

Locus of control & Motivation Strategies for Learning Questionnaire:  
Predictors of Student Success on the  
ATI Comprehensive Predictor Exam & NCLEX-RN Examination

By

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## ABSTRACT

The two purposes of this study were to determine whether locus of control (LOC) was predictive of how a student would perform on the ATI Comprehensive Predictor Exam and the NCLEX-RN, and if the Motivated Strategies for Learning Questionnaire (MSLQ) provided information that would help determine predictors of success on these two exams. The study examined additional variables prominent in the literature including but not limited to, the number of Cs a person earned while in nursing school, and grades in courses such as pharmacology, pathophysiology, and medical/surgical nursing. The influence of a job was also investigated.

It was believed that an individual with an internal locus of control (LOC) would be more likely to be successful on the ATI Comprehensive Predictor Exam and the NCLEX-RN. Internal LOC was found to be statistically significant related to the NCLEX-RN. Using logistic regression a student with an internal LOC when entered into the model with the ATI Comprehensive Predictor Exam was 6.7 times more likely to pass the NCLEX-RN. Using regression analysis this was not found to be true in relationship to the ATI Comprehensive Predictor. The model that was the best predictor of a student's success on the ATI exam included the MSLQ subscales of Test Anxiety, Organization, Self-Regulation, Pharmacology course, the first Medical/Surgical class, Job not healthcare related, and the ATI Medical/Surgical Content Mastery Exam. These seven variables were the best at predicting success. A sub-hypothesis related to student performance on the ATI Medical/Surgical Content Mastery Exam believed that a student with an internal LOC would be more successful, this did not prove to be true. The students with an external LOC had pass rate of 50% on the exam at a Level two proficiency compared to 45.28% passing with an internal LOC. The number of students in the sample that were determined to have an external LOC was very small (n=12) while the results in this study

were not statistically significant it is possible that a sample with a larger sample of students with an external LOC may produce different results. An additional finding was a student working in a healthcare related job or not working scored 2.278 points higher on the ATI Comprehensive Predictor Exam than those working in a non-healthcare related job.

The second hypothesis examined the MSLQ subscales that were predictive of success on the two exams. In terms of the ATI Comprehensive Predictor Exam the subscales that entered into the model were test anxiety, organization, and self-regulation. When determining the MSLQ subscales that were important related to success on the NLCEX, control of learning beliefs and organization were the only two subscales in the model. Those subscales statistically significant in terms of a student achieving Level 2 proficiency on the ATI Medical/Surgical Content Mastery Exam were test anxiety, rehearsal, organization, and peer learning.

When evaluating test anxiety it was determined that as the MSLQ test anxiety score increased for the individual, the odds of passing decreased. Of the individuals with a test anxiety subscale score of 2.9 (scale of 1-7) or less all were successful on the NCLEX-RN. Results indicated that of those students with a test anxiety subscale score of 5.0 or higher, ten students failed the ATI Comprehensive Predictor Exam and four students failed the NCLEX-RN.

An additional hypothesis stated that a student's results on the ATI Medical/Surgical Content Mastery Exam would be predictive of his or her performance on the ATI Comprehensive Predictor Exam. This hypothesis was found to be true. A student scoring at Level II proficiency (mastery of content per ATI Faculty Resource Guide, 2007) was likely to score 4.391 points higher than a student at Level 1 proficiency. As the level of proficiency increased so did the percentage of passing the NCLEX-RN. A student who scored below level

one had a 58.33% pass rate on NCLEX-RN compared to a level two proficiency pass rate of 92.68%.

When looking at student grades in the first medical/surgical course only 70.59% of the students obtaining the letter grade of C passed the NCLEX-RN. The percentage improved with the second medical/surgical course, 80.77% of students with a C passed. Of those students earning a C in pharmacology only 75% of the students passed the NCLEX-RN.

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## CHAPTER ONE

### INTRODUCTION

#### **Problem Statement**

As a result of the current and projected nursing shortage, nursing programs today are pressed by regulatory and governmental agencies as well as the healthcare industry to increase the number of students who graduate from and who are thus eligible to enter the workforce. Nursing is not easy. The profession requires a student who has an aptitude for science and math. Not every individual has these qualities to complete a program of nursing successfully. Most schools of nursing have minimum grade point average (GPA) requirements, which usually range from 2.0 – 2.7 to apply for admission. While a school of nursing can graduate students from its programs who are ready to enter the workforce, in order to be eligible to practice graduates must successfully pass a licensure examination. This exam, administered by the National Council State Boards of Nursing (NCSBN), is referred to as the National Council Licensure Examination for Registered Nurses (NCLEX-RN). Schools are evaluated on how their graduates perform on the NCLEX-RN. The question becomes how do schools of nursing identify those students who will be successful on the exam and those that are at risk for failure.

Nursing faculty who work with students preparing for the high stakes NCLEX-RN found that it is not always possible to predict student performance on the exam (Beeman & Waterhouse, 2001; Beeson & Kissling, 2001; Briscoe & Anema, 1999; Daley, Kirkpatrick, Frazier, Chung & Moser, 2003; Sutton, 2004; DiBartolo & Seldomridge, 2005; Higgins, 2005). A student who previously performed very well in the classroom and clinical settings should conceivably do well on the exam. However, if issues such as a lack of preparation or test anxiety are involved, the outcome may be failure instead of success. Students may go into the licensure

exam confident that they have done well in school, passed a practice exam such as the Assessment Technology Institute (ATI) comprehensive predictor or Health Education Systems Incorporated (HESI) Exit Exam and will do well on the NCLEX-RN. This confidence may result in the student not doing any additional preparation which may cause them to be surprised by poor results (Heroff, 2009).

The NCLEX-RN requires that every student answer a minimum of 75 questions. Students may approach the test with the impression they will only need to answer the minimum number of questions. When this does not happen, some students panic and lose focus on the test (personal communication). Students have indicated that they underestimated the difficulty of the test and felt they did not need to prepare, believing that studying hard in school would be enough. These experiences have been shared by students completing the NCLEX-RN exam (personal communication). Grade point average (GPA) and classroom honors had the students believing they would do well; yet, some agree that there is something within this particular student that made a difference in his or her test outcome.

Conversely, nursing faculty noted that some students who struggled all of the way through nursing school are able to take the exam and pass. What has made the difference for a student such as this? Students have indicated that they knew based on their grades, they must work hard to prepare for the exam. Students have reported taking review courses, working on test-taking strategies with instructors, participating in study groups, or taking an online course. In these situations, the student has taken responsibility for his or her learning and the test outcome, whereas others struggled throughout school, did not prepare and still passed the exam. Are there presage variables that can predict an individual's success or failure on an exam such as the ATI Comprehensive Predictor exam, HESI Exit Exam or the NCLEX-RN?

Results from a qualitative study (Eddy & Epeneter, 2002) indicated that students who were successful on the NCLEX exam assumed accountability and worked hard to prepare for the exam. Those students not passing the licensure exam tended to place responsibility on someone other than themselves when interviewed. Eddy & Epeneter also found a difference in the ability to manage stress with those passing the exam compared to those failing. Students failing the exam on the first attempt stated “employers, family, and others pressured them to take the examination before they were ready, which refers to their external locus of control” (p. 278). Those that passed managed their stress by developing ways to deal with it. In contrast, the unsuccessful group had no plan.

What is it within the student that affects his or her ability to succeed in nursing school, graduate and then pass the licensure examination? One variable believed to influence students academic performance is locus of control (LOC). According to Rotter (1966), LOC plays an integral role in an individual’s degree of responsibility for learning and his or her actions. The belief is that a student with an internal LOC would be more likely to prepare for an exam. Alternatively, the person with an external LOC is often willing to believe that how well he or she will do is based on chance and not his or her individual level of preparation or ability. Consequently, the belief is that a student with an internal LOC will prepare for a test such as the NCLEX exam, knowing that his or her level of preparation will have a direct effect on his or her performance.

Trice (1985) developed a more specific tool to measure LOC known as the Academic Locus of Control (ALOC) tool. The tool measures LOC in relationship to the academic performance of college students. The ALOC creation was based on the recommendation of Rotter that “specific scales of locus of control need to be developed to predict behavior in

specific contexts” (Ogden & Trice, 1986, p. 649). This tool has been shown to be highly correlated with Rotter’s Internal-External (I-E) Scale (Eksterowicz, 1999; Ogden & Trice, 1986; Trice, 1985). Studies have supported ALOC and its relationship to academic achievement (Cook & Brown, 2009; Daum & Wiebe, 2003; Dykeman, 1993; Eksterowicz, 1999; Landis, Altman, & Gavin, 2007; Trice, 1985; Uguak, Elias, Uli & Suandi, 2007). Further, the ALOC has been found to be highly predictive of students making the decision to attend graduate school (Nordstrom & Segrist, 2009).

The concepts of motivation and the strategies for learning that a student employs may also have an effect on the individual’s ability to progress through nursing school and ultimately pass the licensure exam. The internal motivation to prepare, ability to utilize effective study habits, learning strategies, and existing anxieties all may influence a student’s performance. Richardson (2007) found that a student’s motivation and beliefs influence his or her goal attainment. Self-regulated learning (SRL) draws on student motivation and his or her use of metacognitive learning strategies. Self-regulated learning theory recognizes the student as an active participant in his or her learning (Chen, 2002; Montalvo & Torres, 2004; Pintrich, 1999; Pintrich, 2004; Winne & Perry, 2000; Zimmerman, 1999).

Motivation and use of learning strategies may also have a direct effect on a student’s performance in a course or on a high stakes exam such as the NCLEX-RN. Eddy & Epeneter (2002) found that students who had passed on the first attempt had been, “more proactive in test preparation, visualizing the examination experience and mapping a plan to cope with their stress” (p. 278).

Yost (2003) used the Motivated Strategies for Learning Questionnaire (MSLQ) to evaluate the issues of motivation and learning strategies in a group of associate degree nursing

students. Yost found the greater the degree of value the student placed on learning the content and course performance, the greater use the student would make of metacognitive strategies as outlined by the tool. Do baccalaureate nursing students use learning strategies and motivation similar to those of associate degree nursing students?

