recommendation and age as ordered predictors validated the multi-factor ANOVA,  $F(2, 1308) = 19.74, p < 0.01$  (see Table 16 for regression analysis results).

Table 16

*Summary of Regression Analysis: Age and Math Placement Predicting Persistence*

Variable	Model 1			Model 2		
	<i>B</i>	<i>SEB</i>	$\beta$	<i>B</i>	<i>SEB</i>	$\beta$
Age	0.04	0.01	0.10	0.05	0.01	0.12
Math Placement	c			0.03	0.01	0.14

### Human Anatomy and Physiology Delivery Mode

Successful completion of Human Anatomy and Physiology I is a requirement for admission to the college's AASRN program. There are two ways a student can complete Human Anatomy and Physiology I, face-to-face or online. Table 17 displays the frequencies of persistence to an AASRN degree for students registered for Human Anatomy and Physiology I.

Table 17

*Persistence to AASRN Degree: BIO141 Modes Attempt 1 & 2*

	BIO141 Mode	Persistence to degree (n)	Non-persistence to degree (n)
1 <sup>st</sup> Attempt	Face-to-Face	45	207
	Online	3	9
2 <sup>nd</sup> Attempt	Face-to-Face	5	198
	Online	0	18

A one-way ANOVA was conducted to evaluate the relationship between of Human Anatomy and Physiology I (BIO141) face-to-face versus online and persistence to an AASRN degree. The results of the ANOVA were not significant,  $F(3, 199) = 0.73$ ,  $p = 0.53$ ,  $\eta^2 = 0.00$ . Next a multi-factor ANOVA assessed the effects of English placement recommendation and BIO141 delivery mode on persistence to an AASRN degree with no significant results,  $F(9, 193) = 1.51$ ,  $p = 0.15$ ,  $\eta^2 = 0.01$ . Finally, a multi-factor ANOVA examined the effects of math placement recommendation and BIO141 delivery mode on persistence to an AASRN degree with no significant results,  $F(3, 596) = 1.89$ ,  $p = 0.13$ .

**ANOVA: English placement.** To further examine the effects of English placement recommendation and BIO141 mode on persistence to an AASRN degree, a multi-factor ANOVA was conducted separating the BIO141 attempts. Significant results ensued when BIO141 mode first attempt was tested with English placement recommendation to determine the effects on persistence to an AASRN degree,  $F(7, 592) = 0.14, p < 0.01$  (according to Levene's Test of Equality of Variances). A Tukey HSD post hoc test revealed that there were no significant main effects or interaction effects. When the same test was conducted using BIO141 mode second attempt, the results were not significant,  $F(5, 197) = 0.22, p = 0.64$ .

**Multiple regression: English placement.** A multiple regression with unordered predictors (English placement recommendation and BIO141 mode) was significant,  $F(2, 610) = 4.85, p < 0.01$ . Based upon the results, English placement recommendation seemed to be a better predictor of persistence than BIO141 mode. To check the results of the first regression, an additional multiple regression tested English placement recommendation and BIO141 mode as ordered predictors with similar results,  $F(1, 611) = 9.51, p < 0.01$  (see Table 18 for results of regression analysis).

Table 18

*Summary of Regression Analysis: BIO141 Delivery Mode and English Placement  
Predicting Persistence*

Variable	Model 1			Model 2		
	<i>B</i>	<i>SEB</i>	$\beta$	<i>B</i>	<i>SEB</i>	$\beta$
BIO141 Mode	0.03	0.05	0.02	0.02	0.05	0.02
English Placement				0.02	0.01	0.12

### Chemistry Course

To be considered for admission to the AASRN degree program, students must have completed one of several acceptable chemistry options. Chemistry may be completed during high school or students may take college level chemistry. Table 19 displays the frequencies of students who persist or not to an AASRN degree enrolled in chemistry.

Table 19

#### *Persistence to AASRN Degree: Chemistry*

Chemistry	Total = 1,524			
	AASRN: Persistence		AASRN: Non-Persistence	
	n = 50	% = 3.3	n = 1,474	% = 96.7
Chem 1	6	0.12	105	53.5
Chem 111	2	0.04	45	0.03
Chem 121	4	0.08	26	0.12
Chem 1 & 111	0	0	9	0.01
Chem 1 & 121	0	0	5	0.003
Chem 111 & 121	0	0	5	0.003
Chem 1, 111, & 121	0	0	1	0.00
No Chem*	40	80	1,278	86.7

*\*Students with no chemistry listed may have taken chemistry in high school.*

A one-way ANOVA first measured the impact of chemistry completion on persistence to an AASRN degree with significant results,  $F(6, 227) = 4.12, p < 0.01$ . This indicates that successfully finishing chemistry has a positive impact on persistence to an AASRN degree. A multi-factor ANOVA was then conducted to measure the effects of four English placement recommendation groups and four types of chemistry classes on persistence to an AASRN degree. No significant main effect emerged for chemistry and persistence  $F(6, 191) = 0.62, p = 0.72$ , and no significant interaction effect emerged for English placement recommendation and chemistry on persistence,  $F(9, 191) = 0.86, p = 0.45$ . A multiple regression substantiated these findings. Finally, a multi-factor ANOVA measured the effect of math placement recommendation and chemistry on persistence to an AASRN degree but did not reveal significant effects of main or interaction effects.

**Race/Ethnicity**

During the college application process, students identify themselves as one of six racial/ethnic groups as defined by the United States Census Bureau: White, Black (African American), Hispanic, Asian, American Indian/Alaskan Native, Pacific Islander, or Other. Table 20 displays the frequencies of each racial/ethnic group.

Table 20

*Persistence to an AASRN Degree by Race/Ethnic Identity*

Race/Ethnicity	Total = 1,524			
	AASRN: Persistence		AASRN: Non-Persistence	
	n = 50	% = 3.3	n = 1,474	% = 96.7
White	32	64	546	37
African American	12	24	670	45
Hispanic	1	2	92	6
Asian	2	4	92	6
Amer Ind/Alaskan Native	0	0	12	1
Pacific Islander	0	0	21	1.4
Other	0	0	41	2.8



**ANOVA.** An ANOVA was performed to ascertain any impact of race/ethnicity on persistence to an AASRN degree, producing results that warranted some additional investigation,  $F(6, 1517) = 2.82, p = 0.01$ . Follow-up tests were conducted to evaluate pairwise differences among the means using Dunnett's C (assuming that population variances are not equal) because the variances ranged from 0.01-0.05. Post hoc tests revealed a significant difference between White students who persisted to an AASRN degree and African American, Hispanic, and American Indian/Alaskan Native students. To delve deeper into the impact of race/ethnicity on persistence, the racial/ethnic groups were divided further: White and Nonwhite. This ANOVA produced significant results,  $F(1, 1522) = 61.40, p < 0.00$ . Finally, a third ANOVA was performed separating race/ethnicity into three groups: White, African American, and Other (included Hispanic, Asian, American Indian/Alaskan Native, Pacific Islander, or Other). The results were also significant  $F(2, 1521) = 7.60, p < 0.01$ , see Table 21 for 95% confidence intervals. Post hoc tests revealed a significant difference in persistence between White students and African American students.

