Identifying Students At-Risk for an Adverse Academic Event

A Dissertation submitted

by

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to

College of Saint Mary

in partial fulfillment of the requirement

for the degree of

DOCTOR OF EDUCATION

with an emphasis on

Health Professions Education

This Dissertation has been accepted for the faculty of

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Dedication

To my husband, Brandon, who has been a source of support and encouragement through the many years of undergraduate and graduate studies. And to my children, I thank you Samuel, Joshua, and Isaiah for your patience, love, and laughter. Lastly, thank you to my family and friends for all of your continued support.

This is also dedicated to my professors, colleagues, and friends at College of Saint Mary for their unwavering support and mentoring that guided me through this educational endeavor. To Dr. Peggy Hawkins, thank you for recognizing my potential, fostering my educational and professional development, and promoting leadership in nursing education.
Acknowledgements

I would like to acknowledge and extend my sincere appreciation to my committee chair, Dr. Kristin Haas, and my committee members, Dr. Kathleen Zajic and Dr. Jennifer Rose-Woodward, for their guidance, patience, and encouragement.

A heartfelt thank you to Dr. Rebecca Shively for her guidance through the statistical analyses.

I would also like to express my gratitude to Dr. Jo Anne Carrick for her kind words of encouragement.
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Abstract

This study sought to develop an early predictive model to identify students at-risk for an adverse academic event. The study sample included 256 female students from a fully accredited, private, Catholic university in the Midwest. Students ranged in age from 17-50 years with the mean age of 23.93 years. The study sample consisted of white/ non-Hispanic (82.8%), African-American (5.5%), Hispanic (7.4%), Asian/Pacific Islander (1.2%), Other/Missing (3.2%) students. An independent t test showed statistically significant higher means between the ATI® CTAE® composite score of students who were successful in the Fundamentals of Nursing theory course (71.55 ± 9.16) to those who had an adverse academic event (64.17 ± 10.99). Through the use of logistic regression, a statistically significant predictive model using ATI® CTAE® subscores and ATI® SAI® weighted subscale averages was found, $X^2(9) = 23.99, p = .004$. These findings may hold the key to decreasing attrition while maintaining a high standard of NCLEX-RN® success. The early identification using this predictive model and individualized remediation with students who are at-risk are key components of a comprehensive, continuous approach to student success.
CHAPTER I: INTRODUCTION

Nursing education programs face the challenge of decreasing attrition while maintaining a high standard of National Council Licensure Examination for Registered Nurses (NCLEX-RN®) success (Higgins, 2005). The early identification and individualized remediation with students who are at-risk for adverse academic events may provide a resolution to this challenge (Fowles, 1992; McDowell, 2008; Peterson, 2009; Sayles, Shelton, & Powell, 2003). Earlier identification optimizes the chance of student success (Biggs, Kember, & Leung, 2001; Carrick, 2011; Malie & Akir, 2012).

Background and Rationale

Predicting success in nursing programs has been an important endeavor over the past few decades as shown by the multiple articles published each year (Alameida et al., 2011; Briggs, House, & Embry, 2009; Burlison, Murphy, & Dwyer, 2009; Carrick, 2011; Fowler, & Norrie, 2009; Fowles, 1992; Haas, Nugent, & Rule, 2003; Higgins, 2005). A comprehensive approach to student success begins with admission into the nursing program (Carrick, 2011). During this process, the basic student profile including age, ethnicity, gender, socio-economic status, parental status, relationship status, grade point average (GPA), and/or admission assessment scores is established (Carrick, 2011). Nursing schools have admission criteria, including GPA minimums, admission assessments, and prerequisite courses to varying degrees. The standards of these admission criteria are at the heart of many studies to find which combination of criteria increases the likelihood of student success for a particular program (Breckenridge, Wolf, & Roszkowski, 2012; Fowles, 1992; Higgins, 2005; Lenagacher & Keller, 1990; Wolkowitz & Kelley, 2010).
Once admitted, the focus shifts to retaining the students. Pennington and Spurlock (2010) argued that educational institutions have a responsibility to identify students who need assistance and intervene. The method in which to identify the students who are in need of assistance may differ per institution and educational program (Alameida et al., 2011; Breckenridge et al., 2012; Fowler & Norrie, 2009; Haas et al., 2004; Hopkins, 2008). Once at-risk students are identified, interventions can begin. These interventions should commence early and include critical self-reflection and personalized strategies to optimize student success (Biggs et al., 2001; Carrick, 2011; Malie & Akir, 2012). Students who are in need of assistance and who do not receive interventions may be at-risk for an adverse academic event. This includes withdrawal or unsuccessful completion of the course and/or program. This attrition is problematic for nursing programs and their success; however, attrition rates are difficult to ascertain due to varying definitions of attrition and different reporting tools (Fowler & Norrie, 2009).

The National League of Nursing (2012) listed attrition rates of associate degree nursing programs for 2006-2007 at approximately 20% and 12% for baccalaureate nursing programs. More recently, Peterson (2009) reported that 30% of baccalaureate nursing students do not graduate. Peterson went further, stating that the majority of those students leave during the first semester of the nursing program. Rees (2006) confirmed this. At the study institution, first semester attrition rates for the associate degree program have varied over the last four years from 17% to 41%. Given all these statistics, further investigation to decrease attrition and provide consistency in reporting standards is required.

Recently, predicting student success in nursing programs has gained more momentum. The federal government came forward to challenge colleges and universities to meet the needs of students while keeping costs affordable (National Center for Public Policy and Higher
Education, 2008). A high attrition rate affects federal spending, as well as university resources (Peterson, 2009). In addition to monetary impacts on the institution, high attrition rates also affect faculty time, energy, and resources (Lenagacher & Keller, 1990; Peterson, 2009).

Concerning the student, attrition affects not only monetary resources but may affect the students’ psychological well-being by decreasing self-esteem (Lenagacher & Keller, 1990).

Once the student graduates from a nursing program, the next step in becoming a registered nurse is the NCLEX-RN®. The National Council of State Boards of Nursing (NCSBN) developed the NCLEX-RN® to ensure entry-level nursing competence (NCSBN, 2012b). The NCSBN (2012a) is a non-profit organization whose purpose includes protecting the health, safety, and welfare of the public in part by ensuring the entry-level competence of nurses through the NCLEX-RN® (NCSBN, 2012a). Graduates from nursing programs must successfully complete the NCLEX-RN® prior to practicing as a registered nurse (NCSBN, 2012b). The NCSBN calculates the NCLEX-RN® pass rate based upon the number of nursing program graduates who successfully complete the NCLEX-RN® on the first attempt (NCSBN, 2013). This pass rate is another key indicator of program quality as it demonstrates how well the nursing program prepares the students for the NCLEX-RN® and their future career (McDowell, 2008).

In addition to being a quality indicator, nursing student attrition rates indirectly affect the nursing shortage. Attrition may lead to a lack of producing enough graduates, which may compound the nursing shortage issue. According to the American Association of Colleges of Nursing (AACN) (2012), the average age of nurses is 44.5 years with one-quarter of all nurses in their fifties. In addition, the AACN (2012) projected the number of nurses needed between now and 2020 at 1.2 million in order to fulfill the growth needs, as well as replace those nurses who leave the workforce. The enrollment in nursing programs is not growing quickly enough to meet
said demands (AACN, 2012). Decreasing the nursing shortage requires both decreasing attrition in nursing programs and increasing the NCLEX-RN® pass rate (Higgins, 2005; Peterson, 2009; Sayles et al., 2003; Seago, Wong, Keane, & Grumbach, 2008). This translates into admitting qualified students, retaining said students, and ensuring student success in educational programs and on the NCLEX-RN®.

As previously stated, attrition rates are highest among the first semester of nursing education programs (Peterson, 2009; Rees, 2006). Peterson went further stating that early identification of students at-risk for adverse academic events may decrease attrition rates. Fowles (1992), McDowell (2008), and Sayles et al. (2003) confirmed this. The goal then, for this research study, was to identify a predictive model for students who were at-risk for an adverse academic event within the first quarter (first half of the first semester of nursing courses) of an Associate of Science in Nursing (ASN) degree. Once students are identified, remediation can begin with the goal of decreasing attrition while increasing NCLEX-RN® success (Higgins, 2005). This brings about the purpose of this study. The purpose of this retrospective, correlational research study was to isolate variables of students who experienced an adverse academic event using admission GPA, the Assessment Technologies Institute, LLC (ATI®) Critical Thinking Assessment: Entrance® (CTAE), and the ATI® Self-Assessment Inventory® (SAI) at a private, women’s, Catholic university in the Midwest.

**Research Question(s) and Sub Questions**

The overarching research question was: What methods enabled an Associate of Science in Nursing degree (ASN) program at a private, women’s, Catholic university in the Midwest to identify students, within the first quarter, who were at-risk for an adverse academic event? More specifically:
1. What was the relationship between ASN students who experienced an adverse academic event and ATI’s CTAE® score(s) at a private, women’s, Catholic university in the Midwest?

Null Hypothesis: There was no relationship between ASN students who experienced an adverse academic event and ATI’s CTAE® at a private, women’s, Catholic university in the Midwest.

2. What was the relationship between ASN students who experienced an adverse academic event and ATI’s SAI® score(s) at a private, women’s, Catholic university in the Midwest?

Null Hypothesis: There was no relationship between ASN students who experienced an adverse academic event and ATI’s SAI® score(s) at a private, women’s, Catholic university in the Midwest.

3. What was the relationship between ASN students who experienced an adverse academic event and admission grade point average (GPA) at a private, women’s, Catholic university in the Midwest?

Null Hypothesis: There was no relationship between ASN students who experienced an adverse academic event and admission GPA at a private, women’s, Catholic university in the Midwest.

4. What was the relationship of ASN students who experienced an adverse academic event and a combination of admission GPA, ATI’s CTAE® score(s), and/or ATI’s SAI® score(s) at a private, women’s, Catholic university in the Midwest?
Null Hypothesis: There was no relationship of ASN students who experienced an adverse academic event and a combination of admission GPA, ATI® CTAE® score(s), and/or ATI® SAI® score(s) at a private, women’s, Catholic university in the Midwest.