What is the magic formula for student success? Students and faculty in schools of nursing want the same end result, passage of the NCLEX-RN exam. Can early identification of a student's academic locus of control or the student's use of motivation and use of learning strategies help the student to improve his or her quality of learning, thereby affecting performance on the high stakes NCLEX-RN? The dependent variables for this study included the student initially passing the ATI comprehensive predictor exam and then ultimately passing the NCLEX-RN. The independent variables were the perceived LOC measured by the Academic Locus of Control Tool (ALOC); and motivation and learning strategies, measured by the Motivated Strategies for Learning Questionnaire (MSLQ). How schools of nursing identify students at risk of failure and then intervene to ensure they are able to pass the licensure exam on their first attempt is critical.

### **Rationale for Study**

Over the past five to ten years there has been considerable discussion in the media and the healthcare industry regarding the nursing shortage. As the current workforce ages (the average age of a nurse is between 40 – 50 years) (AACN fact sheet, 2009; Health Resources and Services Administration). This is the basis to question whether there will be enough nurses to replace those retiring as well as to meet the demand to fill additional jobs created.

Currently the NCLEX-RN is administered using computer adaptive testing (CAT). As a result, in the change of test administration to computers versus paper/pencil testing, students

must become more familiar and comfortable with testing on the computer. Schools of nursing have begun classroom testing on computers to increase the students' comfort level with this type of format. Several major testing companies have emerged to fill the need identified by faculty to generate computer based exams which provide predictive data on a student's level of knowledge. The student and the school have a need for immediate access to results in order to develop a plan for studying based on identified gaps in the student's knowledge. The two companies that are the forerunners in computer based testing are ATI and HESI.

The NCSBN is charged to ensure that a nurse is competent to provide patient care prior to entering the workforce. To be sure that the NCLEX-RN reflects current nursing practice an analysis of care in the United States is conducted. The examination and passing standard is changed to reflect the complexity of care currently being provided by nurses (NCSBN website). Each time the NCSBN has raised the passing standard to ensure safe care of the public, a significant drop in the national pass rate has occurred. In 2007 there was a dramatic 8.65% drop nationwide in the number of students passing the NCLEX-RN exam on the first attempt. The pass rate in 2006 was 87.29%, while in 2007 the national pass rate was 78.64% (KSBN Annual Report, 2007, p. 51). Historically, approximately only 50% of those individuals who must retake the exam are successful (KSBN Annual Report 2007). A student who fails the NCLEX-RN is eligible to retake the examination again 45-90 days after failing the test. This timeframe is based on the nurse practice act for the state in which they are trying to obtain a license (NCSBN website). In 2007, there were over 26,000 potential nurses nationally who did not pass the exam on the first attempt. If applying the statistic that only 50% of test-takers pass on the second attempt, over 13,000 potential nurses were not able to enter the workforce as registered nurses (NCSBN, 2007 statistics). The 2008 candidate information from the NCSBN show the pass rate

of first-time, United States educated candidates to be 86.7%. The year 2008 found over 29,000 potential nurses repeated the exam with a pass rate of 53.3% on the second attempt (NCSBN, 2008 statistics). The 2009 report indicates that as of the end of the second quarter, the pass rate for first-time testers was 89.52% (NCSBN, 2009 statistics). As of the first half of 2009, more than 11,000 candidates have tested and failed to pass, although this number may also include testers who are taking the test for the third or fourth time (NCSBN, 2009 statistics). Table 1 provides numbers for the years 2007-2009. These continued failures further exacerbate the nursing shortage. The passing standard was changed again in April 2010 (NCSBN website).

Table 1

NCLEX STATISTICS 2007 - 2009

Type of Tester	2007	2008	2009
1 <sup>st</sup> time testers, US Educated Pass Rate %	85.5%	86.7%	88.42%
Number of Repeat testers, US Educated	26,411	29,264	26, 654
Pass Rate % for Repeat testers, US Educated	52.4%	53.3%	55.87%

NCLEX Statistics from NCSBN: [https://www.ncsbn.org/Table\\_of\\_Pass\\_Rates\\_2009.pdf](https://www.ncsbn.org/Table_of_Pass_Rates_2009.pdf) (also 2007 & 2008).

The NCSBN utilizes a test blueprint for the NCLEX-RN which is published on its website (NCSBN, 2007 test blueprint). The blueprint identifies specific categories related to nursing practice as well as the topics included within that category and the percentage of questions which will come from these areas. The test plan is developed and revised every three years based on a practice analysis (Smith, 2002). This analysis is generated by surveying newly licensed nurses regarding their current nursing practice. Educators utilize the test blueprint to develop course content and curriculum (NCSBN, 2007 test blueprint).

**Hypotheses**

1. Students with an internal locus of control (ILOC) will more likely be successful on the ATI Comprehensive Predictor exam and on the NCLEX-RN than those with an external locus of control (ELOC).
  - a. Students with an internal ALOC will spend a greater percentage of study time preparing for the ATI Comprehensive Predictor and the NCLEX-RN.
  - b. Students with an internal ALOC will be more likely to achieve Level II proficiency on the ATI Medical-Surgical Nursing Proctored Exam.
2. Students with a higher score on the Motivated Strategies for Learning Questionnaire (MSLQ) subscales will be more likely to be successful on the ATI comprehensive predictor exam and on the NCLEX-RN.
  - a. Students with higher MSLQ subscale scores will utilize a higher percentage of study time for the ATI Comprehensive Predictor and the NCLEX-RN.
  - b. Students with higher MSLQ subscale scores will be more likely to achieve Level II proficiency on the ATI Medical-Surgical Nursing Proctored Exam.
  - c. Students with a higher score on the MSLQ test anxiety subscale will have a lower score on the ATI comprehensive predictor exam and will be at greater risk for failing the NCLEX-RN.
3. Students who indicate using a higher percentage of study time will be successful on the ATI comprehensive predictor exam and the NCLEX-RN.
4. Students who achieve a Level II proficiency (indicating mastery of the content) on the ATI Medical-Surgical Nursing Proctored Exam will be successful on the ATI Comprehensive Predictor and the NCLEX-RN.

An individual with an ILOC believes that he or she has an impact on academic success based on his or her level of academic preparation (Eksterowicz, 1999; Carden, Bryant & Moss, 2004; Ibrahim, 1996; Landis, Altman, Gavin, 2007; Onwuegbuzie & Daley, 1998; Rotter, 1966; Trice, 1985; Trice & Hackburt, 1989). The hypothesis is that an individual with an ELOC is at greater risk for failure. The range of scores on the ALOC and success on the ATI Comprehensive Predictor and NCLEX will help determine which scores are most predictive. It is also believed a student who has a higher degree of motivation, self-efficacy, and goal orientation will do better on these two high stakes exam. Further, the student's use of learning strategies and resource management will have a direct effect on his or her test performance.

In this study, the fifteen individual subscales of the MSLQ will be evaluated to determine if each is a reliable predictor of student performance on the ATI Comprehensive Predictor Exam and the NCLEX-RN. The identification of specific subscales will allow nurse educators to intervene early for those students at risk as the level of preparation is believed to influence student performance.

It has been hypothesized that the more hours spent studying the greater the likelihood of passing the ATI comprehensive predictor exam and the NCLEX-RN. Time spent reviewing content and doing NCLEX style questions should also increase the student's chance of passing the exams. Mastery of the medical-surgical content (which accounts for approximately 50% of the test questions on the NCLEX-RN) will predict success (ATI faculty resource guide, 2007; NCSBN test blueprint, 2007). The ATI Medical/Surgical Content Mastery Exam is a measurement of the student's level of knowledge related to this subject.

Additional variables identified in the literature were examined to determine the reliability of each on predicting success or failure on either the ATI Comprehensive Predictor Exam or the

NCLEX-RN. These included whether English is the second language for the student, the number of letter grade Cs or below received by the student in nursing courses, the letter grade received in medical/surgical nursing courses, the letter grade received in pharmacology or the pathophysiology/pharmacology course, and the number of hours worked outside of school per week.

### **Definition of Variables**

**Locus of Control** is defined as “an individual’s generalized expectancies regarding the forces that determine rewards and punishments” (Wise, 1999, para one). The literature indicates that those individuals with an internal locus of control (**ILOC**) take responsibility for their actions and for their learning. In contrast, individuals with an external locus of control (**ELOC**) do not see their role in learning, but instead believe success is based on chance or luck.

The term **Self-Efficacy** was defined by Albert Bandura (1994) as “people’s beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. Self-efficacy beliefs determine how people feel, think, motivate themselves and behave” (para one). Pajares (2002b) goes on to clarify that these beliefs are what help motivate us. These beliefs help us work towards our goals, because “unless people believe that their actions can produce the outcomes they desire, they have little incentive to act or to persevere in the face of difficulties” (para thirteen).

**ATI Comprehensive Predictor Exam** is 180 questions patterned from the NCLEX test blueprint. The test is given on the computer, as is the NCLEX-RN, but is not computer adaptive. The test was developed by Assessment Technology Institute and is intended to be predictive of a student’s performance on the NCLEX-RN examination at that moment in time. Student scores

are reported as a percentage. This score correlates to a number which indicates the student's probability of passing the NCLEX-RN. (ATI Faculty Resource Guide, 2007)

**Level II Proficiency** is a level at which ATI has determined that a student has obtained mastery of the content being tested. This proficiency level is utilized for nine content mastery exams, but is not used for the Comprehensive Predictor Exam (ATI Faculty Resource Guide, 2007).

**NCLEX-RN** is the licensure examination that must be passed to obtain a license to practice in the United States as a registered nurse. The student can answer anywhere from a minimum of 75 to maximum of 265 questions. The test is administered using computer adaptive technology and finishes when the computer has determined the competency level of the test-taker. A passing score is based on a logit formula so that the student receives either a pass or fail (NCSBN website).