Table 21

*95% Confidence Intervals of Pairwise Differences in Mean Persistence:*

*Race/Ethnicity*

Race/Ethnicity	<i>M</i>	<i>SD</i>	95% Confidence Intervals
White	0.06	0.23	0.04 – 0.07
African American	0.02	0.13	0.00 – 0.03
Other	0.02	0.15	0.00 – 0.04

**Multiple regression.** Two multiple regression analyses were then conducted to evaluate how well race/ethnic identity predicted persistence to an AASRN degree. For the first multiple regression analysis, race was separated into two groups: White and Nonwhite. The results were significant  $F(1, 1522) = 15.06, p < 0.01$ . For the final multiple regression analysis, race was separated into three groups: White, African American, and Other (included Hispanic, Asian, American Indian/Alaskan Native, Pacific Islander, or Other). This regression also bore significant results  $F(1, 1,522) = 10.04, p < 0.01$ .

**ANOVA: English placement.** A multi-factor ANOVA was conducted to determine the main and interaction effects of English placement recommendation and race/ethnicity on persistence to AASRN degree. There were no significant results for the main or interaction effects of English placement recommendation and race/ethnicity. An additional multi-factor ANOVA was conducted with race/ethnicity separated into three

groups: White, African American, and Other (included Hispanic, Asian, American Indian/Alaskan Native, Pacific Islander, or Other). This did not yield significant results.

**Multiple regression: English placement.** A multiple regression was performed with two unordered sets of predictors, English placement and race/ethnicity (White, African American, and Other to include Hispanic, Asian, American Indian/Alaskan Native, Pacific Islander, or Other). The regression produced significant results  $r^2 = 0.02$ ,  $F(1, 1,321) = 7.46$ ,  $p < 0.01$ . See Table 22 for a summary of the regression analysis.

Table 22

*Summary of Regression Analysis: Race/Ethnicity and English Placement Predicting Persistence*

Variable	Model 1			Model 2		
	<i>B</i>	<i>SEB</i>	$\beta$	<i>B</i>	<i>SEB</i>	$\beta$
English Placement	0.01	0.00	0.12	0.01	0.00	0.11
Race/Ethnicity				-0.02	0.01	-0.08

**ANOVA: Math placement.** A multi-factor ANOVA was conducted to determine the main and interaction effects of math placement recommendation and race/ethnicity on persistence to AASRN degree. There were no significant results for the main or interaction effects of math placement recommendation and race/ethnicity. An additional multi-factor ANOVA was conducted with race separated into three groups: White, African American, and Other (included Hispanic, Asian, American Indian/Alaskan Native, Pacific Islander, or Other). This did not yield significant results,  $F(6, 1299) = 1.05, p = 0.39$ .

**Multiple regression: Math placement.** A multiple regression was performed with two unordered sets of predictors, math placement and race/ethnicity (White, African American, and Other to include Hispanic, Asian, American Indian/Alaskan Native, Pacific Islander, or Other). The regression produced significant results  $r^2 = 0.03, F(1, 1,308) = 17.55, p < 0.01$ . See Table 23 for a summary of the regression analysis.

Table 23

*Summary of Regression Analysis: Race/Ethnicity and Math Placement Predicting Persistence*

Variable	Model 1			Model 2		
	<i>B</i>	<i>SEB</i>	$\beta$	<i>B</i>	<i>SEB</i>	$\beta$
Math Placement	0.02	0.00	0.12	0.02	0.00	0.11
Race/Ethnicity				-0.02	0.01	-0.10

### Summary

Students who declared a pre-nursing curriculum on their college application between the fall semester of 2005 and the fall semester of 2009 were included in this study to establish if a relationship exists between placing into developmental courses and persistence to an Associate of Applied Science Registered Nurse degree. Overall, students who placed into developmental English courses were less likely to persist to an AASRN degree than students who placed into college level English. However, students who placed in Algebra I (MTH 3) were more likely to persist to an AASRN degree than students who placed into any other math course.

The type of high school diploma a student earned did not have a significant impact on student persistence to an AASRN degree nor did it have any influence on the student placement recommendation in English or math. Of the 50 students who persisted to an AASRN degree, 40 reported a traditional high school diploma.

When examining persistence to an AASRN degree of traditionally and nontraditionally aged students, it became evident that age had a significant impact on success. Of the 50 students who persisted to an AASRN degree, 28 were classified as traditionally aged (18-24 years of age) and 22 were classified as nontraditionally aged (25 and older). Further tests divulged that a significant difference in persistence occurred for traditional and nontraditional students who placed into developmental reading and writing as compared to those who placed into college level English and for students who placed into developmental writing and college level reading compared to students who placed into English 111 for reading and writing. A significant difference was also uncovered in persistence to an AASRN degree between traditionally aged and

nontraditionally aged students who placed into Arithmetic (MTH 2) and students who placed into college level math.

Delivery mode of Human Anatomy and Physiology I did not have a significant influence on persistence to an AASRN degree. Of the 50 students who persisted to an AASRN degree, 90% enrolled in BIO141 face-to-face. When the first attempt mode of BIO141 was tested with English placement recommendation to determine persistence to an AASRN degree, the outcomes suggest students who placed into college level English and enrolled in BIO141 face-to-face were more likely to persist. English placement recommendation appears to be a more accurate predictor of persistence to an AASRN degree than the course delivery mode of BIO141. Follow-up tests substantiate English placement recommendation as a more significant indicator for success (grade of “C” or higher) in BIO141 than is delivery mode. Not surprisingly, the grade earned during the first attempt of BIO141 had a significant impact on the grade a student earned during their second attempt of BIO141 (if there was an additional attempt).

In addition to the influence of English placement recommendation on persistence to an AASRN degree, student grades in BIO141 and math placement recommendation significantly contributed to persistence rates. Race/ethnicity had a significant effect on persistence to an AASRN degree but it had no impact on student placement recommendation into English or math.

The following chapter presents a discussion of the findings regarding developmental education and persistence to an AASRN degree. The discussion relates the findings to the theoretical and empirical research presented in the literature review. The chapter also includes conclusions, implications for community college leaders, and

recommendations related to developmental education and nursing school persistence.

Finally, the chapter will conclude with the researcher's overall view of the results and implications for future research.

## **CHAPTER V: DISCUSSION AND CONCLUSIONS**

The purpose of this study was to identify the impact of pre-enrollment variables on persistence to an AASRN degree. This study developed out of an interest in the health care professions coupled with years of experience instructing pre-nursing students in Human Anatomy and Physiology. Although a great deal of student interest in health care exists, it is evident that students lack a clear understanding of the rigors of the pre-nursing curriculum. The nursing shortage is an issue that reaches just about every community in the United States but institutions of higher education are unable to adequately meet the demand. On the surface it would seem, based on the numbers of students who express an interest in nursing, that the Hampton Roads area's nursing shortage should be solved. The problem arises at the front door of college because so few students enter a pre-nursing curriculum college-ready.

This final chapter is divided into three main sections: 1) Study Summary, 2) Findings Related to the Literature, and 3) Conclusions. The Study Summary includes 1) Overview of the Problem, 2) Purpose Statement and Research Questions, 3) Review of the Methodology, and 4) Summary of Major Findings. Findings Related to the Literature includes 1) Persistence/Retention, 2) Developmental Education, and 3) Persistence to an AASRN degree. Finally, the Conclusions include 1) Implications for Action, 2) Recommendations for Future Research, and 3) Concluding Remarks.

### **Study Summary**

#### **Overview of the Problem**

The increased demand for qualified nurses has grown over the last few decades and will continue to grow as the United States faces the impact of an aging population



coupled with unprecedented changes in the health care system. Despite sustained student interest in the field of nursing, educational institutions are not equipped to train the number of nurses needed. In addition to the demands being placed on colleges to prepare future nurses with limited resources, more and more students are arriving at the doors of higher education without the skills necessary to succeed in basic English and math courses. The combination of these factors has produced a complex problem that community colleges are charged to solve.