**Definition of Terms**

**Admission GPA.** Admission GPA was calculated by the final GPA from high school for a first-time, full-time student; or the cumulative GPA from a transfer student’s previous college(s).

**Adverse academic event.** An adverse academic event was the withdrawal or unsuccessful completion of the Introduction to Nursing theory course. Unsuccessful completion was determined by a letter grade of ‘D’ or ‘F’, ‘W’ (withdraw), or ‘NC’ (no credit).

**Critical Thinking Assessment: Entrance® (CTAE).** “The Critical Thinking Assessment is a generic, 40-item test developed in May 2000. The objective of the instrument is to determine students’ overall performance on specified critical thinking skills. The assessment is designed for use at the time of admission and repeated upon completion of the program” (ATI, n.d.c, p. 1).

**Self-Assessment Inventory® (SAI).** “The Self-Assessment Inventory was developed…to help a student assess his or her own personal attributes and attitudes as they relate to qualities of successful nursing candidates. In addition to individual information provided to the student, the assessment gives nursing program faculty a class profile that can be used in tailoring instruction to group and individual needs” (ATI, n.d.b, p. 1).

**Successful completion.** Successful completion was a letter grade of ‘A’, ‘B’, or ‘C’ at the end of the Introduction to Nursing theory course.

**Assumptions/Limitations/Delimitations**

As with any research study, this study contained some basic assumptions:
- The most basic assumption was that the learning and teaching process affected the learning outcomes. This meant that when and how the learning occurred had an impact on the result.

- This study required the administration of two ATI® standardized assessments: CTAE® and the SAI®. The researcher assumed that these assessments were given in the proper sequence and in the method mandated by ATI®.

- Lastly, the researcher assumed that the students responded to the questions or statements in the assessments as accurately and honestly as possible.

In addition to the assumptions, this study contained limitations, such as:

- The convenience sample was gathered from a singular Associate Degree of Nursing program at a private, women’s, Catholic university in the Midwest; therefore, the generalizability of these results must be limited to like institutions and programs.

The delimitations to this study were that the researcher chose to:

- Only use ATI® products, instead of exploring the use of alternative methods, to identify students who are at-risk for adverse academic events. The institution where this study was located used ATI® products.

- In addition, this study solely focused on finding predictive factors for students who were at-risk for adverse academic events, not the best practices for individualized remediation.

**Summary**

Understanding how attrition affects the student, program, school, and federal government is only part of the equation to decrease attrition. In order to decrease attrition, nursing programs must examine the methods to identify students who are at-risk for adverse academic events. The
remainder of the equation is intervening with individualized remediation and predicting successful graduates. The purpose of the correlational research study was to identify nursing students who experienced an adverse academic event using admission GPA, the ATI® CTAE® and the ATI® SAI®.
CHAPTER II: LITERATURE REVIEW

Introduction

The ongoing problem of ensuring both nursing student and program success is a difficult one that comprises multiple factors including the students, faculty, and program. This study used two theories, as the framework, to analyze predictors and discuss interventions to promote student success, which were systems theory and student’s approach to learning (SAL) (Carrick, 2011). The next section defines the theories, provides rationale for use, and explains the key phases in optimizing student success.

Framework

Systems Theory. The foundation of systems theory is that the final product is greater than each ingredient, whether that be the students, faculty, nursing program, or institution (Carrick, 2011). Systems theory emerged in the 1950’s by Ludwig von Bertalanffy and can been seen in various disciplines. Bertalanffy (as cited in Hazzard, 1971, p. 385) defined a system as, “a complex of elements in interaction.” This definition, in whole or in part, is noted throughout the literature regarding systems theory. Hall and Fagan (as cited in Hazzard, 1971, p. 385) defined a system as, “a set of parts or components together with relationships between the parts and between the properties of the parts.” Laszlo and Krippner (1998, p. 7), defined systems theory as, “a complex of interacting components together with the relationships among them that permit the identification of a boundary-maintaining entity or process.” All of these definitions include parts, or components, which are interrelated or have a relationship. The relationship is neither positive nor negative by definition. Carrick (2011, p. 78) reduced these definitions to the description, “the whole is greater than the sum of the parts.” After review of systems theory definitions, this researcher created the following definition: a system is comprised of multiple
components, in which the individual components interrelate and interact with each other to form forceful patterns, which are circular, or continuous. This theory promotes inclusion of all parties in order to achieve success.

Systems theory serves as a foundation for career-decision making, behavioral science, education, medicine, nursing, and occupational therapy; however, the literature did not note nursing education as a setting for systems theory (Salvatori, 2000; Zimmerman & Kontosh, 2007). Hazzard (1971, p. 393) stated that an open system is, “capable of maintaining pattern and organization and proceeding toward increased growth.” This growth may optimize the potential for student success.

**Students’ Approach to Learning.** The second theory used as a framework in this study was the SAL theory, which includes multiple variables, just as systems theory. Through investigating “how students perceived a particular reading task and then went about learning it,” Marton and Säljö (as cited in Biggs et al., 2001, p. 134) created the SAL theory in 1976. The foundation of SAL is that learning is a continuous process whereby learning approaches, learning methods, and learning environments all contribute to student success (Malie & Akir, 2012). In addition, Malie and Akir (2012) stated that student motivation affects these three aspects of learning. Biggs (as cited in Snelgrove, 2004, p. 606) described SAL as, “ways in which students go about their academic tasks, thereby affecting the nature of the learning outcome.” Later, Biggs et al. (2001, p. 137), referred to SAL as, “the nature of the relationship between students, context, and task.” In addition, Carrick (2011, p. 79), stated that “learning approaches are best described as how students go about learning and studying, thereby affecting the learning outcome.” These descriptions all included the relationship of a task, learning, and students. After
review of SAL definitions, the researcher created a definition as the method, or combination of methods, in which a learner obtains knowledge in an educational setting.

The SAL theory literature settings included psychology, arts and science, engineering, nursing, and medicine (Reid, Duvall, & Evans, 2007). Mansouri et al. (2006) discussed that the approach to learning significantly affects the outcome of learning. This understanding of the learning process may increase the potential for student success, thereby reducing adverse academic events.

**Systems Theory in combination with SAL theory.** The purpose of combining these theories was to analyze the learning needs of students and the approach needed to achieve success, specifically early success. Tait and Entwistle (1996) reported that the most predictive measure of program success is first-year grades; however, the highest proportion of failure exists within that first year. If nursing educators can assist students in achieving early success, then more students will have program success potentially.
Figure 1: A comprehensive approach to student success. This figure illustrates a comprehensive approach to optimize the potential for student success. *Figure 1* has been adapted from Carrick (2011). Permission to use granted by author July 2012. Permission to use granted from the National League for Nursing via Copyright Clearance Center June 2014.
Admission

A comprehensive approach to student success (Figure 1) begins with student admission into a nursing program. Admission may identify the basic student profile including age, ethnicity, gender, socio-economic status, parental status, relationship status, grade point average (GPA), and admission assessment scores. Nursing schools have admission criteria, including GPA minimums, admission assessments, and prerequisite courses to varying degrees. The standards of these admission criteria are at the heart of many studies to find which combination of criteria increases the likelihood of student success (Fowles, 1992). Student GPA is one such criterion. Hopkins (2008) found that high school GPA, when coupled with Scholastic Assessment Test (SAT) scores and Nurse Entrance Test (NET)® assessment scores, positively correlates with success in fundamental nursing courses. Peterson (2009) found that past collegiate academic performance, measured by GPA, also significantly correlated with academic success in the first semester of nursing. These findings are consistent with Bauwens and Gerhard (1987); Breckenridge et al. (2012); and Lenagacher and Keller (1990). Entrance GPA has consistently been predictive of cumulative nursing GPA, as well as contributive to the prediction of NCLEX-RN® success (Bauwens & Gerhard, 1987; Breckenridge et al., 2012; Lenagacher & Keller, 1990). This provides the rationale to nursing programs to continue including GPA as part of the admission requirements and as a potential predictor or success.

In addition to GPA, some nursing programs may require that certain prerequisite courses either be completed prior to acceptance into the nursing program or be completed while in the nursing program. Fowles (1992) found that Anatomy and Physiology II, when combined with GPA and Mosby Assesstest® scores, was predictive of program success. Higgins (2005) confirmed that there was a statistically significant difference in course grades of Anatomy and
Physiology II, along with Microbiology, for students who were successful in the nursing program versus those students who were unsuccessful. Similarly, Fowles (1992) found that Anatomy and Physiology I, when combined with GPA and ACT® composite scores, was predictive of National Counsel Licensure Examination for Registered Nurses (NCLEX-RN®) success. Higgins (2005) again confirmed these results. Adding to this, Breckenridge et al. (2012) found that science GPA combined with whether the student repeated any science courses, as well as family income, predicted NCLEX-RN® success with a 93% success rate. These studies provide additional rational for GPA admission requirements and prerequisite science minimum grade requirements.

Nursing programs will often require certain admission assessments, such as the ACT®, SAT®, NET®, and/or Test of Essential Academic Skills® (TEAS). The ACT® is a college admissions assessment, which tests the students’ aptitude in English, mathematics, reading, and science (ACT, Inc., 2012). This admission assessment has shown to be a predictive variable for both nursing program success and on the NCLEX-RN® (Fowles, 1992; Lenagacher & Keller, 1990). An alternate to the ACT® is the SAT®. This tests the students’ aptitude in English, mathematics, and reading (The College Board, 2012). The typical use for these assessments is to measure high school students’ readiness for college.

The NET® assessment, by Educational Resources, Inc., was an alternative assessment to the ACT® and SAT®. The NET® assessment measured pre-nursing students’ academic aptitude as well as social skills (Sayles et al., 2003). The NET® comprehensive score and the subscores of math, reading, learning styles, stress level, social interaction, and test taking significantly correlated with NCLEX-RN® results (Sayles et al., 2003); however, Tipton et al. (2008) refuted this stating that NET® scores were not predictive variables associated with NCLEX-RN®
success. Educational Resources, Inc. is now a part of Assessment Technologies Institute (ATI) (Educational Resources, Inc., 2012) and ATI® has not continued the use of the NET® assessment. This assessment was unique in that it measured not only academic aptitude, but also social skills, which have shown to have a strong role in a student’s success.