**Motivated Strategies for Learning Questionnaire (MSLQ)** is an 81 item self-report questionnaire. The instrument is divided into two sections; motivation strategies and learning strategies. The motivation scale consists of the following subscales: intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs, self-efficacy for learning & performance, and test anxiety. This section includes 31 items. The learning strategies section consists of the following subscales: rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation, time/study environmental management, effort regulation, peer learning, and help seeking. This section contains 50 items. The last four subscales in the learning strategies section have also been labeled resource management: time/study environmental management, effort regulation, peer learning, and help seeking (Artino, 2005; Duncan & McKeachie, 2005; Pintrich, Smith, Garcia & McKeachie, 1991). The instrument can be given

with all 81 items or by using any of the 15 subscales or modules. The MSLQ has been utilized in numerous research studies in a variety of disciplines (Duncan & McKeachie, 2005).

**Self Regulated Learning (SRL)** believes that the learner is actively engaged in his/her learning. The process involves motivation, actions or behaviors that support learning, and metacognition. SRL involves the concepts of cognitive strategies, motivation, goal setting, metacognitive strategies, and resource management (Montalvo & Torres, 2004).

**Metacognitive Self-Regulation** includes the activities of planning, monitoring, and regulating. Within planning students should be setting goals or developing outcomes. They should also be using previous knowledge and experience to plan how to accomplish these goals. Monitoring refers to the students being aware of their progress toward learning and their level of understanding of the material. Monitoring their learning allows the students to adapt as necessary throughout a course. The activity of regulating involves making adjustments in study skills or resource management skills to facilitate and improve learning (Chen, 2002; Pintrich, Smith, Garcia & McKeachie, 1991).

## **Summary**

The goal of schools of nursing is to produce a graduate that can meet the healthcare needs of the public. As the population increases and ages those needs will continue to grow and become more complex. Along with the increasing needs of the public is the problem of the aging nursing workforce. The ability of the graduate nurse to care for patients, families and communities depends on the graduate's ability to successfully pass the licensure examination. The stakes are high for both the school, both in terms of creditability and marketability, and are even higher for students if they are not able to pass the exam and consequently unable to work as

a Registered Nurse. Consequently, finding a means to predict the success of students on these important exams is critical.

## **CHAPTER TWO**

### **REVIEW OF THE LITERATURE**

#### **Introduction**

This chapter examined issues related to student success on the NCLEX-RN. General information related to the history and development of the NCLEX-RN has been provided along with discussion of the current testing format of computer adaptive testing (CAT).

Works related to predictors of success on the NCLEX-RN, were reviewed. For purposes of this review, only studies completed after the year 1994 have been included. The format of the NCLEX-RN changed in 1994 at to CAT; therefore, studies completed before this change did not address the added complexity of a student testing via computer. In addition, computer testing has increased the ability of test developers to add questions other than those in the multiple choice format.

The change in the testing format, the need for students to become familiar with computer testing, and the need for faculty to assess a student's ability to pass the NCLEX-RN has predicated the creation of assessment companies to meet this identified need. This chapter reviewed the two major testing companies and discussed their predictor examinations, as well as reviewed concepts such as locus of control (LOC) and self-regulated learning (SRL). The focus of these concepts related to predicting an individual's academic success, along with discussion of LOC, SRL, student motivation, and use of metacognitive learning strategies as additional means to predict a student's success.

In attempting to determine predictors of success, many studies have chosen to look at variables prior to the student entering the program (pre-nursing), within the program, and at the end of the program. Variables frequently examined pre-program included: age, previous

experience (LPN status), pre-requisite scores such as GPA, ACT, or Scholastic Aptitude Test (SAT), science course grades, and math scores. One common course grade evaluated in nursing programs is anatomy. Grades in courses within a nursing program such as the medical/surgical nursing course or pathophysiology are also indicative of NCLEX-RN success (Alexander & Brophy, 1997; Daley, Kirkpatrick, Frazier, Chung & Moser, 2003; Haas, Nugent, & Rule, 2004; Uyehara, Magnussen, Itano & Zhang, 2007). Studies looking at end-of-program variables have focused on nursing course GPA, cumulative GPA, number of Cs or below in nursing courses and results of a pre-NCLEX-RN examination. A number of studies have also been included in this chapter to illustrate the variables that may potentially predict success or failure on the NCLEX-RN.

## **NCLEX-RN**

The NCLEX-RN must be passed to enter the workforce as a registered nurse. All fifty states require a nurse to have a valid license to practice as a nurse. State Boards of Nursing are charged with protecting the public by providing competent, practicing nurses (Mosser, Williams, & Wood, 2006; NCSBN website; Smith, 2002; Wendt & Alexander, 2007). For many years, the examination was given as a paper/pencil test. The test was initially divided into five sections (Medical Nursing, Surgical Nursing, Pediatric Nursing, Women's Health, Psychiatric/Mental Health Nursing) (Arathuzik & Aber, 1998; Engelmann, 2002; Wood, 2000). The test at that time was given in large rooms with many tables and chairs. Many nursing instructors currently teaching still remember the stress of taking this examination over a two-day period. Proctors would roam the rows of potential registered nurses to ensure no cheating occurred. After taking the exam, an examinee often waited a minimum of six weeks before learning his or her results. The students were given a score for each of the five sections. The test was changed to a pass/fail

grading criteria, which has made it difficult for nursing schools to have useful categorical information related to their program's performance (Arathuzik & Aber, 1998; McDowell, 2008; Waterhouse & Beeman, 2003).

The licensure examination was initially developed as a norm-referenced test. The new format utilizes a criterion-referenced test. The test is computed using the Rausch model. Over the years the tests has gone from a logit of -0.42 in 1998 to a logit of -0.21 as of 2007 (NCSBN Research Brief, 2006). When the passing standard was increased in 2004 and again in 2007, a decrease in the national pass rate occurred. The passing standard was increased again as of April 2010 to a logit of -0.15 (NCSBN website).

In 1994 the NCSBN moved to a new license examination structure (Wood, 2000, para 2). The new exam format utilizes CAT to ascertain the examinee's minimum competency. When an examinee answers a question correctly, the next question he or she sees is more difficult; when the question is answered incorrectly, the next one is easier. The benefit to the computer adaptive technology is that the tester gets a test created specifically for his or her ability. When the examinee answers a question, the computer computes an estimate of the individual's ability while evaluating the content area needed according to the test blueprint and picks the next question where examinee will have a 50% likelihood of being able to determine the right answer. The tester must answer a minimum of 75 questions and could answer up to a maximum of 265 questions. The computer determines the ability of the student when it gets to that 75 question mark to determine competency. When the computer is satisfied with the tester's ability, it will shut off; the same is true if the student is below the minimum competency level. If the computer is not clear on the individual's competency, it will continue to ask questions until it is able to make a decision.

The NCSBN reviewed passing standards every three years by doing the following: an Angoff procedure, looking at the trends in pass rates, and evaluating a survey completed by nursing educators and employers hiring new graduates. The abilities of high school students were also evaluated as this becomes the pool with which schools of nursing work (NCSBN Research Brief, 2006). Additional format questions added increased the challenge for students and faculty to prepare for the exam. Question types included fill-in-the blank, “hot spot” (where the student points to a spot on the computer screen), as well as drag & drop, and select all that apply (Norton et al., 2006).

The test created utilized the established NCLEX-RN test blueprint available for anyone to view on the NCSBN website. The blueprint identified categories related to nursing practice. The percentage of the questions from each area was reported. An increased focus on the categories of pharmacological and parenteral (IV) therapies (13-19%), reduction of risk strategies (13-19%), and management of care (13-19%) (NCSBN, 2007, test blueprint) was implemented during the last two cycles of change in the blueprint. The percentages listed indicated the percent of questions the student would answer related to a specific category. The management of care category included issues of delegation, assignment, prioritization, and leadership. Educators utilized the test blueprint to develop course content and curriculum (NCSBN, 2007 test blueprint).

The test plan developed based on a practice analysis completed by a survey of newly licensed nurses regarding their current practice. This survey represented approximately 10% of nurses licensed in a period of three months (Aucion & Treas, 2005; Smith, 2002). Concern has been expressed about the small sample size utilized for development of the licensure exam by educators and hospital administration. The practice analysis utilized newly licensed RN's who

took the exam in the first four months of 2008. Six thousand nurses were contacted via a mailed paper/pencil tool and asked to complete the survey. Another 6,000 new nurses were contacted and asked to participate via an internet survey (NCSBN Practice Analysis, 2008). In 2007, over 100,000 new nurses obtained a license to practice (NCSBN website). The tools of analysis examined 155 different activities previously identified that nurses perform. Information requested from the survey participants regarded places of employment, hours worked, orientation received, types of clients cared for, and demographics. One section of the survey asked participants to answer the questions based on their most recent shift completed. Not all 155 activities were included on each survey. The practice analysis had nineteen activities that were included on all versions of the survey. The paper/pencil test had two versions while the internet tools had four different versions. Each had nineteen common activities and then the two types of tools had items that are unique to the paper/pencil, as well as ones which are unique to the internet (NCSBN Practice Analysis, 2008).

Aucion & Treas (2005) identified recommendations considered as faculty developed curricular experiences. They reviewed the practice analysis done in 2002 and recommend consideration of some of the following: inclusion of advanced cardiac life support (ACLS) protocols, information related to conscious sedation, experience in long-term care, use of multiple agencies for clinical sites, and experience with leadership and delegation. Of key consideration are the four main areas of activity

“assessment/evaluation activities (e.g. physical status, lab results, treatment effects, rounds), 19 percent; medication-related activities (e.g. incompatibilities, routes, side effects), 16 percent; health care team activities (e.g., supervision of care, communication, discharge planning,

teaching staff), 14 percent; routine care/procedure activities (e.g., baths, vital signs, ambulation, wound care, catheters), 14 percent” (p. 270).

Based on the larger percentage of these four groups of activities, Aucion & Treas recommended schools of nursing ensure adequate coverage within their curriculum.

The NCLEX-RN changed its format over the years as it continues its primary goal: to measure the minimum competence of potential registered nurses (NCSBN website). As the test evolved, nursing faculty continued to adapt content and curriculum to ensure that students were prepared to successfully pass the examination. It was imperative that schools of nursing understand how the test is developed.