Registered Nurse (RN) job openings are expected to increase by 40% in the Commonwealth of Virginia and there are simply not enough RN graduates to keep up with the demand. To exacerbate the situation, the average age of RNs in Virginia is expected to reach 50 years-of-age in 2012, the majority of whom are near retirement. The State Council for Higher Education in Virginia, the American Association of Colleges of Nursing (AACN), and the National League for Nursing (NLN) are working to address the shortage through the development of initiatives, educational programs, and incentives for nurse educators and students.

In addition to producing 60% of all RNs, community colleges are the chief suppliers of remediation for under-prepared students. Developmental education comprises anywhere between 29%-32% of English and math courses, demonstrating the discontinuity between public secondary education and higher education. College readiness must remain in the forefront as colleges tackle the multifaceted nursing crisis. Even if colleges increase the availability of RN programs, the number of RN programs will not matter if students cannot navigate their way through basic English and math courses as they prepare for matriculation. Research interest in developmental education

persists with educators examining best practices and success stories in an effort to increase the number of students who effectively complete developmental courses and move towards goal completion (Bailey, et al., 2010; C. Horn, et al., 2009).

Interest in the field of nursing is high among perspective students but many individuals never make it to the nursing school application process. Student retention, as a measure of success, will continue to lead research in higher education. College stakeholders understand and embrace the monetary, societal, and individual value of engaging students and helping them reach their educational goals. Retention studies are prominent in the body of literature for four-year institutions, community colleges, and nursing schools (Fincher, 2010; Jeffreys, 2007a; Padgett et al., 2010; Park & Pascarella, 2010; Peters, 2010; Rochester, Kilstoff, & Scott, 2005; Sorey & Duggan, 2008). Modest research addresses the retention of nursing students from pre-requisites through graduation (Potolsky, Cohen, & Saylor, 2003) and even less research focuses on the impact of developmental education on nursing school persistence (Peters, 2010).

### **Purpose Statement and Research Questions**

The purpose of this ex post facto study is to examine the effect of placement recommendation into developmental education courses as classified by scores on the computer-adaptive college placement (COMPASS®) test on student persistence to an Associate of Applied Science Registered Nurse degree program at a community college. The independent variable in the study is English or math course placement recommendation status as identified by COMPASS® test scores and the dependent variable is student persistence to an Associate of Applied Science Registered Nurse degree. Attribute independent variables include high school diploma or General

Education Development diploma, age, course delivery mode of Human Anatomy and Physiology I, chemistry completion, and race/ethnicity.

The overarching research question guiding this study is as follows:

- Is there a significant difference in persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® test score recommendations placed them into a developmental education course and students whose COMPASS® test scores placed them in college-level courses?

The overarching research question will be further guided by the following sub-questions:

1. Does attainment of General Education Development diploma or high school diploma impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them in developmental education courses versus college level courses?
2. Does the age (18-24 or 25 & over) of the student impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them in developmental education courses versus college level courses?
3. Does the completion of Human Anatomy and Physiology I online versus face-to-face impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them into developmental education courses versus college level courses?
4. Does the completion of chemistry (Chemistry 1, Chemistry 111, or Chemistry 121) impact persistence to an Associate of Applied Science Registered Nurse

degree for students whose COMPASS® score recommendations place them in developmental education courses versus college level courses?

5. Does race/ethnicity impact persistence to an Associate of Applied Science Registered Nurse degree for students whose COMPASS® score recommendations place them in developmental education courses versus college level courses?

### **Review of the Methodology**

This ex post facto study employed descriptive and inferential statistics to examine the over-arching research question and the research sub-questions. Data obtained from the college's Office of Institutional Effectiveness included demographic information, English placement recommendation, math placement recommendation, AASRN degree status, attempts at Human Anatomy and Physiology I, chemistry course information, age, and race/ethnicity on 1,524 students.

Of the 1,524 students registered in a pre-nursing curriculum between 2005 and 2009, 50 students persisted to an AASRN degree at the college. Multiple factors that contribute to a student's persistence and this study examined several of the factors illuminated in the research literature: age, English placement recommendation, math placement recommendation, and course delivery mode and successful completion of Human Anatomy and Physiology I. In addition to the aforementioned variables, this study also scrutinized the effect of some supplemental attribute variables. For data analysis, students were sorted into groups (see Table 24 for details).

Table 24

*Descriptive Data Categories Used for Analysis*

Variable	Categories for Measure						
Persistence to AASRN degree	Yes	No					
English placement recommendation	Developmental reading & writing	Developmental reading & English 111*		Developmental writing & English 111**		English 111 for reading & writing	
Math placement recommendation	Arithmetic	Algebra I		Algebra II		College math	
High school diploma type	High School		GED				
Age	Traditional		Nontraditional				
Human Anatomy and Physiology I delivery mode	Face-to-face		Online				
Chemistry course	Chemistry 1	Chemistry 111	Chemistry 121	Chemistry 1 & 111	Chemistry 1 & 121	Chemistry 1, 111, & 121	
Race/Ethnicity	White	African American	Hispanic	Asian	American Indian/Alaska Native	Pacific Islander	Other

\*English 111 for writing

\*\*English 111 for reading

Statistical analyses were conducted to determine if any significant differences between the various combinations of the categories of independent and attribute independent variables exists. An Analysis of Variance (one-way and multi-factor) measured main and interaction effects of the independent and attribute independent variables on the dependent variable. Multiple regression analyses were then employed to corroborate the results of the ANOVA tests.

### **Summary of Major Findings**

Ample evidence indicates that nursing program admissions are highly competitive, a reality further elucidated in this study as only 50 out of 1,524 pre-nursing curriculum students were admitted to, and then successfully persisted to an AASRN degree. A comparison of means denotes that 78% of students who successfully completed an AASRN degree placed into English 111 (college level English) as defined by COMPASS® test scores and 30% of students who successfully completed an AASRN degree placed into college math as defined by COMPASS® test scores. Inferential statistics indicate that student placement recommendation into a developmental course versus a college level course as defined by COMPASS® test scores significantly impacts persistence to an AASRN degree.