The TEAS® assessment, by ATI®, is another assessment that measures the academic aptitude of pre-nursing students. This assessment measures English, science, mathematics, and reading comprehension (Wolkowitz & Kelley, 2010). Ukpabi (2008) found that the TEAS® composite score as well as the reading, mathematics, and English subscores significantly correlated with NCLEX-RN® success. Conversely, Wolkowitz and Kelley (2010) found that the most reliable predictor of success was the science subscore, followed by reading, English, and mathematics; however, the measurement of success in this study was the ATI® RN Fundamentals assessment, not NCLEX-RN®. The program administered the ATI® RN Fundamental assessment after the first semester of the nursing program, so the variation of results may be due to early success, the end of first semester, versus later success, the NCLEX-RN®.

The use of admission assessments into colleges and nursing programs is not a new phenomenon. Institutions may need to find the unique combination of variables that assist students with being successful, in both the program and NCLEX-RN®. Fowles (1992) discussed how predictive variables change per geographic location and between demographics; therefore, generalizability is difficult. This demonstrates why each institution has specific admission criteria and that there is not a universal admission standard.

**Risk Assessments/Predictors of Success**

As part of course orientation and the nursing program, an initial needs/risk assessment may be administered. One of the keys to nursing program success is to identify students early
who may be at risk (Johnson, Johnson, Kim, & McKee, 2009). This allows time for remediation before the student is unsuccessful, either in the nursing program or on the NCLEX-RN®. Determining which students are in need of assistance is different in each program because prediction models are program and institution specific (Alameida et al., 2011; Breckenridge et al., 2012; Fowler & Norrie, 2009; Haas et al., 2004; Hopkins, 2008). In addition, Breckenridge et al. (2012) noted that failure is much more difficult to predict.

The question of, “Why can’t students just ask for help?” may arise; however, Grayson, Miller, and Clarke (1998) noted that the problem of students not seeking assistance when needed is prevalent. Pennington and Spurlock (2010) as well as Emory (2013) took this issue a step further and stated that institutions have an ethical responsibility to not just offer student services, but also identify students who are in need of assistance and intervene aggressively. Early identification of students at risk and intervening with student specific remediation will optimize the chance of student success.

One instrument used to predict student’s academic success is the Motivated Strategies for Learning Questionnaire (MSLQ). The development of the MSLQ® began in 1982 and uses student self-reporting techniques (Pintrich, Smith, Garcia, & McKeachie, 1991). The questionnaire is composed of two sections: motivation scales and learning strategies scales (Burlison et al., 2009). Within the motivation scale are topics including intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs, self-efficacy, and test anxiety (Burlison et al., 2009; Duncan & McKeachie, 2005). The learning strategies scales include topics of rehearsal, elaboration, organization, critical thinking, self-regulation, time and study environment, effort regulation, peer learning, and help seeking (Burlison et al., 2009; Duncan & McKeachie, 2005). Previous studies using the MSLQ® in the academic settings demonstrated the
reliability and validity of the instrument (Burlison et al., 2009; Jacobson & Harris, 2008; Kitsantas, Winsler, & Huie, 2008; Mullen 2007); however, any study using self-reports may be questioned for reliability and validity. Throughout the review of literature for assessments to identify students at risk for an adverse academic event, the MSLQ® was the method most used with the highest reliability and validity. In addition to studies specifically using the MSLQ®, some subscale topics are subjects in other studies. Peterson (2009) found a significant correlation between self-esteem and self-efficacy; however, neither self-esteem nor self-efficacy had a relationship to academic success. This contradicts a study by Burlison et al. (2009) which found that self-efficacy and time and study environment assisted with predicting course examination grades.

The ATI® Self-Assessment Inventory (SAI)® includes similar topics of the MSLQ®. Developed in 2000, the SAI® is a relatively new assessment (ATI, n.d.b). The four content areas are critical thinking, learning styles, personal characteristics, and work values (ATI, n.d.b). Within the critical thinking area, there are six subscales: open-minded, flexible, rational, inquisitive, intuitive, and reflective (ATI, n.d.b). The learning styles content contains subscales of visual, auditory, tactile, individual, and group (ATI, n.d.b). Communication skills, stress and coping, integrity, and nursing understanding comprise the personal characteristic area (ATI, n.d.b). The fourth content area of work values covers the subscales of initiative, motivation, self-esteem, time management, leadership, and problem solving (ATI, n.d.b). Due to the infancy of the SAI®, further studies could determine whether it can be a reliable indicator of student success.

The ATI® Critical Thinking Assessment: Entrance (CTAE)® also contains items of similar topics to the MSLQ®. Developed in 2000, the CTAE® is also a relatively new assessment
(ATI, 2001). The CTAE® includes items that incorporate six competencies: interpretation, analysis, evaluation, inference, explanation, and self-regulation (ATI, 2000; ATI, 2001). Due to the infancy of the CTAE®, further studies may determine whether it can be a reliable indicator of student success.

Critical thinking within nursing is an ongoing education goal. Stewart and Dempsey (2005, p. 81) reported that the American Association of Colleges of Nursing (AACN) indicated, “The development of skills in critical thinking and clinical judgment should be the top curricular priority in baccalaureate and graduate nursing programs.” In addition, Romeo (2010, p. 379) described critical thinking as “an attribute that enhances one’s skill in problem solving and decision making.” According to the review of literature by Stewart and Dempsey (2005), previous studies have demonstrated that critical thinking is a variable in predicting both early academic success as well as success on the NCLEX-RN®.

In addition to the MSLQ®, the Watson-Glaser Critical Thinking Appraisal (WGCTA), the California Critical Thinking Dispositions Inventory (CCTDI), and California Critical Thinking Skills Test (CCTST) are subjects of studies. Bauwens and Gerhard (1987) found that critical thinking and academic achievement are significant predictors for the NCLEX-RN® using the WGCTA®. Giddens and Gloeckner (2005) found that the relationship between the CCTST® entrance scores and NCLEX-RN® success were statistically significant with large effect sizes for the composite score, and subscores of analysis and deductive reasoning. The CCTST® exit scores were statistically significant for the composite score and all subscores. Giddens and Gloeckner (2005) also measured the CCTDI® entry and exit scores and found that the entrance scores were not significant, but the exit scores were statistically significant with medium to large effect sizes. Conversely, Stewart and Dempsey (2005) reported that in their study there were no significant
differences found between the students’ CCTDi® and NCLEX-RN® achievement. Many of the previous studies concerning critical thinking have used the CCTST®, CCTDi®, and the WGCTA® rather than the ATI®’s CTAE® tool. In addition, most used standardized assessments and NCLEX-RN® as the indicator for success rather than the completion of the first semester of nursing. Adding to the literature, Romeo (2010) stated that previous studies were limited in that the majority are small, convenience samples from one school, including primarily Bachelor of Science in nursing program students, and generally, these studies have shown a high degree of attrition. This study explored the ATI® tools in an ASN program.

**Student Roles: Early Intervention, Environment, Learning Approaches, and Reflection**

Through the use of systems theory and SAL, both faculty and students are responsible for the outcomes (Biggs et al., 2001) as the root of adverse academic events lies within student learning approaches, as well as faculty teaching methodologies (Carrick, 2011). Once identified, the students who may be at-risk for an adverse academic event can begin reflection and implement strategies that may be more successful. This may facilitate recognition of the gap between current learning methods and achievement. It is essential to begin remediation early in order to modify learning strategies that may not be sufficient for success. Once courses begin, the process of learning and remediation may require further reflection, evaluation, and modification.

Carrick (2011) stated that often students might use learning styles that enabled success in previous academic settings; however, those same learning styles may not be effective in the nursing education setting. According to the SAL theory, successful students have the ability to adapt and use appropriate learning strategies (Malie & Akir, 2012). Once courses begin, this
process may require further evaluation and modification. This process of self-reflection promotes deeper approaches to learning.

Students may have difficulty in transitioning into nursing programs, as previously discussed. Carrick (2011) discussed that new nursing students lack the ability needed for deep learning approaches and concept application, which optimizes the student’s chance of success. Remediation is one method to assist students to be successful. Many schools offer student assistance if the student requests, but many students do not either recognize the need or feel comfortable requesting assistance. Amaro, Abriam-Yago, and Yoder (2006) found that there are many reasons for students not seeking assistance. One such reason is personal restraints such as child-care issues during remediation, family responsibilities, financial need, or because the issue is nonacademic in nature (Amaro et al., 2006; Grayson et al., 1998). Cameron, Roxburgh, Taylor, and Lauder (2011) also noted that students felt that requesting assistance is an admission of failure. Grayson et al. (1998) also discussed academic barriers to seeking assistance such as feeling uncomfortable speaking with faculty regarding issues in the course because faculty evaluates the student’s performance and awards grades. In addition, students perceive some faculty as being too busy or not available when help is needed (Grayson et al., 1998). The last reason for students to not seek assistance, according to Amaro et al. (2006), is cultural and/or language differences. Overall, the reasons that students do not seek assistance are numerous; however, this provides more evidence to faculty and nursing programs to identify students who are at-risk for an adverse academic event and intervene immediately. This optimizes the chance of success in the program and on the NCLEX-RN®.

Interventions and remediation should be a collaborative effort between the students, faculty, and institution. In order for the student to be successful, the student must first take
accountability (Carrick, 2011; Davenport, 2007; McDowell, 2008; McGann & Thompson, 2008; Pardue & Morgan, 2008). Recommended remediation actions include self-directed learning with study plans; auditing courses; personal exploration of learning styles; use of time management, stress reduction, relaxation, coping, and personal wellness skills; maintaining a positive and responsible attitude; use of support systems; and responsible use of resources (Higgins, 2005; McDowell, 2008; McGann & Thompson, 2008; Pardue & Morgan, 2008; Rogers, 2010; Salamonson & Andrew, 2006). In the classroom setting, many students may benefit from group study sessions, content reviews, critical scenarios, test reviews, online discussions, and lectures recording (Carrick, 2011; Davenport, 2007; Higgins, 2005; McDowell, 2008; Pennington & Spurlock, 2010). Lastly, Amaro et al. (2006) discussed the need for individual tutoring and mentoring, as well as providing ethnic staff and faculty to assist students with transitions into the culture and academic setting. In a more collaborative effort, the development of an organized, peer mentorship program can provide peer support, demonstrate positive study methods, promote discussion of strategies to overcome challenges among students, and potentially assist students in cultural transitions (Amaro et al., 2006; Cameron et al., 2011; Rees, 2006; Robinson & Niemer, 2010).