### **Predictors of Success**

Nurse educators are faced with how to prepare students to care for patients as well as how to prepare them to pass the minimum competency exam to obtain a license to practice. A number of studies examined ways to identify those students at risk of failure or, from a positive outlook, predicted those to be successful on the exam. What are the key indicators that a student is at risk? Can early intervention make a difference? A separate issue is the anxiety created related to passing this test. What strategies can programs use to help students reduce their level of anxiety?

Schools of Nursing are evaluated by the public, healthcare agencies and regulatory bodies based on their students ability to pass the NCLEX-RN(Aucoin & Treas, 2005; Davenport, 2007; McDowell, 2008; Norton et al., 2006, Ukpabi, 2008; Sifford & McDaniel, 2007). Norton et al. (2006) further exemplified the significance to schools of nursing related to low NCLEX-RN pass rates: problems with recruitment, less qualified applicants, decreased revenue, increased focus on the program, reduction in satisfaction from employing agencies, and possible regulatory body involvement. This scrutiny led to a very high stakes test for the student and the school.

Beeman and Waterhouse (2001) asked two questions: Is it possible to predict success on the computerized adaptive testing (CAT) version of the NCLEX-RN? Which variables are the best indicators of success? The study examined files of 538 former students from four years who were randomly placed into one of two groups. The authors found when using a discriminant analysis with 21 variables that “sex, age, year of graduation, and SAT verbal scores” (p. 162) were not significantly correlated with success or failure on the NCLEX-RN. The amount of Cs or below that a student obtained in nursing classes was the best predictor of a student’s success ( $r = -.394, p < .0001$ ). Also predictive were the beginning foundational course and pathophysiology grades. The discriminant analysis accurately identified 94% of those students who succeeded in passing the NCLEX-RN and even more importantly determined 92% of those students who were unsuccessful. “There were notable differences between those passing and those failing the CAT NCLEX-RN. Those who passed earned statistically significant higher grades in all didactic nursing courses, had significantly higher GPAs and had a significantly lower number of low theory and clinical grades” (p. 162). The primary drawback to this study was that it was limited to only one program.

Waterhouse & Beeman (2003) found when trying to simplify a previously developed tool by Barkley, Rhodes, & Dufour (1998) that the Risk Appraisal Instrument (RAI) was not as accurate in predicting student failures on the NCLEX-RN, (61%) as their previously developed discriminant analysis which predicted 92% of the failures. Waterhouse & Beeman adapted the RAI to their program and developed the Delaware Risk Appraisal Instrument (DRAI). The goal of this study was to attempt to develop a tool that could be calculated easily as a means for faculty to identify students at risk for failure. A fast predictor of success seemed to be the grade from their medical/surgical class. They found grades from this course “predicted 78.4% of

failures and 61.6% of passes” (p. 38). The authors also reported the number of Cs was also predictive.

Haas, Nugent and Rule (2004) supported the previously stated findings as they found a strong correlation with cumulative nursing GPA ( $r=.664$ ) and a student’s verbal SAT score ( $r=.580$ ). Using a discriminant analysis, the following variables were investigated: nursing GPA, SAT verbal score, SAT quantitative, cumulative GPA at the end of program, and GPA as transferred into program, age, gender, and ethnicity. The authors used a stepwise method to find the best combination of variables to identify those students likely to pass or fail. The model with SAT (verbal & quantitative), nursing GPA, age, gender, location of the campus and race was able to predict 61.3% of those students who failed. The significance of this finding is that future students can be helped and as a result, the risk of failure will decrease.

Beeson & Kissling (2001) also supported the belief that the number of Cs that a student earns while in nursing school was a good indicator of his or her potential success or failure on the NCLEX-RN. They performed a retrospective study with 505 students and looked at data from six years. The independent variables included age, gender, grades in specific pre-nursing classes, grades in courses at each step in the nursing program, cumulative GPA at completion of the program, and score on the Mosby Assess Test. The pre-admission into the nursing program variables included science courses (Anatomy, Physiology, Microbiology) and also course grades in psychology, sociology, human development, and a course related to family development. The authors divided their sample in half and used one group as a development sample. The other group was then used to validate findings. Findings indicated that students with fewer Cs, higher GPAs and a superior score on the Mosby Assess Test had a higher degree of success on the NCLEX-RN. Using stepwise regression analysis, the authors determined that for those

individuals in the developmental testing group the “odds of failing the NCLEX-RN increased 56 percent for each additional C, D, or F a student received in nursing courses. For each increase of 10 percentage points on the Mosby Assess Test, the odds of failing decreased 150 percent” (p. 124). Based on study results, the authors were able to create a prediction formula for their school. The formula includes the number of Cs or below, percent right from the Mosby Assess Test, and factors of whether or not the student is a traditional or non-traditional student (non-traditional students were found to do better). Of significance is that the number of Cs or below was most predictive in identifying students likely to fail on the NCLEX-RN. The authors stated, “students with one grade of C or below in nursing courses had a passing rate of 84 percent. Students with three or more Cs, Ds, or Fs, had a passing rate of 51 percent” (p. 126).

Endres (1997) retrospective study’s goal was to find the best predictors of success for students not born in the United States. Endres found that the student with Ds & Fs in nursing courses were more likely to be unsuccessful on the licensure exam. The study randomly sampled students from a total population of 1205 students (years 1987-1992) to obtain 50 students divided into three groups (not born in United States, African-American, and Caucasian). Nine independent variables were evaluated to determine if they were predictive of a student’s success on the NCLEX-RN: admission and cumulative GPA, GPA in nursing courses, medical/surgical class grade, score on the Mosby Assess Test, number of Cs or below (nursing), length in the curriculum, previous LPN experience, gender, and ethnicity. Results indicated that ethnicity was not related to a student’s performance on the NCLEX-RN. However, a student’s number of Cs or below and success or failure on the exam, were strongly significant. It was also found that the higher the number of Cs or below earned by the student, the greater the likelihood of the student failing. The Mosby test score of less than 21 was even more indicative of failure on NCLEX-RN.

When including both the number of Cs or below and the Mosby score below the acceptable limit, the study found that those students had a greater chance of failing. Higher GPAs whether they were on admission, from nursing course GPA or a cumulative GPA indicated a higher chance of passing. Previous healthcare licensure (LPN status) was not significant.

Recommendations from this study (Endres, 1997) included the need to review admission policies and to examine the amount of time students take to complete the program. Endres found that African-American students took longer (more semesters) to complete the program. Schools of nursing may need to re-evaluate the standard that every student progress through the program at the same pace.

Using a logistic regression analysis, Seldomridge and DiBartolo (2004) found that a student's performance on their medical/surgical exams and their score on the National League for Nursing Comprehensive Achievement Test for Baccalaureate Students (NLNCATBS) were highly predictive of students' ability to pass. This study looked at thirteen different independent variables and also examined the students' progress at three different points in their education. The first point of examination included data pre-entry into the program and involved assessing grades in anatomy & physiology, pathophysiology, chemistry, statistics, number of Cs and cumulative pre-admission GPA. At the conclusion of the first year in the nursing program, they looked at additional variables: number of Cs in courses from the first year, the test score average from two medical/surgical courses, and the cumulative GPA at this point. The researchers used additional variable from the last year of nursing school as their third point of evaluation. These included: number of Cs and performance on the NLNCATBS. The dependent variable was student success or failure on the NCLEX-RN. The retrospective study reviewed records from 186 students in which the overall NCLEX-RN pass rate was 80.6%.

In evaluating their results, Seldomridge & DiBartolo (2004) found that the NLNCATBS had a strongest relationship to student performance on the NCLEX-RN ( $r = .452, p = .000$ ). The student's pathophysiology grade and the medical/surgical course grades also had strong relationships, ( $r = .377, p = .000$  and  $r = .307, p = .000$ ) respectively. While the pathophysiology grade predicted success, the authors determined that for this population it was not helpful in identifying those at risk to fail. The number of Cs, were higher for students who failed the exam than for those who passed. They also found when a student had "five or more Cs in junior-year nursing courses, 50 percent passed NCLEX-RN, while those without any Cs had a pass rate of 100 percent" (p. 364).

Several other models were developed using a stepwise approach. The best model at predicting both success and failures was when the NLNCATBS was first and medical/surgical grades second. This grouping was able to forecast "94 percent of NCLEX-RN passes and 33.3 percent of NCLEX-RN failures, with an overall accuracy of 82.3 percent" (p. 365). The best model for calculating a student's likelihood of success was using the NLNCATBS and then the pathophysiology grade. This combination increased "the prediction for NCLEX-RN failures to 50 percent; prediction of success dropped slightly to 93.3 percent, the overall success in predicting NCLEX-RN performance was 84.9 percent" (p. 365). These results were used to identify students who would be at greater risk to fail so remediation can be provided prior to taking the NCLEX-RN.

In a five year review of student performance on NCLEX-RN (1988 – 1994), Alexander and Brophy (1997) investigated those students failing, a total of 94 students. As a means of comparison, they randomly chose 94 students who passed the exam during that same time period. The subjects were individuals who had chosen to complete the program with an

associate's degree at the end of two years instead of completing the BSN program. This was an option available to students in this program. The study examined pre-admission as well as program variables. Pre-admission variables included SAT, high school chemistry and math grades, class rank, GPA prior to entering the program, credits completed prior to entering the program, and age. GPA at the end of the first and second year, nursing course grades and then nine primary classes were identified by the authors to be of importance including anatomy & physiology. Key findings found that the best indication of a student's abilities "were verbal SAT scores, nursing grade point average, and NLN Comprehensive Achievement Test scores" (p. 443). The conclusion was that a student's SAT verbal score could help identify those at greater risk so that additional support could be given early.