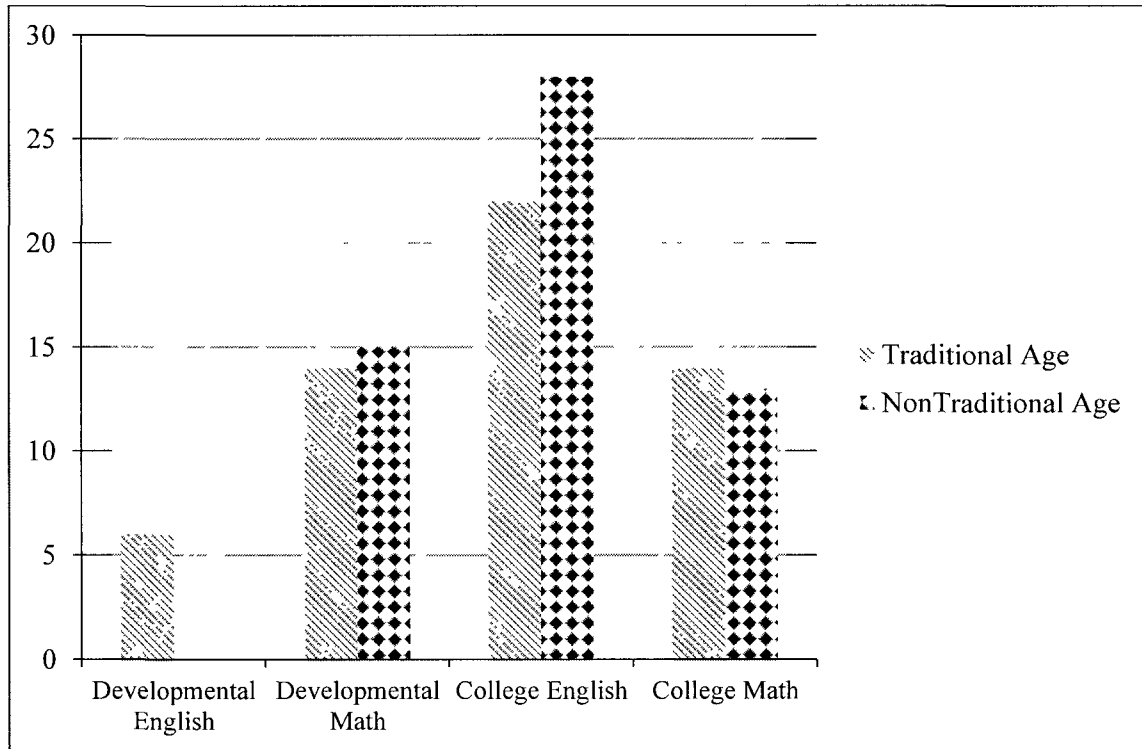
The attribute independent variables added an additional layer to this analysis. A framework for the analysis of results was developed by applying prominent theoretical models for defining nontraditional student characteristics (Bean & Metzner, 1985; Jeffreys, 2004). Both models explore the importance of student characteristics such as prior educational experiences, age, race/ethnicity, and gender. In evaluating the impact of attribute independent variables (student characteristics) on student persistence to an

AASRN degree, the results of this study indicate that 88% of students reported a traditional high school diploma. The diploma did not appear to have a significant impact on persistence.

Age (traditional or nontraditional) was evaluated as an attribute independent variable with English placement recommendation and math placement recommendation via ANOVA and multiple regression analyses to measure any impact on persistence to an AASRN degree. Of the traditionally aged students who persisted to an AASRN degree:

Table 25

*Placement Recommendations of Traditional and NonTraditional Age Students: AASRN Persistence*



The most significant differences between traditionally aged and nontraditionally aged students existed amongst those students who placed into developmental reading and English and those who placed into college level English. Further, a significant difference existed between students who placed into developmental math and those who placed into college math. An additional point of interest is that 100% of nontraditionally aged students who persisted to an AASRN degree placed into English 111.

Copious research focuses on student success rates in online courses and yields mixed results. In this study, the delivery mode of Human Anatomy and Physiology I (BIO141) revealed a difference in persistence to an AASRN degree. The number of students who enrolled in the online version of the course and persisted to an AASRN degree is so small (three) that it is difficult to be sure of the impact.

The type of chemistry course that a student completed did not affect persistence to an AASRN degree nor did the interaction between chemistry and English or chemistry and math placement recommendation. This indicates that the simple completion of chemistry does not serve as an accurate predictor of persistence to an AASRN degree. Finally, race/ethnicity seemed to have some influence on persistence to an AASRN degree but did not affect placement recommendation in English or math courses. This variable is not likely a good predictor of persistence to an AASRN degree. The results do illustrate the overall lack of diversity in the nursing field; 64% students who persisted to an AASRN degree were identified as White.



## **Findings Related to the Literature**

### **Persistence/Retention**

Student retention remains an area of research interest for universities, community colleges, and nursing schools. Predominate research identifies under-prepared students (Fike & Fike, 2008; Glogowska, et al., 2007; Handel & Herrera, 2003), adult learners (Astin, 1993; Bean & Metzner, 1985; Nomi, 2005; Spady, 1970), under-represented students (Cohen & Brawer, 2003; Opp, 2002; Ortiz, 1995), and first-generation college students (Handel & Herrera, 2003; Rendon & Matthews, 1989; Settle, 2011) as those most at risk for attrition. Community college researchers define retention as persistence to goal achievement (Mohammadi, 1996; Sydow & Sandel, 1998; Walleri, 1981, 2001; Wild & Ebberts, 2002; Wyman, 1997). The average retention rate for community colleges is 51.4% nationally and 62.8% in Virginia (NCHEMS, 2009). The student characteristics as defined in predominating retention research will be addressed in the section:

*Persistence to an AASRN Degree.*

### **Developmental Education**

The literature review examined current, prevailing student persistence research and the role of developmental education in predicting student success (i.e. persistence). Developmental education is an important aspect of community college as many colleges ready for developmental education redesign. This study adds to the body of research through an exploration of student preparedness and successful goal completion. Voluminous numbers of students enroll in developmental education courses, each with their own educational dreams, in hopes that the community college will be the beginning of a successful academic journey. Unfortunately, many students never fulfill their

academic goals because they are under-prepared and immediately face a daunting barrier to success when placed into developmental education courses.

Current research on developmental education asserts that 50% of all first-time college students will require some remediation (Bailey, Jeong, and Cho 2010; Burley, Butner, and Cejda, 2001; Cohen and Brawer, 2003; Horn, McCoy, Campbell, and Brock, 2009; Peters, 2010; and Potolsky, Cohen, and Saylor, 2003). The reported results for student's COMPASS® placement tests in this study are similar to the aforementioned findings, with 43% of the students in this study placing into developmental English (for reading, writing, or both reading and writing). In this study the number of students who placed into developmental math due to COMPASS® recommendation was higher than the 50% reported in empirical studies at 74% (Bahr, 2008; Zavarella & Ignash, 2009). To serve the large percentages of students needing remediation, at least 29% of all community college courses offered are at the developmental level (Cohen & Brawer, 2003).

Of the 50 students who persisted to an AASRN degree in this study, 78% placed into English 111 as defined by COMPASS® test score recommendations. A mere two out of the 50 students who persisted to an AASRN degree were placed into developmental reading. Student need for developmental math appears to have less of an impact on persistence to an AASRN degree than does the need for English remediation. Seventy-four percent of students in this study placed into developmental math as defined by COMPASS® test scores, a much higher number than the 32%-60% of other studies (Bettinger & Long, 2005; Cohen & Brawer, 2003; Peters, 2010) but similar to placement recommendation patterns reported by Burley, et al. (2001). Further, the need for

developmental math did not have a negative impact on student persistence to an AASRN degree; 58% of students who persisted to an AASRN degree placed into developmental math. The results of this study support earlier research in which authors describe the success of math remediation (Bean & Metzner, 1985; Umoh & Eddy, 1994; Zavarella & Ignash, 2009). In fact, Bahr (2007) and Umoh and Eddy (1994) found that students who were successfully remediated in math had similar chances of success as those students who required no math remediation.