Students who have had an adverse academic event can benefit from frequent advising meetings, early warning systems, implementing individual plans for improvement, and initiating contracts between faculty and students (Hadenfeldt, 2012; McGann & Thompson, 2008; Rogers, 2010). These same interventions may be implemented prior to the adverse academic event if the student is identified as being at risk. Students who learn and adapt these strategies will optimize their chance of success.
Standardized assessments that simulate the NCLEX-RN® are a useful tool for both faculty and students. Bonis, Taft, and Wendler (2007), as well as Pennington and Spurlock (2010), discussed how standardized assessments throughout the curriculum assist students to identify strengths and weaknesses. This may facilitate adequate NCLEX-RN® preparation throughout the program versus waiting until the last semester and administering a comprehensive assessment. Students can create individualized learning plans to ensure adequate NCLEX-RN® preparation prior to graduation from the nursing program.

**Faculty Roles: Curriculum, Teaching Methodology, and Reflection**

Nursing faculty are an essential element of student success. Faculty create the environment and foster student learning. Mullen (2007) discussed how important it is to create a supportive and collaborative environment while maintaining cohesiveness between the classroom, clinical, and office. Methods for creating such an environment include clearly communicating expectations, providing honest and positive feedback, demonstrating patience, inviting students to ask for assistance, demonstrating consistent availability, and role modeling positive, professional behaviors (Amaro et al., 2006; Grayson et al., 1998; Kitsantas et al., 2008; Pardue & Morgan, 2008; Rogers, 2010). In addition to inviting students to seek assistance, requiring tutoring or individual appointments for students who are at risk for an adverse academic event can assist those students who may be reluctant to come forward (Rogers, 2010).

The area of teaching methodology is highly researched in nursing and adult education. There are entire books regarding the most effective, integrative teaching methodologies for nursing students (Bastable, 2003; Billings & Halstead, 2005; Bradshaw & Lowenstein, 2007; Caffarella, 2002). These authors reviewed curriculum standards, implementation, assessment, and teaching strategies based upon teaching and learning theories, as well as adult learning
theories. Implementing a variety of teaching methodologies meets the needs of various learning methods and approaches. Students may be more visual, auditory, or tactile and have personal preferences between individual or group settings (ATI, n.d. a). In order to facilitate learning to a group, each content topic may be delivered using multiple formats or combined formats such as: using pictures, lectures, physical activities, independent learning activities, and collaborative learning (ATI, n.d. a). Carrick (2011), Pardue and Morgan (2008), and ATI® (n.d. a) recommended that a faculty member reflect upon personal learning preferences, and use the information gained, to reexamine current teaching methodologies to ensure current methods meet the learner needs, not faculty preferences. While faculty may not be able to implement each of these strategies, using a multifaceted approached based upon these recommendations can foster students to achieving deep learning approaches.

The faculty cannot meet all the demands of the classroom, nor will one specific methodology suit for the entire cohort; but with individual, or small group, tutoring, students may be successful (Carrick, 2011; Malie & Akir, 2012). Individualized tutoring sessions should incorporate the students’ attitudes, beliefs, motives, expectations, and study strategies (Malie & Akir, 2012). This provides a more individualized, holistic approach to prevent adverse academic events and optimize the potential for nursing student success. In addition, ATI® (n.d. a) provided a technical report to use with the SAI® results to assist faculty with promoting student initiative, motivation, self-esteem, time management, leadership skills and problem solving. Promotion of these specific character traits are not typically discussed in textbooks, but assist the faculty in upholding student and program integrity. Faculty who are aware of a variety of teaching methods as well as personal preferences can create an optimal learning environment despite the variety of student learning needs.
Discussion of the interventions and remediation methods are frequent topics in nursing education articles. Carrick (2011) as well as Pennington and Spurlock (2010) also discussed concerns regarding the methods of these findings. The lack of experimental methods with adequate sample sizes, determined by a power analysis, provided questionable findings (Carrick, 2011; Pennington & Spurlock, 2010). In a review of literature of eight studies, Pennington and Spurlock (2010) found that there was a lack of description of the intervention methods and use of multiple methods at once which prevents replication of the study, as well as knowing which of the methods, or the combination, resulted in the findings. Pennington and Spurlock (2010) challenged future studies to implement more stringent research methods with more accurate statistical analysis. The use of these processes may determine the most appropriate remediation methods to use with students who are at-risk for an adverse academic event.

Another critical element is the nursing program and institution. Within the curriculum, computer aided instruction, NCLEX-RN® style assessment questions, and standardized assessments can assist students with the application of content (Davenport, 2007; Higgins, 2005; McDowell, 2008). The institution can provide student services that will promote individual student learning. These services may include workshops for testing skills, textbook reading methods, study skills, adjustment skills, time management, relaxation techniques, stress management skills, prioritization, and personal wellness (Amaro et al., 2006; Higgins, 2005; Kitsantas et al., 2008; McDowell, 2008; McGann, & Thompson, 2008; Patton & Goldenberg, 1999; Pennington & Spurlock, 2010; Rees, 2006; Sharon, 2005). These resources create a caring environment that fosters student self-improvement strategies and initiative. The implementation of such institutional, program, faculty, and student initiatives creates a positive environment in which students are motivated to succeed.
Summary

The purpose of this study was to accurately identify nursing students at risk for adverse academic events within the first quarter of an Associate of Science in Nursing degree. Once students are identified, remediation can begin with the goal of decreasing attrition while increasing NCLEX-RN® success (Higgins, 2005). Use of adequate admission criteria, early identification of at-risk students, self-reflection for students and faculty, a variety of teaching methodologies, and implementation of remedial activities promotes an environment that optimizes the chance of student success. The framework for this study was the combination of systems theory and SAL theory. This, in turn, may lead to lower attrition rates, higher NCLEX-RN® pass rates and program quality rates, and positively affect the nursing shortage.
CHAPTER III: METHODS AND PROCEDURES

Research Design

This research study was completed using a retrospective, correlational research design as the goal was to determine if there was a relationship between the variables (Creswell, 2012; Urdan, 2010). This type of design did not require manipulation of any variables (Urdan, 2010) and allowed the researcher to predict an outcome, such as adverse academic events (Creswell, 2012).

Identification of Sample and Description of Setting

The research study used a convenience sample based upon proximity, ease-of-access, and the need to develop program specific predictors (Alameida et al., 2011; Breckenridge et al., 2012; Creswell, 2012, Fowler & Norrie, 2009; Haas et al., 2004; Hopkins, 2008; Urdan, 2010). Each Associate of Science in Nursing (ASN) cohort, in the sample, consisted of 49-86 students. There were approximately 1,000 students at this private, women’s, Catholic university in the Midwest at the time of the study. This university was accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools and the ASN program, specifically, was accredited by the Accreditation Commission for Education in Nursing (ACEN), formally known as National League for Nursing Accrediting Commission (NLNAC).

The total population size included 281 students. The inclusion criteria consisted of ASN students who had received either a letter grade, a ‘Withdrawal’ (W), or a ‘No Credit’ (NC) for the first attempt of the Introduction to Nursing theory course between Fall 2010 and Fall 2013 and completed both predictor assessments, ATI®’s Critical Thinking Assessment: Entrance (CTAE)® and Self-Assessment Inventory (SAI)®. Exclusion criteria included those students who dropped the course or did not complete one or both of the predictor assessments. Missing
admission GPA data did not exclude that student’s data. A power analysis indicated that a minimum sample size of 123 was required based upon the use of 23 predictors, a statistical level of significance of \( p = .05 \), power criterion of .80, and an effect size of \( f^2 = .15 \) (Creswell, 2012; Soper, 2006-2013).

**Demographics**

Demographic information regarding student age upon admission, ethnicity, and admission year was collected and analyzed and findings documented in ‘Chapter IV’. In addition, attrition rates per cohort were calculated and then reported in the results.

**Data Gathering Tools**

The tools used in this research study included ATI®’s CTAE® and SAI®. The CTAE® was developed in 2000 (ATI, 2001). This assessment was a 40 question, four-option multiple-choice assessment in which the student must have completed the assessment in its entirety during one attempt and within the 40-minute time allotment (ATI, 2001). This web-based computer administered assessment was given within the first week of the first semester of the nursing program in a proctored setting as directed by ATI® (ATI, 2001). The readability of this assessment was at a 9.3 grade level and was developed in compliance with credentialing bodies’ educational outcomes criteria to identify characteristics and skills that demonstrate critical thinking in students, and procedures which conform to ‘industry standards’ (ATI, 2001). The reliability was \( \alpha = .7012 \). Per Urdan (2010), an alpha level of .70 or higher is considered acceptably reliable. Content validity was based upon the test development procedures as discussed in the technical manual (ATI, 2001). The assessment was scored with a composite score, as well as the following subscores (number of questions in each area noted in parentheses after each topic area): analysis (6), evaluation (8), explanation (7), inference (9), interpretation
The SAI® was developed in 1999-2000 (ATI, n.d. b). This assessment was a 195 question, five-option Likert-type response assessment which must have been completed at one time and within the three-hour time allotment (ATI, n.d. b). This web-based computer administered assessment was given with in the first week of the first semester of the nursing program in a non-proctored setting (ATI, n.d. b). This assessment was developed using test development procedures, which conform to the Code of Fair Testing Practices in Education and the Standards for Educational and Psychological Testing (ATI, n.d. b). The reliability was $\alpha = .9144$ (ATI, n.d. b). Content validity was based upon test development procedures as described in the technical manual (ATI, n.d. b). The assessment was scored in areas related to (number of questions in each area noted in parentheses after each topic area): critical thinking (40), learning styles (45), professional characteristics (50), and work values (60) (ATI, n.d. b). Scores were a mean of all item responses, scored in the same direction, and transferred to a 10-point scale (ATI, n.d. b).