In a doctoral dissertation study, Stuenkel (2002) used discriminant analysis to examine admission, program, and assessment testing variables to determine a model that correctly predicted success or failure on the NCLEX-RN. Stuenkel looked at all variables both individually and in groups. Age and gender were found to not be predictive at any point. In terms of pre-admission variables the best model found was the SAT score, National League for Nursing (NLN) pre-test, and pre-admission GPA. This grouping predicted 80% of those passing, and provided an eta square value of 34%. This grouping had a very small sample size due to SAT scores not being available for those students transferring into the program. The SAT did correctly identify 66% of those failing. In looking at within program information when nursing GPA, NLN pre-test, and pre-requisite GPA were grouped, 78.4% or 269 cases were accurately identified as passing and 21% were accurately identified as failing. Of the NLN Achievement tests used by this school, the most predictive was the Community Health when used alone; however, when grouped together with the Adult Care exam predictability of passing or failing

increased. Stuenkel identified this finding as supported by the work of Barkley, Rhodes & DuFour (1998). It is difficult to say whether grouping all five NLN achievement test scores together would have been a better predictor of student success or failure; but, due to gaps in data when using all 5 of the NLN achievement tests the sample size decreased to 59. Using the student's nursing GPA, NLN Adult Care, and Community Health scores, 79.3% of the students were accurately identified to pass but only 33.3% of those in the fail group were identified (n=305). Of significance is the finding that for the NLN Adult Care Achievement test "the mean for the pass group is approximately 1.5 standard deviations greater than the mean for the fail group....On the NLN Maternal-Child Achievement test, the mean for the pass group is more than one standard deviation greater than the mean for the fail group" (p. 72).

Peterson (2009) in a descriptive, correlational study focused on whether there was a relationship involving a student's previous coursework, self-esteem, and self-efficacy. The focus of Peterson's study was student attrition in the first semester. Peterson cited AACN data that attrition further exacerbated the shortage of nurses by rejecting potentially qualified students. The Rosenberg Self-Esteem and General Self-Efficacy Scales were used on students participating through convenience sampling. A student's academic ability was determined by GPA at the end of the beginning semester in nursing school. The preferred GPA was 2.5 or greater. A student's admission GPA was used to determine his or her previous ability.

Results of Peterson's study (2009) indicated a positive relationship existed between previous academic ability (admission GPA) and current semester GPA ( $r=.514, p < .01$ ). Self-esteem and self-efficacy were found to not be significantly related to this group's academic success. Of significance, 29 out of 66 students did not progress to the next semester on a full-

time basis related to academics. Sample size was small and only included data from one program. One recommendation was the need to consider part-time status for some students.

Arathuzik and Aber (1998) conducted a descriptive correlational study with 79 nursing students in their final semester. The study evaluated both academic and non-academic variables on successful passage of the NCLEX-RN. Cumulative GPA, NCLEX results, responses to an Internal and External Block Scale, demographic tool, and a Study Skills Self-Efficacy Scale were tabulated along with the student's theory and clinical grades in the last semester. The study demonstrated low significance existed with cumulative GPA, when English was the preferred language at home.

Information also from Arathuzik and Aber (1998) found to be significant from the Internal Block scale indicated that individuals identifying less anxiety and emotions did better on the NCLEX-RN than individuals with a high level of emotional stress. From the External Block Scale, those persons with limited or no family obligations performed better on the examination. This improved performance may also be a result of decreased stress and fatigue related to family responsibilities. The study also found critical thinking ability correlated to NCLEX success. Arathuzik and Aber (1998) stressed the need to assess academic and non-academic variables to help identify students at-risk to provide early intervention.

A retrospective study with nursing students completing an Associate Degree Nursing program and their NCLEX-RN results was conducted examining four years (2001-2004) of data. (Tipton, Pulliam, Beckworth, Illich, Griffin & Tibbitt, 2008). During that period 85% of those sampled passed the NCLEX-RN exam. The independent variable was cumulative nursing GPA with NCLEX-RN results as the dependent variable. An independent samples t-test found a statistically significant difference between those students who passed and those who failed

( $t(101) = 6.21, p = .000$ ) even though the tangible difference between the GPA of those passing or failing was very minor. Students not being recognized early enough for help was of concern to the authors when cumulative GPA was used as a focal point.

The researchers (Tipton et al., 2008) conducted a Pearson correlation using two nursing courses at the beginning of the program. The cumulative nursing GPA and the first two courses were significant ( $r = .64$ ). Identification of risk from courses taught at the beginning of the program provided faculty a mechanism to provide earlier intervention. In addition, results on the nationally used standardized entrance exam provided information related to reading, math, test-taking and stress. The additional variables did not prove to be significantly different between the groups (those passing and those failing).

Briscoe & Anema (1999) examined variables related to a student's academics and non-academics in another associate degree nursing program study. This study questioned effects related to GPA pre-admission, failure of a clinical course, NLN tests (Adult Health I & II), age, and ethnicity. The sample size was small with only 38 students. In analyzing the data they found pre-admission GPA and clinical course failure to not be significant in a student's ability to pass NCLEX-RN. What they did find significant with this small convenience sample was student scores on the NLN Adult Health I & II, age, and race. The NLN Adult Health I had a Pearson correlation of ( $r = 0.476, p = 0.01$ ) with the Adult Health II ( $r = 0.371, p = 0.01$ ). It found that the older the student, the greater the probability for success. This sample had a high age range (24-56). Related to race, students were grouped into either, White non-Hispanic, Black non-Hispanic, African descent, and Hispanic. The African group demonstrated poor performance on the NCLEX-RN with all groups failing. All five individuals in this group were international students.

Another study (Sayles, Shelton & Powell, 2003) utilized the following variables: the Nursing Entrance Test (NET) developed by Educational Resources, Inc. (ERI), Pre-RN test scores (follows NCLEX test blueprint), ACT, cumulative GPA, nursing course GPA, repeating nursing courses, pre-admission into the program courses, last course in the program, gender, and ethnicity. Sayles, Shelton, & Powell completed a correlation study using 78 student records from an associate's degree of nursing program in 2001. Of the 78 students, 68 students passed NCLEX (84.6%). Of note was that over 69% of the students in this study were already functioning as LPNs. Of the variables examined, gender, cumulative GPA, NET scores (excluding math, reading and the total scores), ACT score, number of courses taken again, and pre-admission into the nursing program courses were found to not have any significance. What was found to be significant with this population related to passing the NCLEX-RN exam at the  $p < .05$  were: nursing GPA, the Pre-RN final score, NET results related to math, reading, and overall results, ethnicity, and the last nursing class grade. In a closer evaluation, students who had higher math and reading scores on the NET were found to have success on the NCLEX-RN. The author's findings further support the correlation of the Pre-RN exam in predicting a student's success on NCLEX-RN. Findings from this study indicated that non-Caucasian students had a higher failure rate on the exam. Sayles, Shelton and Powell support the need to identify students early through some means of assessment so that intervention can be initiated.

Hopkins (2008) completed a study, which utilized the NET exam, with the goal of determining what academic and non-academic variables may contribute to success in a fundamentals course within the beginning semester of nursing school. Many schools desired to be able to identify student's at-risk intervention throughout the program, making it much more likely that the student would complete the nursing program and be successful on the NCLEX-

RN. The benefit of the NET exam is that besides academic variables, it also gives an indication of non-academic variable such as the student's stress level (family, social, money, work, school) along with his or her preferred learning style. Other variables included in the study were critical thinking, SAT scores, GPAs from high school and college, math and reading composite scores from NET, age, and grade in the fundamentals course. The sample size consisted of 383 students from an associate's degree program. "A factor analysis was conducted identifying five factors: reasoning, learning style, analytic, anxiety and commitment" (p. 257). Using a regression analysis, all five factors were entered in the model had results of  $X^2 (9, N = 383) = 33.10, p < 0.01$ . "Predicted success was good, with 99% of the successful students correctly identified and an overall success rate of 82.5%" (p. 258). Unfortunately, the model did not identify those who would fail, with only 5.9% were correctly identified.

Daley, Kirkpatrick, Frazier, Chung & Moser (2003) conducted an *ex post facto* study looking at two different years. The first year, students took the Mosby Assess Test and the next year the HESI Exit Exam was administered. Besides demographic data, pre-admission variables included chemistry courses, anatomy, sociology, and zoology grades along with the pre-admission GPA. Additional nursing school variables identified were pathophysiology, senior medical/surgical nursing class, and the clinical associated with it. Study results found those students passing the NCLEX-RN were older, with a superior pre-admission GPA and ACT scores. In relationship to the nursing program variables, those individuals with better grades in pathophysiology, the medical/surgical course and clinical were more likely to be successful on the NCLEX-RN. The two different assessment tests also demonstrated that students with higher scores on either the Mosby Assess Test or the HESI examination had a higher likelihood of being successful on the licensure exam.

Uyehara, Magnussen, Itano, & Zhang (2007) evaluated variables at three different points for students within their study: pre-admission, in the program and exiting the program. The study reviewed records from 224 students over a five year period. This study used scores from the NLN pre-nursing test. This test provides information on a student's math, verbal and science skills as well as providing a total score. A number of courses evaluated the student from within the program, with the Mosby Assess Test used as the variable exiting the program. Participants in the study had a very high pass rate, 97.25%. While the authors found the NLN test for Adult Health, Maternal/Newborn, and Pediatrics positively correlated, the test which was most prognostic of success on the NCLEX-RN were the NLN Adult Health Comprehensive Test. Using study results the program rearranged the order of classes, added an elective course on NCLEX-RN prep, and increased use of NCLEX type questions. A fundamentals class was identified as being predictive of NCLEX-RN success as well as the pathophysiology course.

Yin & Burger (2003) conducted a retrospective study using pre-admission variables from an associate degree program. Independent variables included age, gender, ethnicity, student status, any LPN experience, and high school data including rank in class and GPA. Also examined were college hours received prior to entering the program, college GPA at admission to the program and final GPA. Pre-nursing course grades were collected from science courses (anatomy, chemistry, microbiology, and physiology), English and psychology. Data was run using correlations and logistic regression. Results indicated that pre-admission GPA as well as grades in the sciences and psychology was superior for those students who passed NCLEX. "The overall likelihood ratio statistic for a two-variable model (college GPA prior to admission and high school rank) was significant. For each 0.1 increase in GPA, the odds of passing NCLEX increased thrice" (p. 233). Also of significance was "when the college preadmission GPA is less

than 2.95, the average NCLEX-RN passing rate drops to 76% as compared to 96% when the GPA exceeds 2.95” (p. 234). A benefit to this study was the generalizability of the results related to the larger sample size ( $n= 325$ ) and the use of common pre-nursing courses as variables.