Current research suggests further implications for students who enroll in developmental courses. Students who place into developmental courses are less likely to persist to graduation or goal completion (Bahr, 2008; Bailey, 2009; Bettinger & Long, 2005; Burley, et al., 2001; Crews & Aragon, 2007; NLN, 2011). There are numerous hypotheses concerning variables that predispose a student to needing remediation. Empirical investigations imply predictive value for socio-economic status and racial/ethnic background as to whether or not a student will place into developmental education courses (Bettinger & Long, 2005; Burley, et al., 2001; Escobedo, 2007; Handel & Herrera, 2003; NLNAC 2008 standards and criteria, 2008; Nomi, 2005; Opp, 2002; Ortiz, 1995; Schuetz, 2008; Whitaker & Pascarella, 1994). About 40% of Whites graduated from high school college-ready while only 23% of African American and 20% of Hispanic students graduated high school with the skills necessary for college success (Greene & Winters, 2005). According to estimates published by the United States Census Bureau, 10.6% of Whites fall below poverty level, 27% of African Americans, 28.4% of American Indian/Alaskan Natives, 24.8% of Hispanics, and 12.5% of Asians fall below the poverty line. The results of this study bare similar result to other studies; students who

identify themselves as racial/ethnic minorities were less likely to persist to an AASRN degree. Further, 34% of students who identified as White placed into developmental English compared with 46% of Hispanic students and 65% of African American students.

The results of this study are similar to prevailing studies of nontraditional student persistence. In both age groups, attrition was high. The nontraditionally aged students exhibited a 98% attrition rate while the traditionally aged students had a 94% attrition rate. Although Bean and Metzner do not associate age with attrition, the authors do assert that age is an important variable when considered with other variables such as work and family responsibilities (Bean & Metzner, 1985). Age has also been identified as a revealing predictor of course placement recommendation and persistence (AACN, 2011; Mohammadi, 1996; Peters, 2010; Sydow & Sandel, 1998). Peters reports that as student age increases so too does the number of remedial courses required (2010). Peters' findings are consistent with the study population as a whole but not with the population of students who persisted to an AASRN degree. Age, when coupled with placement recommendation, serves as a fairly accurate predictor of retention. The retention rates (or persistence to AASRN degree) for students in this study are much lower, 3.3%. This percentage does not account for students who changed curriculum or went on to other RN programs. The overall retention rate of the college studied averaged a 68% retention rate, higher than the national average.

### **Persistence to an AASRN Degree**

Retention during nursing school has been explored at length and researchers have found that nursing school retention is high, especially when compared to retention rates of community colleges (Jeffreys, 2004, 2007b; NLN, 2010c; Perin, 2006). One reason

that nursing schools enjoy successful student retention is attributed to the stringent admissions standards. By considering stringent admissions standards for RN programs, the research literature, and outcomes of this study, it seems likely that the majority of attrition will occur among students taking the pre-nursing courses (Grzegorzcyk, 1995; Jeffreys, 2007b). This observation is further corroborated by a 2006 study in which Perin examined the retention of a cohort of nursing aspirants and found a retention rate (students who advanced to the nursing program within three years) of 17%. In the current study's population, 3% of students who declared a pre-nursing curriculum were retained through an AASRN degree. Among the variables correlated to persistence in nursing school are student background characteristics, grades in nursing pre-requisite courses, and scores on entrance exams (Benda, 1991; Buerhaus, et al., 2005; Sadler, 2003).

**Adult learners.** Some previous research suggests that adult learners are often less successful in college than their traditionally age counterparts (Fike & Fike, 2008; Halpin, 1990; Metzner & Bean, 1987) but other studies claim the opposite to be true (Gallagher, et al., 2001; Peters, 2010; Potolsky, et al., 2003). It is likely that the success of nontraditional students varies from program to program. Supporting the premise that adult students are more likely to be successful in nursing school, a substantial shift in the ratio of traditionally aged to nontraditionally aged students occurred from students in the pre-nursing curriculum to graduation from the AASRN program. In this investigation, the population includes 1,134 traditional age students (74% of the study population) and 390 nontraditional age students (26% of the study population) who declared a pre-nursing curriculum. The number of traditionally aged students decreased from 74% to 56% and

the number of nontraditionally aged students increased from 26% to 44% from the time that students declare a pre-nursing curriculum through completion of AASRN degree.

Nontraditionally aged students who placed into developmental courses, as defined by COMPASS® test scores, were much less likely to persist to an AASRN degree than traditionally aged students in the same developmental courses. Further, all of the nontraditionally aged students who persisted to an AASRN degree placed into college English, suggesting that being over 24 and placing into developmental English increases the odds of attrition.

**Millennial students.** Millennial students have been described as the most diverse, technologically savvy, and educated generation yet (Henry, 2008; Howe & Strauss, 2000). The Millennials are expected to enroll in community colleges at higher rates than earlier generations. In contradiction to predominating research on Millennials, this study demonstrates that these students are not as prepared for careers in health care as are the nontraditionally aged students. A lack of preparation among this generation may be attributed to the shifting pedagogical approaches in public education following the implementation of No Child Left Behind (McGlynn, 2005).

**Under-prepared and at-risk students.** Under-prepared students, defined as those who require remediation, (Fike & Fike, 2008; Goldstein & Perin, 2008; Handel & Herrera, 2003) compose 43% to 78% of the current study population. Evaluating reading comprehension has been identified as an accurate variable in predicting the successful completion of nursing school (Community Colleges Essential to Nursing, Allied Health Professions, 2008; Gallagher, et al., 2001; Peters, 2010). In this study the importance of reading comprehension is exemplified by the small number (7/50 or 14%) of students

who persisted to an AASRN degree after placing into developmental English as defined by the COMPASS® test scores. Of those students placing into developmental English, two out of 50 students placed into developmental reading and writing and five out of 50 students placed into developmental writing and English 111. This small population of students persisting to an AASRN degree further supports the claims of the importance of reading comprehension and agrees with findings of Peters. In her study, Peters found that less than half of the Associate Degree Nurse graduates were required to enroll in developmental courses. The ability to read and comprehend material presented in a textbook is imperative to student success in any course, so it stands to reason that students requiring reading remediation are less likely to successfully complete an AASRN degree.

According to prevailing research, at-risk student access to higher education is often complicated because these under-prepared students are often members of low income, under-represented, racial/ethnic minority groups, (Escobedo, 2007; Opp, 2002; Pascarella & Terenzini, 1991; Swigart & Murrell, 2001b) and are less likely to persist in college due to inadequate academic background or other barrier (Potolsky, et al., 2003). Many of the academic barriers reported are the result of low socio-economic status and limited availability of resources for public schools. Under-represented (minority) groups are disproportionately represented below the poverty level (NCHEMS, 2009; USCB, 2011). According to the National Center for Education Statistics, 20% to 45% of racial/ethnic minority students attend high-poverty schools. Low income students, minority students, and female students are all more likely to attend a community college and are less likely to persist to goal completion (L. Horn & Nevill, 2006). The results of

this study reflect the disproportionate racial/ethnic makeup of college; Whites students comprised 64% of persisters to an AASRN degree, a percentage that had nearly doubled from 38% pre-nursing curriculum. These results should be considered with caution as the sample size of students who persisted to an AASRN degree was small.

**High school diploma or General Education Development diploma.** This study defines nontraditional students by age alone. One should remember that other demographic characteristics, such as having a GED, are often employed to identify nontraditional students. GED recipients are generally assumed to be under-prepared students, an assumption refuted in the research literature. There is a lack of evidence indicating statistically significant differences in college success between students with a traditional high school diploma versus a General Education Development diploma (Hawsey, 1997; Jeffreys, 2007a). Of the 50 students who persisted to an AASRN degree, six reported having a GED. In agreement with Hawsey and Jeffreys, this variable had no significant impact on persistence to an AASRN degree.