**Data Gathering Procedures**

- The data gathering procedures for the data used in this study have been listed below.

- The demographic reports, including age, ethnicity, admission year, and admission GPA were received via the Registrar’s office and entered into the data management system by the ATI®/Assessment Coordinator.

- The CTAE® was given during class time within the first week of the first semester in the ASN program and was proctored by nursing faculty.
- The CTAE® result reports were received via ATI® and entered into the data management system by the ATI®/Assessment Coordinator.

- The SAI® was given as an assignment to be completed by the student outside of class time in a non-proctored environment within the first week of the first semester in the ASN program. Students earned activity points for completion.

- The SAI® result reports were received via ATI® and entered into the data management system by the ATI®/Assessment Coordinator.

- Final grade reports for the Introduction to Nursing theory course were received from the university’s Application Specialist and entered into the data management system by the ATI®/Assessment Coordinator. Grades were coded as either ‘Successful’ (1) or ‘Unsuccessful/Adverse Academic Event’ (0).

- The data management system was IBM®’s SPSS Statistics Data Editor, version 21.

- The next step was to clean the database by sorting cases to identify misnumbered entries (Creswell, 2012). Data for a student who was missing scores from either the CTAE® or SAI® were removed.

- Following the completion of the data entry, the researcher had a university faculty member/Institutional Review Board (IRB) Chair assign numbers to all students, remove student names, and randomize data lines to ensure confidentiality and eliminate bias. Data was then returned to the researcher for data analyses.

**Data Analyses**

The data analyses included both descriptive and inferential statistics (Creswell, 2012). The descriptive statistics included age variances, ethnicity percentages, and the number of students per admission year. In addition, attrition rates per cohort were calculated. Inferential
statistics measured the relationship between success or adverse academic events (dependent variable) and GPA, ATI®’s CTAE®, and ATI®’s SAI® assessments (independent variables) (Creswell, 2012; Urdan, 2010). The characteristics of the variables used in this research study are listed in Table 1.

Table 1. Identifying Students At-Risk for an Adverse Academic Event Research Study

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source</th>
<th>Variable Type</th>
<th>Format</th>
<th>Data Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Demographic report – Registrar’s office</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Demographic report – Registrar’s office</td>
<td>Dichotomous</td>
<td>Nominal</td>
<td>1-Caucasion, 2-African American, 3-Hispanic, 4-Asian /Pacific Islander, 5-Other, 6-Missing</td>
</tr>
<tr>
<td>Admission year</td>
<td>Demographic report – Registrar’s office</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>Admission GPA</td>
<td>Demographic report – Registrar’s office</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>CTAE® Composite</td>
<td>ATI® report</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>CTAE® Analysis</td>
<td>ATI® report</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>CTAE® Evaluation</td>
<td>ATI® report</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>CTAE® Explanation</td>
<td>ATI® report</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>CTAE® Inference</td>
<td>ATI® report</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>CTAE® Interpretation</td>
<td>ATI® report</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>CTAE® Self-Regulation</td>
<td>ATI® report</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>SAI® Critical Thinking</td>
<td>ATI® report</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>SAI® Professional Characteristics</td>
<td>ATI® report</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>SAI® Work Values</td>
<td>ATI® report</td>
<td>Continuous</td>
<td>Ratio</td>
<td>n/a</td>
</tr>
<tr>
<td>Final Introduction to Nursing theory grade</td>
<td>Final grade report – Application Specialist</td>
<td>Dichotomous</td>
<td>Nominal</td>
<td>0-D/F/W/NC, 1-A/B/C</td>
</tr>
</tbody>
</table>

Regression analysis allowed for a designated predictor variable and dependent variable (Urdan,
2010). Specifically, logistic regression was used for the purposes of this research study as it allowed the dependent variables to be dichotomous in nature, while the independent variables were continuous (Urdan, 2010). After analyses, the researcher and a statistics consultant reviewed the analyses, findings, and interpretations.

**Ethical Considerations**

As previously stated, all data remained confidential as demonstrated by the use of a faculty member/IRB Chair who removed student names and randomized data lines. This ensured minimal risk to the students whose data was used in this research study while potentially increasing the quality of education for future nursing students. Data was stored electronically on a password-protected computer within a locked office. Request to conduct research and permission to use student data granted by the Vice President of Academic Affairs (Appendix A). IRB approval also granted (Appendix B).
CHAPTER IV: RESULTS

Introduction

The purpose of this retrospective, correlational research study was to isolate variables of students who experienced an adverse academic event using admission GPA, ATI® Critical Thinking Assessment: Entrance (CTAE)®, and the ATI® Self-Assessment Inventory (SAI)®. The overarching research question was: What methods enabled an Associate of Science in Nursing degree (ASN) program at a private, women’s, Catholic university in the Midwest to identify students, within the first quarter, who were at-risk for an adverse academic event? More specifically:

1. What was the relationship between ASN students who experienced an adverse academic event and ATI®’s CTAE® score(s)?
2. What was the relationship between ASN students who experienced an adverse academic event and ATI’s® SAI® score(s)?
3. What was the relationship between ASN students who experienced an adverse academic event and admission GPA?
4. What was the relationship of ASN students who experienced an adverse academic event and a combination of admission GPA, ATI® CTAE® score(s), and/or ATI® SAI® score(s)?

This chapter will discuss the statistical methods used to analyze the data, results of the analyses, and the significant findings for each of the four research questions.

This study was conducted at a fully accredited, private, women’s Catholic university in the Midwest. The sample included all students who entered the Fundamentals of Nursing theory course in Fall 2010, 2011, 2012, and 2013 who completed both the ATI® CTAE® and the ATI®
SAI® (N= 256). Twenty-five participants were excluded from the data analyses due to missing data from ATI® CTAE® and/or the ATI® SAI®. All ATI® CTAE®, ATI® SAI®, and entrance GPA data were used in analyses, including outliers found via boxplot, as all data had been previously reviewed for accuracy prior to coding. In addition, removing outliers would not have provided a realistic data set to identify students who may be at-risk for an adverse academic event.

Demographics

The study sample included 256 students entering the Fundamentals of Nursing theory course between Fall 2010 and Fall 2013. The results of the number of students per year as well as the associated attrition rates are outlined in Table 2. Specifically, the number of ‘A’s, ‘B’s, ‘C’s, ‘D’s, ‘F’s, ‘W’s, and ‘NC’s were not calculated; instead, students were grouped as either successful or having an adverse academic event.

Table 2. Cohort Numbers and Attrition Rates

<table>
<thead>
<tr>
<th>Admission Year</th>
<th>Number of students</th>
<th>Final grade</th>
<th>Attrition rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>D/F/W/NC</td>
<td>A/B/C</td>
</tr>
<tr>
<td>2010</td>
<td>86</td>
<td>23</td>
<td>63</td>
</tr>
<tr>
<td>2011</td>
<td>60</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>2012</td>
<td>49</td>
<td>10</td>
<td>39</td>
</tr>
<tr>
<td>2013</td>
<td>61</td>
<td>5</td>
<td>56</td>
</tr>
<tr>
<td>Totals</td>
<td>256</td>
<td>48</td>
<td>208</td>
</tr>
</tbody>
</table>

*Note. D = Letter grade of ‘D’. F = Letter grade of ‘F’. W = Withdraw from the Fundamentals of Nursing theory course. NC = no credit for the Fundamentals of Nursing theory course as the student was not successful in the clinical component. A = Letter grade of ‘A’. B = Letter grade of ‘B’. C = Letter grade of ‘C’.*

Students in the sample ranged in age from 17 to 50 years with a mean age of 23.93 years upon admission to the university. White, non-Hispanic students made up 82.8% of the sample. The ethnicity characteristics of the sample are shown in Figure 2.
Research Question #1: What was the relationship between ASN students who experienced an adverse academic event and ATI®’s CTAE® score(s)?

The ATI®’s CTAE® assessment was scored with a composite score as well as subscores in the areas of analysis, evaluation, explanation, inference, interpretation, and self-regulation (ATI, 2001). A two tailed, independent samples $t$ test was calculated to compare the ATI® CTAE® composite score of students who were successful in the Fundamentals of Nursing theory course to those who had an adverse academic event. The analysis produced a significant $t$ value ($t_{(254)} = -4.84, p < .001, d = .73$). An examination of the means revealed that students who were successful had a higher ATI® CTAE® composite score ($71.55 \pm 9.16$) than those who had an adverse academic event ($64.17 \pm 10.99$). Subsequently, a logistic regression analysis was conducted to examine the effect of the ATI® CTAE® composite score on the likelihood of an adverse academic event. The logistic regression model was statistically significant, $X^2(1) = 20.91, p < .001$. The model accounted for 12.7% of the variance in adverse status event scores.
and correctly classified 82% of cases. Sensitivity was 6.3%, specificity was 99.5%, positive predictive value was 17.86%, and the negative predictive value was 82.14%.

A two-tailed, independent samples t-test was also calculated to compare the ATI® CTAE® subscores of students who were successful in the Fundamentals of Nursing theory course to those who had an adverse academic event. The analyses produced significant t-values for all six subscores as noted in Table 3. An examination of all six subscore means demonstrated that students who were successful had higher mean scores than those who had an adverse academic event. This is noted in Table 3.