Higgins (2005) used both quantitative and qualitative approaches in studying attrition and passing of NCLEX-RN in another associate’s degree program. The study was conducted in three stages with the first involving looking at pre-admission courses, nursing skills course, pre-admission test scores, demographic data, and HESI Exit Exam results. The second stage involved surveying other schools in the state to determine strategies being used to improve attrition and pass rates. The last stage involved interviewing faculty and students regarding the experience with studying and NCLEX-RN. The anatomy and physiology course and microbiology did have a significant effect on a student finishing the program with anatomy and physiology also being significant to passing the NCLEX-RN. The pre-admission test (specific test was not identified) was found to be significant in the areas of math, science, and reading in relationship to both completion of the program, with science being significant to passing the NCLEX-RN. None of the demographic variables were significant. The HESI exit exam was significant; those individuals with higher scores were more likely to pass. The strongest comments from faculty centered over the need to mentor students.

Jeffreys (2007) chose to look at progression throughout one associate degree nursing program, completion of a nursing program and successful licensure. Many of the variables that affect a student’s ability to pass the NCLEX-RN exam may also affect his or her ability to move through and complete the program. For purposes of a pre-admission GPA, four courses were used: English, Anatomy & Physiology, psychology and a philosophy course focusing on ethics. The anatomy and physiology course was also examined independently. Progression was

evaluated based on completion of the program, whether progression issues were the students' choice, and course grades. The first medical/surgical nursing course was found to be significant in that the higher the grade, the more likely the student would be to stay in the program and be successful on the NCLEX-RN. The progression group completing the group as outlined in the curriculum was found to have a higher nursing course GPA. Jeffreys found that a student's pre-admission GPA, anatomy & physiology grade, and whether he or she had a number of transfer credits, to not be significantly related to progression through the nursing program or licensure. The overall pass rate for this group of students was 80%. More than 90% of the students without any nursing course failures were successful on the NCLEX-RN the first-time. "The number of withdrawal/failures was inversely correlated with first time pass rate (Pearson's  $r = -0.339$ ;  $p = 0.004$ ) (p. 414). Findings also indicated a positive correlation between the nursing course overall GPA and first-time success on the NCLEX-RN. As the GPA dropped, so did the chances of passing. In this program where the medical/surgical course is a foundational course, Jeffreys stressed the need to provide students with a firm beginning to their nursing knowledge, so this can translate into success as the student moves through the program. This study also supports the findings of Endres (1997) as ethnicity was not a factor in nursing students' success on their first attempt at the NCLEX-RN.

Engelmann (2002) in her dissertation study looked at which variables programs of nursing in the state of Illinois used to identify students at risk. The study examined students at three points: admission into the program, completion of the program and sitting for NCLEX-RN. Engelmann surveyed all programs within the state and then completed interviews with eight schools (20%) that had reported high pass rates. The survey asked schools what identified a student as at risk. Low exam results, a student requesting assistance, lack of readiness for a class

session, and problems correlating theory into practice were the items most frequently identified by those completing the survey. Strong correlations were found for all of these variables in determining a student at risk for program completion. In relationship to failure on the NCLEX-RN, poor exam scores within the nursing curriculum and not being ready for class had the strongest correlations. Schools were also asked if some type of assessment exam was given during the middle of the program; 40.5% of the schools did use an assessment test with the most frequently used exam being the HESI mid-curricular exam. Of interest is 60% of the schools used some form of exit exam, but did not have a formal remediation obligation and no graduation effect. Engelmann stressed the need to look at both academic and non-academic variables in doing a student risk assessment. As part of her dissertation, she also looked at resources and support available to students. She found that even though one school had a low GPA, the school had a very high NCLEX-RN pass rate due to the vast number of resources in place to assist students at risk.

McGann & Thompson (2008) developed a course to assist students identified as at risk. The class was required for a student to be able to continue in the program. Important features used to work with the sixteen students were mentoring and reflection. A lot of work was done by the students related to test taking strategies, discussion of test anxiety, the need to ask for help and how to manage study time. Students identified that the mentoring helped with self-esteem and confidence. At the end of the course the student's GPAs went from 2.48 to 2.92 for that semester ( $Z=-4.26, p<.0001$ ). Of significance is the group had an 87% pass rate on the NCLEX-RN.

Percoco (2001) studied 177 students graduating from another associate's degree nursing program between the years 1991-1997. Findings indicated that related to successful completion

of the nursing curriculum course grades in psychology, pharmacology and GPA for biology were the best indicators of passing NCLEX-RN. The model with these elements was able to correctly identify 76.77% of those students finishing the program. When looking at NCLEX-RN success the pharmacology grade alone had predictive value with a 78% prediction success.

Schafer (2002) in her dissertation study attempted to identify a model that would be predictive for students at risk of failure on the NCLEX-RN in one baccalaureate nursing program. Her research evaluated an extensive number of models that might be indicative of student performance. Variables included pre-admission items such as grades from lower division courses, courses within the nursing program, age, race, and gender. African Americans were found to have a lower admission GPA, lower pre-requisite GPA (calculated from 16 specific courses identified by the researcher), and a lower rate of passing on the NCLEX-RN. In the sample of 401 students, only 19 students were designated as African American or Black. Age and gender were found to have no significance related to program completion or NCLEX-RN passing. The anatomy and physiology grade was determined to be the course from the lower division that was most predictive of NCLEX-RN success. The GPA from the first semester of the junior year was also found to be predictive of NCLEX-RN results. Schafer points out that this is the semester in which pathophysiology and pharmacology are taught. This semester was more predictive than the first semester in the senior year as she believed there was grade inflation from clinical course grades.

Rogers (2010) completed a qualitative and quantitative study examining the correct prescription for a student to be successful in terms of student retention and their success on the NCLEX-RN. As part of the study, Rogers interviewed six senior nursing students and three faculty members. Rogers found three dominant themes: student-related, collaborative, and

curriculum related. In examining the theme, student-related, Rogers discussed “motivation, academic abilities such as critical thinking, test-taking and study skills; organization; prioritization of roles and responsibilities; the ability to manage life events and extreme stress; and health care experience” (p. 97). A question for nursing faculty should be if we are helping students use critical thinking skills, developing skills related to test-taking and moving students from memorization to application and analysis of the information obtained. Related to dealing with stress, Rogers focused on how little information students are given on how to take care of themselves by meeting their basic needs. The information that surfaced related to the collaboration theme was the importance of communication, having a support system, and the involvement of faculty. Curricular themes had to do with teaching methods (lecture not a well liked modality), use of practice NCLEX questions, and NCLEX workshops. Recommendations to assist programs and students in the future were to mentor students, help develop positive relationships with peers for support, development of self-care skills, promotion of critical thinking activities, and NCLEX preparation activities. The limitation to this study is that it relates to only one program and only six students who were successful in the program and NCLEX-RN and three faculty members were interviewed.

Studies since 1994 have examined a variety of variables from a number of points within a nursing curriculum (pre-admission, within the program, and end of program). Variables found to be most predictive of student success on the NCLEX-RN include grades in science courses prior to admission, SAT verbal scores, and number of Cs or below in nursing courses. Also found to be of significance are grades in a pathophysiology course and/or medical-surgical nursing course. Positive performance on any kind of pre-NCLEX-RN examination appeared to be predictive of success on the NCLEX-RN. With all of these predictive variables students are still

misidentified in terms of passing or failing. What additional variables need to be added to the picture?

### **Assessment Testing**

Another major emphasis from schools of nursing has been the use of standardized normative testing prior to taking the NCLEX-RN. This testing provides the program with an indication of the student's level of preparedness. Before development of the computer adaptive testing (CAT) format of the NCLEX-RN, many schools used paper/pencil tests to assess a student's level of readiness. Schools predominantly reported using the Mosby Assess Test or the National League for Nursing Comprehensive Achievement Test for Baccalaureate Students (NLNCATBS) (Seldombridge & DiBartolo, 2004). The drawback to these paper/pencil tests was that it took weeks before the student received any information on his or her performance.

In order to provide programs with reliable, quick data on student performance companies have emerged that have a mechanism in place to meet this demand. The goal of these companies is to provide products that give students the opportunity to verify their mastery of content, chances to practice testing on the computer, and some indication of their level of preparedness subsequent to taking the NCLEX-RN in a timely fashion. Of major importance to many schools is the ability to practice testing on the computer. A computer test is different in that unlike the paper/pencil test, students cannot revisit a question once they have submitted their answer. Wood (2002) found that students more familiar with computers and those who had practiced testing on computers had a decreased level of anxiety when sitting for the NCLEX-RN. Interviews of students that either passed or failed the exam supported the frustration of not being able to go back in a computerized test. A student cannot skip a question and come back to it as many do on a paper/pencil test. Currently, the two major companies being utilized for computer based testing

products are Assessment Technologies Institute (ATI) and Health Education Systems, Incorporated (HESI). The other popular testing company, Educational Resources, Incorporated (ERI) (who developed the NET) has been purchased by ATI.

Both ATI & HESI have different products to prepare their customers. The use of the assessment package depends on the nursing program. According to Jones & Bremmer (2008), it is imperative for the school to be clear what outcomes it desires from the assessment company. The belief is that beside the potential to improve NCLEX-RN pass rates other benefits can include, “predicting academic readiness, assessing critical thinking skills, assessing content-specific knowledge, predicting programmatic success, using as part of admission criteria, identifying content deficiencies in the curriculum” (p. 207). Another issue that must be clarified by the nursing programs is whether the company-based testing results have consequences such as passing a course, required remediation, progression in the major, graduation and authorization to sit for the NCLEX-RN. (Frith, Sewell, & Clark, 2006; Heroff, 2009; Jones & Bremmer, 2008; Mosser, Williams & Wood, 2006; Spurlock, 2006; Spurlock & Hanks, 2004;).