**Nursing school pre-requisites.** High school GPA and nursing program entrance exam scores are commonly employed as measures to predict student success in nursing school. In addition to high school GPA and entrance exam scores, nursing program prerequisite course grades are accurate predictors of success in nursing school. Arguably the most important and telling predictor of success amid the nursing school pre-requisites is Human Anatomy and Physiology I, often referred to as the “gateway” or “weed-out” course (Jeffreys, 2007a; Newton, 2008; Starck, Love, & McPherson, 2008). In the present study, a statistically significant relationship exists between students’ grade in Human Anatomy and Physiology I (BIO141) and persistence to an AASRN degree. Students who



earn an “A” in Human Anatomy and Physiology I receive 4 points while those who earn a “C” receive only 2 points. The more points a student earns, the better the chances for admission.

Human Anatomy and Physiology I (BIO141) is offered in two delivery modes, a face-to-face lecture or an online lecture. BIO141 has a high failure/withdrawal rate with only about 50% of students successfully completing the course. Enrolling in a course with a difficulty level like BIO141 online adds to the complexity. Much research in the field of online learning concurs that the most important predictor for success in an online course is student preparedness (Bambara, Harbour, Davies, & Athey, 2009; Dykman & Davis, 2008b; Leski, 2009). Little research speaks directly to the impact of delivery mode on persistence in science courses. Results of the present study suggest that there is not a statistically significant difference on persistence to an AASRN degree as a result of BIO141 course delivery mode.

## **Conclusions**

### **Implications for Action**

The results of this research indicate a relationship between student preparedness, age, race/ethnicity, and persistence to an AASRN degree. The cost of preparing an RN workforce is steep but so too is the cost of student remediation. This study has illustrated the importance of college readiness for student success. This section will describe the implications for action for practitioners

**College-readiness and developmental education.** Developmental education has financial costs that are estimated to be as high as \$2.3 billion (Bailey, 2009). Some would argue that this is wasted money since so few students who require remediation

successfully reach goal completion (VCCS, 2011). The need for remediation is tied to college-readiness among high school graduates. Only 34% of high school graduates were considered college-ready in 2002 (Greene & Winters, 2005). In Virginia, 40% of high school graduates were college ready in 2002. Of these graduates who were college-ready, there was a disparity between racial/ethnic groups: 46% of Whites and 27% of African Americans. Developmental education has long been in need of redesign and the VCCS has begun this process so students spend less time in remediation, ultimately leading to cost benefit (VCCS, 2011). The redesign has come in response to declining financial resources and increasing enrollments of students who are not college ready.

Following the VCCS' lead, community colleges can find more efficient means of preparing students for college level work. However, this preparation must not solely be the responsibility of community colleges. Community colleges should be tasked with working in conjunction with local public schools to bridge the gap between high school graduation requirements and college readiness. Through increasing college readiness among secondary schools, especially those in low income, under-served areas, the disparity in nursing student diversity can be addressed. The Bill and Melinda Gates Foundation has set forth ambitious initiatives to increase the number of college-ready high school graduates from 33% to 80% (Gates & Gates, 2009). Underlying the attainment of college-readiness is data analyses to measure success and advocacy to empower students and support innovative teachers (Gates & Gates, 2009). Using the basic theoretical model of the Gates Foundation, community colleges should work with local schools to develop programs that prepare students for the demands of college and

more specifically, nursing school. This may mean that college administrators, counselors, and faculty develop and cultivate a meaningful relationship with the area public schools.

**Nursing school persistence, developmental education, and intervention strategies.** Institutions of higher education are not meeting the growing demand for Registered Nurses even though the nursing shortage is one that is native to all communities. To begin to meet the workforce mandates for RNs, college stakeholders can use the results of this study to help improve the way in which they prepare a diverse population of students for nursing school and beyond. Because students are less likely to persist to an AASRN degree if they place into developmental reading as defined by COMPASS® test score recommendations, college counselors and administrators can work with students by providing interventions to help them succeed to their goal or to find an alternative vocation. Intervention efforts could be focused on the front door of the institution through curricular orientation programs or at preliminary advising sessions. Advising sessions might cluster students by career or curricular pathways, emphasizing the importance of study skills, class preparation, and pre-program coursework.

Learning communities may perhaps be established for under-prepared students, providing a built-in support system and accountability network. Jump Start/Summer Bridge programs designed to improve students' skills prior to their first semester enrollment could be implemented as intervention or retention strategies. Learning communities or Jump Start programs might implement a cohort model, grouping students by remediation need, age, gender, or maybe even race/ethnicity (Pelkey, 2011). Research has proven the effectiveness of learning communities in increasing the persistence of academically under-prepared students (Lieberman & Miller, 2011; Owens, 2010).

A final intervention strategy aimed at increasing the collaboration between student services and faculty might be the implementation of an early alert system. The early alert creates a team-centered approach at student retention (Pelkey, 2011). Although many colleges have early alert programs, there is little to no training rendering the system ineffectual (Norin, 2010). There are two ways that a faculty member may use Early Alert. Within BlackBoard a rule may be created that alerts students and any observers (counselor for instance) if student is falling below a minimum criteria. There is also a form available online that faculty may use to alert counselors of students at risk of failing. For a system such as Early Alert to be successful, faculty and counselors need professional development to teach them how to use the system and how to intervene to properly help students.

**Stakeholders.** Faculty teaching in nursing programs can use the results of this study to help them begin to define predictors of potentially successful students. One such predictor, successful completion of Human Anatomy and Physiology I (BIO141), warrants more attention. Faculty and students alike will better understand that without the basic ability to read and comprehend, completion of BIO141 will be impossible. Through a more complete understanding of the future rigors of nursing pre-requisites and nursing school, students may better assess their chances for success.

College administrators, counselors, faculty, and students should understand the social implications of a nursing workforce that lacks the diversity of the community. Because students who identify as racial/ethnic minorities are less likely to persist to an AASRN degree or pass the NCLEX-RN, recruitment and intervention strategies should be designed to help increase diversity in nursing school and in the workforce. ARMS

(Affirming At-Risk Minorities for Success) has offered successful retention strategies through mentoring, tutoring, advising, and educational seminars (Sutherland, et al., 2007).

### **Recommendations for Future Research**

This study has just begun to delve into the multi-faceted problem of the national RN shortage and several research areas merit further investigation. This section will outline some recommendations for future research that became evident during the course of the present study.

**Expanding the research scope through research design.** This study examined persistence to an AASRN degree at one institution making the results limited in scope. If this quantitative ex post facto study were expanded to include all public two-year colleges with RN programs in the Commonwealth of Virginia, the results would be more widely applicable. Data may be requested from the Office of Institutional Effectiveness for the VCCS making the expansion of this study is feasible. Two additional research designs might be employed in future investigations. A case-study approach using a qualitative design would explore the depth of student experience as they either persist to an AASRN degree or not. A mixed-methods approach would allow further investigation into trends that arise during quantitative research. Interviewing students who both persist to an AASRN or do not may employ a phenomenological approach through which the researcher may develop a picture of the experiences of these individuals. In addition to expanding the research design, this study might be applied to colleges with RN programs outside of the Commonwealth of Virginia.

**Developmental education redesign.** Developmental education is being redesigned across the United States (Boylan, 2011) making the effectiveness of redesign strategies an excellent research topic. As redesign is implemented, there will arise a need for program evaluations to assess the effectiveness of the courses and weigh the cost-benefit ratio. Several program evaluation approaches exist but the participant-oriented evaluation approach would allow students to be the primary focus (Fitzpatrick, Sanders, & Worthen, 2004).