<table>
<thead>
<tr>
<th>Subscore Area</th>
<th>$t_{(254)}$ values</th>
<th>$p$</th>
<th>Cohen’s $d$</th>
<th>$M \pm SD$</th>
<th>A/B/C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis</td>
<td>-2.87</td>
<td>.005**</td>
<td>.44</td>
<td>68.75 ± 17.40</td>
<td>76.92 ± 19.29</td>
</tr>
<tr>
<td>Evaluation</td>
<td>-3.28</td>
<td>.001**</td>
<td>.50</td>
<td>68.48 ± 17.68</td>
<td>76.80 ± 15.38</td>
</tr>
<tr>
<td>Explanation</td>
<td>-2.05</td>
<td>.041*</td>
<td>.32</td>
<td>72.32 ± 15.71</td>
<td>77.19 ± 14.66</td>
</tr>
<tr>
<td>Inference</td>
<td>-2.64</td>
<td>.009**</td>
<td>.42</td>
<td>48.61 ± 14.79</td>
<td>54.70 ± 14.34</td>
</tr>
<tr>
<td>Interpretation</td>
<td>-2.91</td>
<td>.004**</td>
<td>.47</td>
<td>60.85 ± 17.81</td>
<td>69.43 ± 18.57</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>-2.46</td>
<td>.017*</td>
<td>.43</td>
<td>74.47 ± 26.03</td>
<td>84.25 ± 18.75</td>
</tr>
</tbody>
</table>

Note. *$p < .05$. **$p < .01$. ***$p < .001$

A logistic regression analysis was conducted subsequently to examine the effect of the ATI® CTAE® subscores on the likelihood of an adverse academic event. The six predictors were simultaneously entered into the model: Analysis, Evaluation, Explanation, Inference, Interpretation, and Self-Regulation. The logistic regression model was statistically significant, $X^2(6) = 21.42, p = .002$. The model (Nagelkerke $R^2$) accounted for 13% of the variance in adverse academic status scores and correctly classified 82% of cases. Sensitivity was 6.3%, specificity was 99%, positive predictive value was 17.92%, and negative predictive value was 82.07%. Of the six predictor variables, none were statistically significant alone. Overall, the results demonstrated that there was a relationship between ASN students who experienced an...
adverse academic event and ATI®’s CTAE® score(s). In addition, the ATI® CTAE® can be used to predict students who may be at-risk for an adverse academic event.

**Research Question #2: What was the relationship between ASN students who experienced an adverse academic event and ATI’s® SAI® score(s)?**

The ATI® SAI® assessment was scored in areas related to critical thinking, learning styles, professional characteristics, and work values (ATI, n.d. b). Scores were a mean of all item responses, scored in the same direction, and transferred to a 10-point scale (ATI, n.d. b). This study examined the items in the areas of critical thinking, professional characteristics, and work values. Analyses were conducted using the weighted averages in the three areas of critical thinking, professional characteristics, and work values. A two tailed, independent samples $t$ test was calculated to compare the ATI® SAI® weighted subscale averages of students who were successful in the Fundamentals of Nursing theory course to those who had an adverse academic event. The analyses only produced a significant $t$ value for the Personal Characteristics weighted subscale as shown in Table 4.

<table>
<thead>
<tr>
<th>Weighted Subscale Average Area</th>
<th>$t_{(254)}$ values</th>
<th>$p$</th>
<th>Cohen’s $d$</th>
<th>$M ± SD$</th>
<th>$D/F/W/NC$</th>
<th>$A/B/C$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Thinking</td>
<td>.27</td>
<td>.266</td>
<td>.79</td>
<td>7.18 ± .70</td>
<td>7.15 ± .61</td>
<td></td>
</tr>
<tr>
<td>Personal Characteristics</td>
<td>.05</td>
<td>.050*</td>
<td>.96</td>
<td>5.83 ± .72</td>
<td>5.82 ± .71</td>
<td></td>
</tr>
<tr>
<td>Work Values</td>
<td>-.16</td>
<td>.157</td>
<td>.88</td>
<td>6.75 ± .75</td>
<td>6.76 ± .67</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* *$p < .05$. **$p < .01$. ***$p < .001$.

A logistic regression analysis was conducted subsequently to examine the effect of the ATI® SAI® weighted subscale averages on the likelihood of an adverse academic event. The three predictors were simultaneously entered into the model: SAI® weighted Critical Thinking average, SAI® weighted Personal Characteristics average, and SAI® weighted Work Values.
average. The logistic regression model was not statistically significant, $X^2(3) = .32, p = .957$.

None of the three predictor variables were statistically significant alone.

In addition to exploring the relationship between the ATI® SAI® weighted subscale averages and students who experienced an adverse academic event, the individual subscales were explored: Critical Thinking (Open-Minded, Flexible, Rational, Inquisitive, Intuitive, and Reflective), Personal Characteristics (Communication Skills, Stress and Coping, Integrity, and Nursing Understanding), and Work Values (Initiative, Motivation, Self-Esteem, Time Management, Leadership, and Problem Solving). A two tailed, independent samples $t$ test was calculated to compare the ATI® SAI® subscales of students who were successful in the Fundamentals of Nursing theory course to those who had an adverse academic event. The analyses did not produce a significant $t$ value for any of the individual ATI® SAI® subscales as shown in Table 5.

<table>
<thead>
<tr>
<th>Subscale Area</th>
<th>$t_{(254)}$ values</th>
<th>$p$</th>
<th>$M \pm SD$</th>
<th>A/B/C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Thinking: Open Minded</td>
<td>-1.00</td>
<td>.308</td>
<td>7.46 ± 1.14</td>
<td>7.62 ± 1.00</td>
</tr>
<tr>
<td>Critical Thinking: Flexible</td>
<td>.95</td>
<td>.342</td>
<td>6.92 ± 1.04</td>
<td>6.74 ± 1.15</td>
</tr>
<tr>
<td>Critical Thinking: Rationale</td>
<td>-.73</td>
<td>.465</td>
<td>7.01 ± 0.86</td>
<td>7.12 ± 0.95</td>
</tr>
<tr>
<td>Critical Thinking: Inquisitive</td>
<td>.59</td>
<td>.559</td>
<td>7.04 ± 1.03</td>
<td>6.94 ± 1.09</td>
</tr>
<tr>
<td>Critical Thinking: Intuitive</td>
<td>-.09</td>
<td>.923</td>
<td>6.95 ± 1.02</td>
<td>6.96 ± 1.04</td>
</tr>
<tr>
<td>Critical Thinking: Reflective</td>
<td>.94</td>
<td>.348</td>
<td>7.70 ± 0.98</td>
<td>7.57 ± 0.87</td>
</tr>
<tr>
<td>Personal Characteristics: Communication Skills</td>
<td>.37</td>
<td>.713</td>
<td>5.82 ± 1.01</td>
<td>5.76 ± 1.03</td>
</tr>
<tr>
<td>Personal Characteristics: Stress and Coping</td>
<td>.34</td>
<td>.735</td>
<td>4.47 ±1.14</td>
<td>4.41 ± 1.14</td>
</tr>
<tr>
<td>Personal Characteristics: Integrity</td>
<td>.25</td>
<td>.800</td>
<td>7.68 ± 1.05</td>
<td>7.64 ± 1.01</td>
</tr>
<tr>
<td>Personal Characteristics: Nursing Understanding</td>
<td>-1.43</td>
<td>.153</td>
<td>6.33 ± 0.71</td>
<td>6.48 ± 0.66</td>
</tr>
<tr>
<td>Work Values: Initiative</td>
<td>-.89</td>
<td>.373</td>
<td>7.16 ± .80</td>
<td>7.28 ± .82</td>
</tr>
<tr>
<td>Work Values: Motivation</td>
<td>-.13</td>
<td>.897</td>
<td>7.63 ± 1.09</td>
<td>7.65 ± .91</td>
</tr>
<tr>
<td>Work Values: Self-Esteem</td>
<td>-.05</td>
<td>.963</td>
<td>6.07 ± 1.06</td>
<td>6.08 ± 1.00</td>
</tr>
<tr>
<td>Work Values: Time Management</td>
<td>-.16</td>
<td>.873</td>
<td>6.63 ± 1.17</td>
<td>6.66 ± 1.03</td>
</tr>
<tr>
<td>Work Values: Leadership</td>
<td>1.00</td>
<td>.318</td>
<td>6.10 ± 0.69</td>
<td>5.97 ± .80</td>
</tr>
<tr>
<td>Work Values: Problem Solving</td>
<td>-.24</td>
<td>.814</td>
<td>7.26 ± 0.91</td>
<td>7.29 ± 0.88</td>
</tr>
</tbody>
</table>

*Note. *$p < .05$. **$p < .01$. ***$p < .001$*

A logistic regression analysis was conducted subsequently to examine the effect of the ATI® SAI® subscales on the likelihood of an adverse academic event. The 16 predictors were
simultaneously entered into the model: Critical Thinking (Open-Minded, Flexible, Rational, Inquisitive, Intuitive, and Reflective), Personal Characteristics (Communication Skills, Stress and Coping, Integrity, and Nursing Understanding), and Work Values (Initiative, Motivation, Self-Esteem, Time Management, Leadership, and Problem Solving). The logistic regression model was not statistically significant, \( X^2(16) = 13.05, p = .669 \). None of the 16 predictor variables were statistically significant alone. Overall, the results demonstrated that there was only a relationship between ASN students who experienced an adverse academic event and ATI®’s SAI® Personal Characteristic subscale; however, none of the ATI®’s SAI® weighted subscales demonstrated the ability to predict students who may be at-risk for an adverse academic event.

**Research Question #3: What was the relationship between ASN students who experienced an adverse academic event and admission GPA?**

The admission GPA was obtained from either high school cumulative GPA, if the student had not previously attended college, or a cumulative GPA of all college credits. A two tailed, independent samples \( t \) test was calculated to compare the admission GPA of students who were successful in the Fundamentals of Nursing theory course to those who had an adverse academic event. The analysis did not produce a significant \( t \) value (\( t_{(254)} = -.39, p = .690 \)). An examination of the means revealed that students who were successful had a mean GPA of 3.16 ± 0.51 compared to a mean GPA of 3.13 ± 0.55 for those who had an adverse academic event.

Subsequently, a logistic regression analysis was conducted to examine the effect of the admission GPA on the likelihood of an adverse academic event. The logistic regression model was not statistically significant, \( X^2(1) = .16, p = .689 \). Overall, the results demonstrated that there was not a relationship between ASN students who experienced an adverse academic event and
admission GPA. In addition, the admission GPA cannot be used to predict students who may be at-risk for an adverse academic event.

Research Question #4: What was the relationship of ASN students who experienced an adverse academic event and a combination of admission GPA, ATI® CTAE® score(s), and/or ATI® SAI® score(s)?