ATI has developed nine proctored content mastery exams and a comprehensive predictor exam based on the NCLEX-RN test blueprint. ATI has identified benchmarks for each exam that designate a level at which the student has obtained mastery of that content area. Most schools give the comprehensive predictor exam in the last semester of the nursing curriculum. The comprehensive predictor exam is similar to the NCLEX-RN and indicates the student’s probability of passing the exam at that time (ATI faculty resource guide, 2007; Davenport, 2007; Jacobs & Koehn, 2006). With the ATI product, students are given books, DVDs, and online practice exams that provide content review. The level of testing and materials provided is

determined by the school, and there is a cost to the student (Davenport, 2007; Holstein, Zangrilli & Taboas, 2006).

Ukpabi (2008) used a discriminant analysis to evaluate the ATI tests along with a number of other variables. Findings from this study indicate the Critical Thinking, TEAS Comp, Mental Health, Pharmacology and Fundamental ATI tests were statistically significant in predicting success on the NCLEX-RN. While these results are promising, the sample was very small at thirty-nine. When surveyed (Wood, 2002) an administrator believed that the ability to practice with computerized testing through ATI helped improve student success on the NCLEX-RN.

Implementation of a progression policy using the ATI products was completed at a small, rural community college. Heroff (2009) reported on the process of ATI implementation. Benefits identified were early student remediation and evidence that could support any curriculum modifications. Heroff did stress the need for remediation to be required and consequences attached to completion. Students within this program are obligated to sign a contract with a faculty advisor regarding remediation. A drawback identified was that some students might interpret positive performance on the content mastery exams as support for no further preparation as students identified “a false sense of security and tend to think that no other preparation for the NCLEX-RN was necessary” (p. 82). This statement was also supported by student comments in the research conducted by Wood (2002). A strong recommendation was to ensure that students and faculty knew how to correctly interpret results of the various exams. An additional suggestion was that remediation is the student’s responsibility, but that faculty should assist by providing a variety of resources for remediation. A key component to the success of any assessment testing program is that it must have the support of all faculty members (Davenport,

2007; Jacobs & Koehn, 2006). Also, clear guidelines must be established for all nursing faculty to follow related to implementation (Heroff, 2009). Additional positive reason for assessing knowledge of content as the student moves through a curriculum was to assess mastery of content knowledge. Assessment of specific content areas allowed the student to be aware of weaknesses so that remediation can occur earlier rather than later (Holstein, Zangrilli, & Taboas, 2006).

Mosser, Williams, & Wood (2006) compared two nursing programs using the ATI product. One school in the study required a student be passing the existing course with a 75% or better prior to being able to take the proctored ATI exams. Online exams were available for student preparation prior to completing the proctored exam. The benchmark set by the school was the 40<sup>th</sup> percentile for a proctored exam. Those students not attaining that mark did not pass the course and could not move forward in the program. At this school, results indicated that “students who achieved lower than the 20<sup>th</sup> percentile on the first attempt at passing either the fundamentals or medical-surgical proctored tests failed the NCLEX-RN, even though they achieved the 40<sup>th</sup> percentile or higher on the second attempt. The faculty made the decision to not allow students to repeat these two proctored tests if the first score was below the 20<sup>th</sup> percentile. In addition, the percentile required for passing was increased to 50 for all exams” (p. 313-314). The second school also used the 50<sup>th</sup> percentile as its mark. Remediation was required based on test results along with additional testing. Jacobs & Koehn (2006) also supported the need for mandatory remediation with the cut-off score for its program being the 60<sup>th</sup> percentile. The remediation was required to be completed by the end of the semester.

HESI utilizes its Exit Exam (E2) as the predictor of a student’s success on the NCLEX-RN. A student achieving a score of 850 (previously 85) on this exam has a 95% probability of

successfully passing the exam (Nibert, Young, & Britt, 2003; Spector & Alexander, 2006). The exam is scored based on a proprietary model, the HESI Predictability Model (HPM) which includes the level of difficulty of the question. The report for each student supplies the student and his or her school information related to the NCLEX test blueprint and nursing process (Nibert, Young, & Adamson, 2006). A benefit to the proctored HESI exams is that students are allowed to review online the questions they missed with the corresponding rationale (Lauchner, Newman & Britt, 2005). Content specific exams are available for administration based on each individual program's choice. HESI will also work with a nursing program to customize an exam to that school's curriculum (Lauchner, Newman & Britt, 2005). HESI has a comprehensive review book with DVDs that can be purchased, along with practice exams related to five specific content areas.

Lauchner, Newman & Britt (2005) examined the HESI Exit Exam (E2) results of 2,613 RN students. The sample included students from both RN & PN programs and from the three types of RN nursing programs (ADN, BSN & Diploma). In addition, the schools from which the sample came were mailed a questionnaire asking if the test had been proctored and NCLEX-RN results for those students taking the E2. Over 70% of the students who failed the NCLEX-RN took the HESI exam in a non-proctored environment. However, the study did find that a majority of exams were given in a proctored setting. The authors found that "for all groups of students, the E2 was determined to be 99.49% accurate in predicting success on the licensing exam when administered in monitored situations and 96.82% accurate when administered in unmonitored situations" (Lauchner, Newman & Britt, 2005, p. 7S).

In the fourth validation study (Nibert, Young & Adamson, 2006) sought to verify results from the previous studies. "In this study additional scoring intervals were designated to provide

more discrimination in the middle-scoring groups, where the greatest ambiguity existed regarding the degree of risk for NCLEX failure” (p. 30S). HESI results of students taking the exam during the 1999-2000 year where schools verified passing or failing of NCLEX were utilized. A 98.30% predictive accuracy was obtained from this study. Another significant finding was that the HESI E2 showed no disparity between types of nursing program (ADN, BSN, or diploma). Looking at intervals related to scoring outcomes, results “indicated that NCLEX failures increased as the scoring interval decreased...of the 526 students scoring in the G/H category, 264 (50.19%) failed” (p. 31S). Categories run A-H in HESI scoring. The third validation study supported previous work from the first two studies and supported the belief that monitoring during the examination improved the predictability of the results. A majority of schools are now monitoring students during the examination (Nibert & Young, 2005).

Frith, Sewell, & Clark (2006) reported on implementation of the use of the HESI E2 within a nursing program. The program was previously using the Mosby Assess Test, but wanted a tool that could provide more immediate feedback on the student’s results and provide computer testing practice. The initial implementation included students taking both the Mosby Assess Test and the HESI E2. A positive correlation was found between the two ( $r = 0.723$ ,  $p < .0001$ ). At the time 10 students who should have been successful on the NCLEX according to the Mosby test actually failed, leading to a decision to move to the HESI E2 exam along with the use of HESI’s content specific exams. Additionally, a review course was added to the curriculum to assist students in test-taking strategies and to preparation for both the HESI E2 and the NCLEX-RN. The results of the review course showed a jump from 30% to 89% in students passing the HESI E2 on the first attempt within three years time.

Sifford and McDaniel (2007) also utilized the HESI exam as a means for early identification of those students needing remediation. They worked with 47 students who had fallen short of the benchmark on the HESI exam given as a practice exam the previous semester. These students were enrolled in a two credit course the following semester that included test-taking strategies and prioritization. Students also received help looking at their individual strengths and assistance working on their weaknesses. Results from the course showed a significant difference in performance on the NCLEX-RN,  $t(46)=-5.228$ ,  $p<.001$ .

In order to help ensure that its students are successful on the NCLEX-RN, many schools of nursing have developed progression policies. These policies usually have an established benchmark the student must achieve to either pass a course or graduate (Lauchner, Newman, & Britt, 2005; Morrison, Free & Newman, 2002; Nibert, Young, & Adamson, 2006; Nibert, Young & Britt, 2003; Spector & Alexander, 2006; Spurlock, 2006). Nibert, Young & Britt (2003) found when questioning program officials that 30.2% of the schools had a cut-score that a student must achieve and if not, graduation was affected. Also, the ability to take the NCLEX was in jeopardy; interestingly enough, programs that submitted survey answers did not have a specified remediation program (71.81%). Morrison, Free & Newman (2002) reported on information retrieved by "...7 different programs at 5 schools of nursing. Findings indicated that NCLEX-RN pass rates improved in the 7 programs by 9-41% and ranged from 88-97% within 2 years after implementation of the progression and remediation policy" (p. 95).

Spurlock (2006) argued that the high-stakes progression policies specifically related to the HESI exam may be detrimental to the student and questioned the validity of the test. The student's score is based on a proprietary formula that is not published, although HESI Inc. has published four validity studies with over 17,000 students included in the results. These studies

have demonstrated a 96.36% to 98.30% success in predicting NCLEX-RN success. Again, these results have indicated success but not failure. Many students who have done poorly on the HESI have gone on to successfully pass the NCLEX-RN on the first attempt (Spurlock, 2006).

Spurlock & Hanks (2004) contend that when looking at the data from their study using a cut score of 90 (higher than the 85 recommended by HESI) that the “positive predictive value of the HESI Exit Examination is only 19%, meaning that nearly 81% of students ‘predicted to fail’ (who scored < 90.00) actually passed the NCLEX-RN” (p. 543). The question becomes whether this group is denied the ability to take the NCLEX-RN as a result of a school’s progression policy.

An additional retrospective study was done using students who tested between January 2004 & July of 2005 from one school (Spurlock & Hunt, 2008) with a total of 179 students. First E2 scores and last E2 scores were evaluated (many students tested multiple times but the authors took the first and last scores for this study). According to results from the last E2 test of the 167 students predicted to pass, 22 actually failed and, of the 12 predicted to fail, 10 actually passed. On the basis of this testing, the school would have anticipated a pass rate of 94%, instead their rate was 86.6%. When looking at the relationship between the first and the last E2 score, Spurlock & Hunt found that the first test score was significant, while the final score was not. They contend that allowing students to retake the exam multiple times may actually give a student and school a false sense of security related to the student’s ability to perform successfully on the NCLEX-RN.

Jones & Bremner (2008) also do not support the use of high-stakes progression policies. Through their research they found that tests such as the ATI and HESI are more indicative of a

student's current level of preparation, not necessarily the student's ability to be successful on the exam.