A number of developmental education initiatives exist. These initiatives are Achieving the Dream, Bill and Melinda Gates Foundation, The Carnegie Foundation for the Advancement of Teaching: Mathway and Statway, Complete College America, Gateway to College National Network, Getting Past Go, and Increasing Student Success: Redesigning Mathematics (The National Center for Academic Transformation). Each of the initiatives embraces a different method of redesign so researchers must decide their effectiveness.

**Developmental education and nursing school persistence.** There are few studies specifically focused on measuring the relationship between needing remediation and the successful completion of a Registered Nurse degree (Perin, 2006; Peters, 2010). Those studies that do examine nursing school success focus on variables that will predict student success in nursing school and/or passing the NCLEX-RN (Beeman & Waterhouse, 2001; Grzegorzcyk, 1995; Roa, Shipman, Hooten, & Carter, 2011; Romeo, 2010; Sutherland, et al., 2007). Because more and more students are arriving at the front door of college lacking the skills to successfully reach their goals, the importance of

understanding remediation and designing effective intervention strategies will be a top priority for college stakeholders.

**Age as a predictor of student success.** Age is a significant variable that has been validated as a predictor of student success. Future research might examine the relationship between age and placement recommendation into either developmental or college level courses. In this study, two age groups were defined but it might be of research interest to further divide students into age groups that more closely reflect generational categories. Another area of future research may examine the correlation between age and work status, i.e. as age increases does work responsibility? How does this affect student success?

Students of nontraditional age often have family responsibilities that their younger counterparts do not. Exploring the number of dependents and marital status of students may be a valid way to measure outside responsibilities. A final area of research might explore the connection between age, work status, and full or part time school status on persistence. Each of these possible areas of research might be examined through mixed methods approaches so that the feelings and experiences of students can be connected to the quantitative results.

**Student background characteristics and pre-nursing variables.** This study explored a limited number of student background factors, as the research progressed several additional variables became evident. The conceptual models put forth by Tinto, Benda, Fowles, Bean and Metzner, and Jeffreys identified pre-entry variables including high school GPA, SAT or ACT scores, nursing school pre-requisite GPA, nursing school entrance exams, gender, socio-economic status, parents' educational background, and

family obligations. High school GPA, SAT or ACT scores, nursing school pre-requisite GPA, and academic commitment together serve as valid indicators of student ability and future success. If these variables are further considered along with gender, socio-economic background, and parents' educational background a valid predictive model might be developed.

Nursing has been a traditionally female dominated field but has seen increasing numbers of males over the last decade (Jeffreys, 2004; NLN, 2010a). Gender was not examined as an attribute independent variable because the number of males who persisted to an AASRN degree (five) was so small. Potential research might consider the special set of obstacles that men face when attempting to break the gender barrier. This would be ideal for a qualitative, phenomenological study.

Human Anatomy and Physiology I (BIO141) is an important pre-requisite course with a high rate of failure/withdrawal. Currently, few institutions require completion of basic biology prior to enrollment in BIO141. Future research might explore the likelihood of successfully completing BIO141 for students who required reading remediation. Additionally, the correlation between reading comprehension level and grade earned in Human Anatomy and Physiology I warrants investigation. Further, research could examine the effects of BIO141 grade on students' likelihood of persistence to an AASRN degree.

**Expanding beyond one institution.** One of the study's limitations would provide an interesting topic for research: students who declared a pre-nursing curriculum may have eventually been accepted to another institution to complete an RN degree. Tracking students through persistence to an AASRN at other institutions would likely result in an



increase in the number of students who successfully reached goal completion. This type of longitudinal study might pose some difficulties in acquiring data but it would likely reveal some interesting results, especially if admissions standards of the other programs are considered. Further, a comparison of admissions standards and persistence rates of public institutions might be compared against the admissions standards and persistence rates of for-profit institutions. The cost-effectiveness of for-profit schools is an issue that is gaining interest as the United States continues its economic downturn.

**NCLEX-RN.** The success of a college's RN program and the amount of state funding the college receives is often based upon student pass rates on the NCLEX-RN (Beeman & Waterhouse, 2001; Giddens, 2009; Higgins, 2005; Sutherland, et al., 2007; Waterhouse & Beeman, 2003). Many studies explore the factors that may contribute to a students' ability to successfully pass the NCLEX-RN but few studies actually consider the impact that a lack of college-readiness may have on this success. This type of study would follow a student from the time they declare a pre-nursing curriculum, remediation (if required), graduation, and through successful completion of the NCLEX-RN. This could be accomplished through a quantitative research design but including a qualitative component would allow researchers to extract experiences and feelings that might contribute to success.

Existing research focuses on the impact of specific student background variables to predict student success on the NCLEX-RN. Future research might include all of the variables that influence student success on the NCLEX-RN as identified in the research literature: the effect of remediation, age, race/ethnicity, socio-economic status, parents' educational background, full or part time work status, full or part time school status,

nursing entrance exam scores, and grades in nursing pre-requisite courses. Finally, the amount of time that passes from when a student first enrolls in the college's pre-nursing curriculum to program admission and the amount of time between graduation from an AASRN degree and sitting for the NLCEX-RN could yield some evidence of the importance of timely progression through the entire process of becoming a nurse.

### **Concluding Remarks**

Increasing persistence and retention rates of community college RN students has critical implications for students, community colleges, and the health care industry. The United States is in the midst of an economic crisis that could be positively affected by increasing the number of certificates and degrees awarded by community colleges (Barrack H. Obama, 2011). President Obama's Health Care and Education Reconciliation Act includes \$2 billion allocated specifically to help community colleges develop, provide, and improve education for health care programs. This act has tremendous consequences for community college systems for they are charged with helping to fill economic gaps and shortages in health care. Community colleges are currently the leading educators of Associate Degree nurses producing 60% of all RNs (AACN, 2008) and are the most economical of the school choices available.

Despite a national shortage of RNs, community colleges cannot educate future RNs quickly enough to fill the openings. The shortage of RNs is a complex problem that begins with a population who is not college-ready and ends with deficiency in qualified nurse educators. The challenge in responding to the shortage of RNs lies in the complexity. In undertaking this research, it was hoped that the research might begin to fill the gap in the literature pertaining to the struggles and barriers that students face before

they even get to the application phase of nursing school. Many students enter community college with aspirations to become a Registered Nurse but lack the academic skills and preparation required to successfully traverse the bumpy, obstacle-laden path to achieving their goal.