**Admission GPA and ATI® CTAE® composite score analysis.** A logistic regression analysis was conducted to examine the effect of admission GPA and ATI® CTAE® composite score on the likelihood of an adverse academic event. The two predictors, admission GPA and ATI® CTAE® composite score, were simultaneously entered into the model. The logistic regression model was statistically significant, $\chi^2(2) = 19.94$, $p < .001$. The model (Nagelkerke $R^2$) accounted for 12.3% of the variance in adverse academic event scores and correctly classified 82.1% of cases. Sensitivity was 6.4%, specificity was 99.5%, positive predictive value was 17.75%, and negative predictive value was 82.25%. This demonstrated that admission GPA and ATI® CTAE® can be used to predict students who may be at-risk for an adverse academic event.

**Admission GPA and ATI® CTAE® subscores analysis.** A logistic regression analysis was conducted to examine the effect of admission GPA and ATI® CTAE® subscores on the likelihood of an adverse academic event. The seven predictors were simultaneously entered into the model. The logistic regression model was statistically significant, $\chi^2(7) = 20.63$, $p = .004$. The model (Nagelkerke $R^2$) accounted for 12.7% of the variance in adverse academic event scores and correctly classified 82.1% of cases. Sensitivity was 6.4%, specificity was 99.5%, positive predictive value was 17.75%, and negative predictive value was 82.25%. This
demonstrated that admission GPA and ATI® CTAE® subscores can be used to predict students who may be at-risk for an adverse academic event.

**Admission GPA and ATI® SAI® weighted subscale average analysis.** A logistic regression analysis was conducted to examine the effect of admission GPA and ATI® SAI® weighted subscale averages on the likelihood of an adverse academic event. The four predictors were simultaneously entered into the model. The logistic regression model was not statistically significant, $X^2(4) = .87, p = .925$. This demonstrated that admission GPA and ATI® SAI® weighted subscale averages cannot be used to predict students who may be at-risk for an adverse academic event.

**Admission GPA and ATI® SAI® subscales analysis.** A logistic regression analysis was conducted to examine the effect of admission GPA and ATI® SAI® subscales on the likelihood of an adverse academic event. The 17 predictors were simultaneously entered into the model. The logistic regression model was not statistically significant, $X^2(17) = 14.76, p = .613$. This demonstrated that admission GPA and ATI® SAI® subscales cannot be used to predict students who may be at-risk for an adverse academic event.

**Admission GPA, ATI® CTAE® subscores, and ATI® SAI® weighted subscale average analysis.** A logistic regression analysis was conducted to examine the effect of admission GPA, ATI® CTAE® subscores, and ATI® SAI® weighted subscale averages on the likelihood of an adverse academic event. The 10 predictors were simultaneously entered into the model. The logistic regression model was statistically significant, $X^2(10) = 23.81, p = .008$. The model (Nagelkerke $R^2$) accounted for 14.6% of the variance in adverse academic event scores and correctly classified 82.1% of cases. Sensitivity was 8.5%, specificity was 99%, positive predictive value was 17.47%, and negative predictive value was 82.52%. This demonstrated that
admission GPA, ATI® CTAE® subscores, and ATI® SAI® weighted subscale averages can be used to predict students who may be at-risk for an adverse academic event.

**Admission GPA, ATI® CTAE® subscores and ATI® SAI® subscales analysis.** A logistic regression analysis was conducted to examine the effect of admission GPA, ATI® CTAE® subscores, and ATI® SAI® subscales on the likelihood of an adverse academic event. The 23 predictors were simultaneously entered into the model. The logistic regression model was not statistically significant, $X^2(23) = 33.74, p = .069$. This demonstrated that GPA, ATI® CTAE® subscores, and ATI® SAI® subscales cannot be used to predict students who may be at-risk for an adverse academic event.

**ATI® CTAE® subscores and ATI® SAI® weighted subscore average analysis.** A logistic regression analysis was conducted to examine the effect of the ATI® CTAE® subscores and ATI® SAI® weighted subscale averages on the likelihood of an adverse academic event. The nine predictors were simultaneously entered into the model. The logistic regression model was statistically significant, $X^2(9) = 23.99, p = .004$. The model (Nagelkerke $R^2$) accounted for 14.5% of the variance in adverse academic event scores and correctly classified 82.4% of cases. Sensitivity was 10.4%, specificity was 99%, positive predictive value was 17.27%, and negative predictive value was 82.73%. This demonstrated that ATI® CTAE® subscores and ATI® SAI® weighted subscale averages can be used to predict students who may be at-risk for an adverse academic event.

**ATI® CTAE® subscores and ATI® SAI® subscales analysis.** A logistic regression analysis was conducted to examine the effect of the ATI® CTAE® subscores and ATI® SAI® subscales on the likelihood of an adverse academic event. The 22 predictors were simultaneously entered into the model. The logistic regression model was not statistically significant, $X^2(22) = \ldots$
33.51, \( p = .055 \). This demonstrated that ATI\textsuperscript{®} CTAE\textsuperscript{®} subscores and ATI\textsuperscript{®} SAI\textsuperscript{®} subscales cannot be used to predict students who may be at-risk for an adverse academic event.

**Results Summary**

In summary, the data analysis showed statistically significant higher means between the ATI\textsuperscript{®} CTAE\textsuperscript{®} composite score and subscores of students who were successful in the Fundamentals of Nursing theory course to those who had an adverse academic event. The data analysis did not show statistical significance in the difference of the means nor predictive value when independently using the ATI\textsuperscript{®} SAI\textsuperscript{®} weighted subscale averages, the ATI\textsuperscript{®} SAI\textsuperscript{®} subscales, nor the admission GPA. Using the combination ATI\textsuperscript{®} CTAE\textsuperscript{®} subscores, and ATI\textsuperscript{®} SAI\textsuperscript{®} weighted subscale averages demonstrated higher percentage accuracy in classification, sensitivity, and predictive value for those who were successful as shown in Table 6 (bolded row); however, results varied minimally from the logistic regression analyses using just ATI\textsuperscript{®} CTAE\textsuperscript{®} composite or subscores. The predictions for students who were successful in the Fundamentals of Nursing theory course are identified more accurately than those who had an adverse academic event.
<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Chi-square</th>
<th>df</th>
<th>p</th>
<th>Nagelkerke R²</th>
<th>Percentage accuracy in classification</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Positive predictive value</th>
<th>Negative predictive value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTAE® composite</td>
<td>20.905</td>
<td>1</td>
<td>.000***</td>
<td>12.7</td>
<td>82</td>
<td>6.3</td>
<td>99.5</td>
<td>17.86</td>
<td>82.14</td>
</tr>
<tr>
<td>CTAE® subscores</td>
<td>21.418</td>
<td>6</td>
<td>.002**</td>
<td>13</td>
<td>82</td>
<td>6.3</td>
<td>99</td>
<td>17.92</td>
<td>82.07</td>
</tr>
<tr>
<td>SAI® weighted subscale averages</td>
<td>.315</td>
<td>3</td>
<td>.957</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAI® subscales</td>
<td>13.053</td>
<td>16</td>
<td>.669</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admission GPA</td>
<td>.161</td>
<td>1</td>
<td>.689</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admission GPA, CTAE® composite</td>
<td>19.941</td>
<td>2</td>
<td>.000***</td>
<td>12.3</td>
<td>82.1</td>
<td>6.4</td>
<td>99.5</td>
<td>17.75</td>
<td>82.25</td>
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<tr>
<td>Admission GPA, CTAE® subscores</td>
<td>20.626</td>
<td>7</td>
<td>.004**</td>
<td>12.7</td>
<td>82.1</td>
<td>6.4</td>
<td>99.5</td>
<td>17.75</td>
<td>82.25</td>
</tr>
<tr>
<td>Admission GPA, SAI® weighted subscale averages</td>
<td>.869</td>
<td>4</td>
<td>.925</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admission GPA, SAI® subscales</td>
<td>14.726</td>
<td>17</td>
<td>.613</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admission GPA, CTAE® subscores, SAI® weighted subscale averages</td>
<td>23.811</td>
<td>10</td>
<td>.008**</td>
<td>14.6</td>
<td>82.1</td>
<td>8.5</td>
<td>99</td>
<td>17.47</td>
<td>82.52</td>
</tr>
<tr>
<td>Admission GPA, CTAE® subscores, SAI® subscales</td>
<td>33.743</td>
<td>23</td>
<td>.069</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTAE® subscores, SAI® weighted subscale averages</td>
<td>23.996</td>
<td>9</td>
<td>.004**</td>
<td>14.5</td>
<td>82.4</td>
<td>10.4</td>
<td>99</td>
<td>17.27</td>
<td>82.73</td>
</tr>
<tr>
<td>CTAE® subscores, SAI® subscales</td>
<td>33.514</td>
<td>22</td>
<td>.055</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. *p < .05. **p < .01. ***p < .001
Early identification combined with individualized remediation for students who are at-risk for an adverse academic event may decrease attrition and increase National Counsel Licensure Examination (NCLEX-RN)\textsuperscript{\textregistered} pass rates for nursing programs by optimizing student success. Considering the majority of attrition occurs during the first semester of a nursing program, early identification is needed (Petersen, 2009). The purpose of this study was to isolate variables of students who experienced an adverse academic event using admission GPA, ATI\textsuperscript{\textregistered} Critical Thinking Assessment: Entrance (CTAE)\textsuperscript{\textregistered}, and the ATI\textsuperscript{\textregistered} Self-Assessment Inventory (SAI)\textsuperscript{\textregistered}. The overarching research question was: What methods enabled an ASN program at a private, women’s, Catholic university in the Midwest to identify students, within the first quarter, who were at-risk for an adverse academic event?

This chapter will review the study design as well as include a discussion of the results. Specifically, discussion will include the interpretation of the results, correlations to the literature review and theoretical framework, limitations of the study, implications for nursing education, and suggestions for future research.

**Research Questions, Results, Interpretation, and Correlation of Results to the Literature**

This research study included data for 256 female nursing students from an accredited, private, women’s, Catholic university in the Midwest. The ethnicity of the students included in the study was similar to the workforce findings published in the *National Council of State Boards of Nursing and the Forum of State Nursing Workforce Centers 2013 National Workforce Survey of Registered Nurses* (Budden, J., Zhong, E., Moulton, P. & Cimiotti, J., 2013), as shown in Figure 3.
This demonstrates the similarities in the ethnicities with the largest variations noted in the Hispanic and Asian/Pacific Islander ethnicities. This promotes generalizability of the results to other institutions of like student populations.

**Research question #1: What was the relationship between ASN students who experienced an adverse academic event and ATI®’s CTAE® score(s)?** For this question, both the ATI® CTAE® composite score and the subscores were analyzed. The results found that an increase in the ATI® CTAE® mean composite score and in the individual mean subscores was associated with a decrease in the likelihood that a student would experience an adverse academic event. The logistic regression found that the ATI® CTAE® predictors more accurately classified students who were successful rather than those who had experienced an adverse academic event. None of the ATI® CTAE® subscores were statistically significant alone, demonstrating the need for a holistic view of critical thinking to determine success.
These results confirm previous findings that critical thinking is an important variable in predicting both early and NCLEX-RN® success (Bauwens & Gerhard, 1987; Giddens & Gloeckner, 2005); however, previous studies most commonly used the Watson-Glaser Critical Thinking Appraisal (WGCTA), the California Critical Thinking Dispositions Inventory (CCTDI), and California Critical Thinking Skills Test (CCTST) assessments to measure critical thinking. In addition, these findings also support the theory that the crucial patterns of critical thinking, which are established prior to enrolling in a nursing education program, may be a powerful predictor of success in nursing programs and on NCLEX-RN® (Bauwens & Gerhard, 1987).

**Research question #2: What was the relationship between ASN students who experienced an adverse academic event and ATI’s® SAI® score(s)?** For this question, both the ATI® SAI® weighted subscale averages and individual subscales were analyzed. The results found that none of the predictor variables were statistically significant. Using the ATI® SAI® values alone were not adequate to classify a student who experienced an adverse academic event.

Throughout the literature, the Motivated Strategies for Learning Questionnaire (MSLQ) was used most widely with the highest reliability and validity. Despite the overlap of content topics between the MSLQ® and the ATI® SAI®, this study did not confirm that ATI’s® SAI® could be used in place of the MSLQ®. Instead, it may be beneficial to have nursing students complete the MSLQ® as a risk-assessment rather than, or in addition to, the ATI® SAI®.

**Research question #3: What was the relationship between ASN students who experienced an adverse academic event and admission GPA?** For this question, the admission GPA was analyzed as a predictive variable. The results were similar to those in question two in that this predictor was not statistically significant. Using the admission GPA alone is not
adequate to classify students who experienced an adverse academic event. One reason it may not have been found to be predictive is the decrease in variability of the admission GPAs. This university requires a GPA of 2.75 for admission, thereby decreasing the variability of admission GPAs. The mean GPA for those who were successful was $3.16 \pm 0.51$ compared to a mean GPA of $3.13 \pm 0.55$ for those who had an adverse academic event.

This finding was consistent with the findings by Hopkins (2008) which noted that GPA, only when coupled with SAT® and NET® scores, correlated with success in fundamental nursing courses. However, Bauwens and Gerhard (1987), Breckenridge et al. (2012), and Lenagacher and Keller (1990) all demonstrated that admission GPA was a consistent predictor of cumulative nursing GPA as well as contributing factor on the prediction of the NCLEX-RN® success indicating that it was a valid predictive variable when used individually. It is important to note that success, in these studies, were measured by cumulative nursing GPA and NCLEX-RN® results, rather than early, fundamental nursing courses.

Research question #4: What was the relationship of ASN students who experienced an adverse academic event and a combination of admission GPA, ATI® CTAE® score(s), and/or ATI® SAI® score(s)? The combination ATI® CTAE® subscores and ATI® SAI® weighted subscale averages demonstrated higher percentage accuracy in classification, sensitivity, and predictive value for those who were successful rather than those who experienced an adverse academic event. This combination was only minimally more accurate than using the ATI® CTAE® comprehensive score alone or the combinations of: 1) ATI® CTAE® subscores; 2) admission GPA and the ATI® CTAE® composite score; 3) admission GPA and the ATI® CTAE® subscores; or 4) admission GPA, ATI® CTAE® subscores, and ATI® SAI® weighted subscale averages. The increased accuracy with the combination of factors demonstrated that there is not
one key factor but that adverse academic event causes are multifactorial. The increased percentage accuracy in classification for those who are successful rather than those at-risk for an adverse academic event has been noted previously by Breckenridge et al. (2012) who stated that failure is more difficult to predict than success.

**Correlation of Results to the Theoretical Framework**

As previously discussed in the second chapter, a comprehensive student success approach is essential for a nursing program in order to optimize individual student success, decrease attrition, and increase NCLEX-RN® success. Carrick (2011) identified the two interdependent systems of Nursing Education and Nursing Student Learning. This study adapted the approach by Carrick (2011) adding admission standards, risk assessments, and early student success plans as shown in Figure 1. Once each institution can identify the program specific predictors, such as the combination ATI® CTAE® subscores and ATI® SAI® weighted subscale averages, development of student specific remediation strategies may begin.

**Limitations**

This study was conducted at a single institution’s Associate of Science in Nursing (ASN) program using strictly ATI® products instead of exploring other risk assessment products. This, along with all sample demographics, are major limiting factors to generalizability; however, Alameida et al. (2011), as well as Pennington and Spurlock (2010) argue that it is the institution’s responsibility to identify and assist at-risk students. Furthermore, according to Alameida et al. (2011) and Pennington and Spurlock (2010), each program will need an individualized predictive model as institution, program, and student characteristics differ. Another factor limiting generalizability is that these predictive variables were only compared to the success in the Fundamentals of Nursing theory course, not to program or NCLEX-RN®
success. These risk assessments are scored based upon student responses and self-reported characteristics and behaviors. Studies, such as this, must assume student responses are honest and accurate.

In addition to the above mentioned limitations, sample sizes for those who were successful versus those experiencing an adverse academic event were disproportionate. Lastly, rationale for student withdrawal and the specific numbers of ‘D’s, ‘F’s, ‘W’s, and ‘NC’s were not analyzed.

**Implications/Recommendations for Education**

The goal of this study was to determine a predictive model for students at-risk for adverse academic events in the ASN program at this private, Catholic, women’s university. Students identified as at-risk for adverse academic events can then be encouraged to seek assistance to optimize their success. This process, as shown in Figure 1, promotes a holistic, comprehensive approach to optimizing student success, decreasing attrition rates, and promoting program success all the while keeping educational costs affordable. This process begins with admission standards. As shown in the results, GPA, when used in combination with risk assessments, can be a predictive variable. Thus, the continuation of this admission standard is essential. Risk assessments, offered within the first weeks of the semester, allow additional predictive variables to be used in program specific models. This forms an early intervention foundation in which the interdependent systems of Nursing Education and Nursing Student Learning may be built upon.

In both the Nursing Education and Nursing Student Learning systems, providing positive teaching and learning environments that foster student learning is essential. Positive environments emphasize that all students can be successful provided each student strategically plans their learning efforts and seeks assistance when needed. Seeking assistance should not be
seen as an admission of failure, rather all students should be reassured that seeking assistance is part of the expectation to optimize success in individual courses, the program, and on the NCLEX-RN®. Positive learning environments, with individualized remediation, optimize early student success, which may lead to future program success (Tait & Entwistle, 1996).

Remediation programs for students identified as at-risk should be conducted in a team approach, provide structured activities, increase the amount of time spent on the materials, and include mentoring opportunities (Burlison et al., 2009). These programs will only be successful if faculty are given the needed education and ongoing resources to provide for the students.

**Future Research**

In order to create program specific, predictive models, additional studies at individual institutions are recommended, including validation of findings at the studied institution. Ideally, the creation of a holistic, standardized risk assessment that includes academic and nonacademic predictors would promote widespread success, likely decreasing the nursing shortage. In addition, subsequent studies of ATI® admission and risk assessments may demonstrate success in building predictive models in other ASN and/or Bachelor of Science in nursing programs. Once students can be accurately identified as at-risk for adverse academic events, assessments that identify student specific, holistic interventions as well as studies identifying remediation best practices may provide clarity to this overwhelming challenge. According to Carrick (2011), as well as Pennington and Spurlock (2010), remediation studies have not consistently used experimental methods and adequate sample sizes as determined by power analyses. This decreases the confidence in current remedial practices. Additional studies may also include investigating early predictive models for both program and NCLEX-RN® success.
Summary

Nursing education programs face the challenge of decreasing attrition while maintaining a high standard of NCLEX-RN® success. The reason for student failure in a course, in a program, and/or on the NCLEX-RN® is multifactorial. An aggressive and comprehensive approach holds the key to overcoming the challenges of attrition and program success. The early identification, utilizing admission GPA and risk assessment scores such as the ATI® CTAE®, and the individualized remediation with students who are at-risk for adverse academic events are key components of this comprehensive, continuous approach.
References


Assessment Technologies Institute, LLC. (ATI). (n.d. c). Critical thinking assessment. Retrieved from


November 22, 2013

Christi Glesmann
College of Saint Mary
Omaha, NE 68106

Dear Ms. Glesmann,

Please consider this letter as documentation of my approval of your request to conduct research at College of Saint Mary. Your project entitled Identifying Students At-Risk for an Adverse Academic Event sounds like a very interesting and helpful study and I wish you the best as you complete this study. If there are any questions I am glad to respond to them.

Sincerely,

Christine Pharr, Ph.D.
Vice President for Academic Affairs
Appendix B

January 29, 2014

Dear Ms. Glesmann,

Congratulations! The Institutional Review Board at College of Saint Mary has granted approval of your study titled Identifying Students At-Risk for an Adverse Academic Event.

Your CSM research approval number is CSM 1401. It is important that you include this research number on all correspondence regarding your study. Your study is in effective through February 1, 2015. If your research extends beyond that date, please submit a “Change of Protocol/Extension” form which can be found in Appendix B at the end of the College of Saint Mary Application Guidelines posted on the IRB Community site.

Please submit a closing the study form (Appendix C of the IRB Guidebook) when you have completed your study.

Good luck with your research! If you have any questions or I can assist in any way, please feel free to contact me.

Sincerely,
Vicky Morgan
Dr. Vicky Morgan
Director of Teaching and Learning Center
Chair, Institutional Review Board  *  irb@csm.edu