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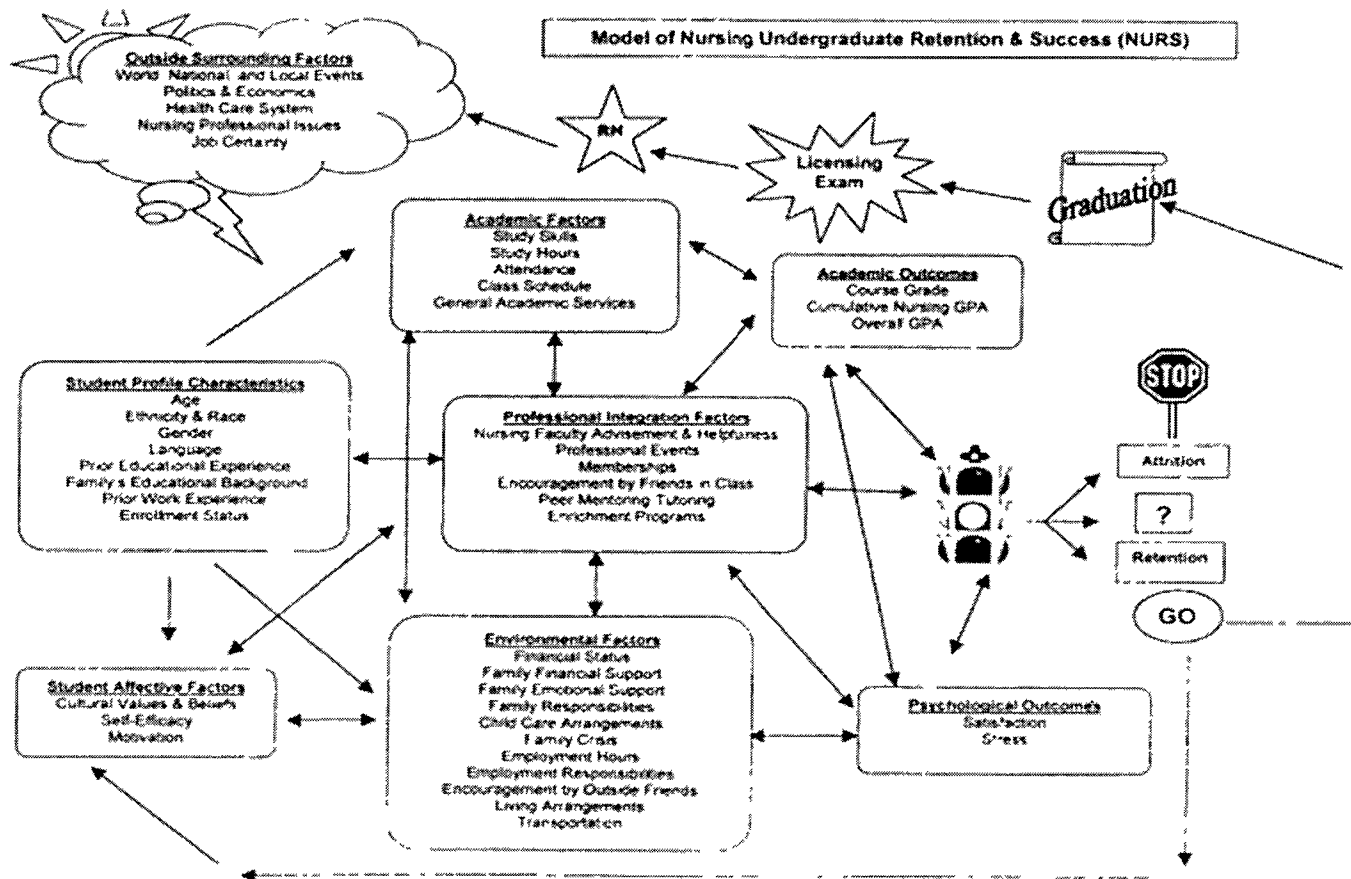
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APPENDIX A

Jeffreys' NURS Model



## Appendix B

*SYNTAX: Follow-up test of Interaction Effect of Age and English Placement on*

*Persistence to an AASRN degree*

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## APPENDIX C

*SYNTAX: Follow-up test of Main and Interaction Effects of Age and Math Placement on Persistence to an AASRN degree*

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## APPENDIX D

*IRB Approval*

DARDEN COLLEGE OF EDUCATION  
OFFICE OF THE DEAN  
NORFOLK, VIRGINIA 23529-0156  
PHONE (757) 683-3938  
FAX (757) 683-5985

February 28, 2011

Proposal Number 201002052**Professor Williams:**

Your proposal submission titled, “Persistence to an Associate of Applied Sciences Registered Nursing Degree: The Impact of Placing into Developmental Education Courses on Student Success” has been deemed EXEMPT from IRB review by the Human Subjects Review Committee of the Darden College of Education. If any changes occur, especially methodological, notify the Chair of the DCOE HSRC, and supply any required addenda requested of you by the Chair. You may begin your research.

We have approved your request to pursue this proposal indefinitely, provided no modifications occur. Also note that if you are funded externally for this project in the future, you will likely have to submit to the University IRB for their approval as well.

If you have not done so, PRIOR TO THE START OF YOUR STUDY, you must send a signed and dated hardcopy of your exemption application submission to the address below. Thank you.

Edwin Gómez, Ph.D.  
Associate Professor  
Human Subjects Review Committee, DCOE  
Human Movement Studies Department  
Old Dominion University  
2021 Student Recreation Center  
Norfolk, VA 23529-0196  
757-683-6309 (ph)  
757-683-4270 (fx)

**VITA**

**Caroline Clark Rivera**  
**Darden College of Education**  
**Old Dominion University**  
**Norfolk, VA, 23529**

**Education**

1997 Florida Atlantic University, Bachelor of Arts in Anthropology  
1999 New Mexico State University, Master of Arts in Forensic Anthropology  
2001-2005 Old Dominion University, Master of Science in Biology  
2007-2011 Old Dominion University, PhD. in Community College Leadership

**Research Experience & Field Experience**

2003-2005 Research Assistant in Assisted Reproduction lab at Old Dominion University.  
2001-2003 Research Assistant for Physical Engineering Research Institute.  
1997-1999 Research Assistant in Center for Adolescent Life Development.  
1998 Independent research at the University of Pretoria, South Africa.  
1997 Belize Valley Archaeological Reconnaissance.

**Teaching Experience**

2005-Present Associate Professor of Biology. Tidewater Community College, Norfolk, VA. Teaching experience includes Basic Human Biology 100, Anatomy and Physiology I (141) and Anatomy and Physiology II (142). Developed Human Biology 100 and Human Anatomy and Physiology I (141) online lecture course.  
2010-Present Adjunct faculty, Paul D. Camp Community College, Suffolk, VA. Teaching experience includes Human Anatomy and Physiology I and Human Anatomy and Physiology II.  
2002- 2005 Adjunct faculty, Tidewater Community College, Norfolk, VA. Teaching experience includes General Biology 101, Basic Human Biology 100, Human Anatomy and Physiology I (141), and Human Anatomy and Physiology II (142). Developed online course for Human Biology 100, Human Anatomy and Physiology I (141) and developed an introductory course in Forensics (BIO285).  
2001-2005 Graduate teaching assistant, Old Dominion University. Teaching experience includes Human Anatomy and Physiology 250/251, Comparative Vertebrate Anatomy 500, Anatomy for athletic trainers 560, Advanced Human Physiology 580, Human Cadaver Dissection 580, and Gross Anatomy for the Doctorate in Physical Therapy 889.

**Papers Presented**

2002 "Electropulsing of T-Lymphocyte Leukemia Cells". Paper presented at the annual Biology research symposium, Old Dominion University.  
1999 "Skeletal Asymmetry in Two South African Populations". Paper presented at the 68th annual meeting of the American Association of Physical Anthropologists, Columbus, Ohio

**Academic Societies & Honors**

1995 Lambda Alpha, Florida Atlantic University chapter  
1999 Phi Kappa Phi national honor society  
1998 Secretary Anthropology/Sociology graduate student organization  
1998 Graduate student council representative Anthropology/Sociology GSO  
2001 Biology Graduate student organization  
2008 Awarded \$2,000 academic fellowship from the Community College Leadership program  
2009 Nominated for Philanthropic Educational Organization Women's Doctoral Fellowship  
2010 Selected for membership in the Golden Key National Honour Society

The word processor for this dissertation was Caroline Clark Rivera.