The major benefit to assessment testing is the student becoming comfortable with computer based testing. The computer format helps the student adapt to answering the question in front of them and then moving on compared to a paper/pencil test, where the student is able to skip around. The NCLEX-RN computer test is designed so that once the student answers a question he or she is not able to go back. This is necessary as the CAT format looks at the response on the previous question to determine the type and degree of difficulty of the next question the student receives. Computer testing using normative tests also provides the student and his or her school with an indicator of a student's content mastery at that point in time. If a student is identified as having content weaknesses, that knowledge deficit can be strengthened early on instead of at the end of the program. ATI focuses on remediating the identified weak areas of the student at the point in time he or she is learning the content. (ATI faculty resource guide, 2007). The bottom line is the need to help students prepare in order to be successful on their first attempt on the NCLEX-RN.

### **Locus of Control**

Julian Rotter (1966) was part of the social learning theory movement back in the 1950s. In the 1960s, Rotter believed that an individual's behaviors or beliefs were prefaced by reinforcements he or she might have had, and led individuals to identify the probable cause of his or her action. Beliefs were also found to guide further actions (Neill, 2006; Wise, 1999). The individuals with internal locus of control see things happening as a result of the behaviors or actions they take. Neill (2006) on his website related to locus of control states that it is a "unidimensional continuum, ranging from external to internal" (Neill, p. 1) He used the

following figure to represent the differences between internal and external locus of control (Neill, p.2):

Figure 1 Locus of Control

External Locus of Control	Internal Locus of Control
Individual believes that his/her behavior is guided by fate, luck, or other external circumstances.	Individual believes that his/her behavior is guided by his/her personal decisions and efforts.

Neill, J. (2006). What is locus of control? Retrieved from <http://wilderdom.com/psychology/loc/LocusOfControlWhatIs.html>.

The literature suggests that an internal locus of control is a more optimal belief system. In this case, the individual with an internal locus of control is taking responsibility for his or her own actions and understands that what happens is a direct result of the role he or she played. What happens or the end results are based on actions or inactions (Rotter 1966). Wise (1999) discussed that persons with internal locus of control develop increased expectations related to their success. These individuals adapt and use increased effort to improve performance in the future (Grantz, 1999; McCullough, Ashbridge & Pegg, 1994; Sheppard & Crocker, 2006). Individuals that are continually unsuccessful over a period of time may move to a greater external locus of control and as a result may be less motivated to try (Grantz, 1999). Hulse, Chenowith, Lebedovych, Dickinson, Cavanaugh, and Garret (2007) utilized Rotter’s Locus of control (RLOC) in their study. They discuss Rotter’s hypothesis, that when a person believes that he or she is able to manage what happens, the person will

“(1) be more alert to the aspects of the environment that can provide useful information for his or her future behavior, (2) take steps to improve his or her environmental condition, (3) place greater value on skill or achievement reinforcements and be generally more

concerned with his or her ability and (4) be resistive to subtle attempts to influence him or her” (Hulse et al., p. 341).

The family has also been shown to influence a person’s locus of control. Those students who have more stability and family resources are more likely to have an internal locus of control. It was found that families who demonstrate hard work, value the importance of education, and who take responsibility for one’s actions were more likely to have an internal locus of control. Those with a decreased socioeconomic status have the belief that they have limited control over what happens in their life (McCullough, Ashbridge & Pegg, 1994; Sheppard & Crocker, 2006).

In a study conducted by Janssen & Carton (1999), 42 students were examined using the academic locus of control (ALOC) tool developed by Trice (1985). The research questions focused on whether a student’s ALOC had an impact on his or her level of procrastination. It also looked at whether the perceived difficulty of a task also affected procrastination. Students with a lower ALOC (internal) were more likely to procrastinate fewer days (6.05 days for internals compared to 9.95 days for externals). The effect of locus of control depended on how procrastination was defined; results showed a higher degree of significance when defined as finishing versus starting an assignment. Data also found that a specific assignment was completed and turned in sooner by individuals with internal ALOC. Study results were supported by Trice & Milton (1987) who identified procrastinators as more likely to have an external locus of control.

In evaluating how missing class contributes to academics, researchers stressed the importance of students taking responsibility for their actions (Trice & Hackburt, 1989). Lack of acknowledgement that an individual’s behavior affects the results is a definition of external LOC. Many students with poor grades or missing assignments attribute the end result to the fault

of someone other than themselves. Results in a study of 96 students found “as hypothesized, there were significant Pearson product-moment correlations between the LOC and nonillness-related absenteeism ( $r=-.32$  and  $-.37$ )” (Trice & Hackburt, 1989, p. 338) for women and men.

Landis, Altman, Gavin (2007) conducted a study using 127 students enrolled in an undergraduate psychology course to assess study skills, locus of control, and self-efficacy. The belief was that individuals with an internal LOC would be willing to put in the extra time to study with the conviction that additional time would benefit them in the long run with a better grade. The researchers used three surveys, Trice’s Academic Locus of Control (ALOC), a self-efficacy tool designed to look at study skills, and then a separate tool based on their research. After a Bonferroni correction, they found that individuals with an “internal LOC and high self-efficacy reported significantly greater use of study skills ( $m=95.19$ ,  $SD=6.87$ ) than those participants with a moderate LOC and moderate self-efficacy ( $M=86.41$ ,  $SD=6.46$ )” (129). The authors question whether or not, if the participants had been at the high end of externality, the results might have been different.

Ferrari & Parker (1992) also looked at locus of control and self-efficacy to determine if there was a difference in freshman course outcomes with 319 students. The authors took Trice’s (1985) ALOC and converted the tool to a 5 point Likert scale instead of the original true/false format. Results indicated ALOC was not predictive related to the freshman outcomes of end of semester GPA and semester credits completed ( $r = .013$  &  $.011$  respectively).

Another study looking at locus of control, procrastination, and academics (Carden, Bryant, & Moss, 2004) found locus of control to be significant. This study used Rotter’s (1966) Internal-External (I-E) Locus of Control scale. Students with an internal LOC, defined as 10 or

less, had better GPAs, less test anxiety, and were less likely to procrastinate. These results support Janssen & Carton's (1999) findings.

Ibrahim (1996) attempted to see how the Trice (1985) ALOC scale worked with students from a different culture. The scale was translated into Arabic to survey students (123 men and 368 women) from four levels of college. Students were from a variety of disciplines with equal representation in each discipline. Participants completed the ALOC, Rotter's I-E scale and an Arabic achievement motivation scale. Of interest results showed the Omani sample

“scores ranged from 4 to 23, with a mean of 12.9 (SD=3.5), while in the American sample (Trice, 1985) the scores ranged from 2 to 26 with a mean of 12.8 (SD=4.8). Trice observed no significant difference between males and females in scores on the Academic Locus of Control Scale. But in the present sample, women had higher scores on Externality (M=13, SD=3.6, n=332) than men (M=12.1, SD=2.98, n=115;  $t=3.17$ ,  $p=.002$ ). This finding may be attributed to cultural differences in childrearing practices. Omani girls are more dependent on their parents and experience more parental influence than boys. Socialization of girls emphasizes conformity more than for boys (Ibrahim, 1996, p. 825).

When examining internal consistency with this sample, the alpha coefficient was lower than Trice's (1985) original study (.58 Omani vs .70 American). Predictive validity was also in question with the validity of each item being very low. It was of interest that the ALOC scale was better than the Rotter I-E scale in relationship to the participant's GPA. The individual items were analyzed and discussed related to cultural expectations. The findings could be very helpful in understanding differences in students based on their culture.

Richardson (1995) used the ALOC scale in studying 1089 students at a large university outside of the United States. As previously stated by Rotter (1966), the belief is that individuals who have an internal locus of control understand that what they do makes a difference in the end result. Those who have a greater external score believe that things happen more randomly. The students participating were from four different disciplines and ranged in age from less than 20 to 35. Results of the study demonstrated that individuals were more likely to have an internal LOC as they got older. The subjects in their 30s scored below 10 on the scale (0-28); however, the subjects 25 years of age or less scored at 11 or above. Of the disciplines studied, students from the Arts were more likely to be internal than students from the natural or social sciences. Richardson states that the reason for a greater degree of internality from students in the Arts may be “a sense of independence, a freedom to explore alternatives, and awareness, that their own efforts and creativity can affect their course grades” (p. 1389).

Onwuegbuzie & Daley (1998) conducted a study with 154 college students. The students were asked to complete the ALOC, study habits inventory, self-perception profile for college students, and the social interdependence scale. The findings indicated that LOC was significantly related to study skills, along with sections of the self-perception profile for college students (Perceived scholastic competence, Perceived self-worth and Perceived intellectual ability and the individualistic scale from the social interdependence scale). The authors used setwise regression to try and further explain the variance. When merged, the 5 items mentioned above were able to explain 39% of the variance related to study habits. Alone, ALOC accounted for 27% of the variance. Of interest is the belief that individuals with an external locus of control often study at the last minute using memorization rather than understanding the material which will allow this knowledge to be used in the future. Shepherd, Fitch, Owen & Marshall (2006) while using the

Nowicki-Strickland Locus of Control scale found when studying a group of high school students that those with an internal locus of control had higher grades. Individuals with failing grades, according to self-report, were found more external on the locus of control scale.

Internal locus of control and self-esteem were investigated to determine their impact on a freshman's adjustment to college (Mooney, Sherman, & LoPresto, 1991). Trice's (1985) ALOC scale was used along with the Student Adaptation to College Questionnaire and the Coopersmith Self-Esteem Inventory. There was a significant correlation linking ALOC with a student's ability to adapt to college life  $r(86) = .67, p < .001$ . A student with internal LOC adapted well. The study also found that a student's self-esteem positively correlated with his or her adjustment to college. This study's sample included women from one small, private college.

An internal LOC was found to be the strongest indicator of student going to graduate school (Nordstrom & Segrist, 2009) in a study investigating the likelihood of 95 students to progress academically. The study used Trice's (1985) ALOC, GPA, and a consumerism scale. While GPA was significant in terms of student moving on to graduate school, when the other scales were added, GPA became less important. Nordstrom & Segrist strongly contend that "students with an internal locus of control see the clear connection between their efforts and the outcomes they derive. They see themselves as the architects of their education—believing they can make things happen by managing their time effectively, ... In short, many of the tasks that differentiate 'average' graduate students from 'go-getters' rely upon an internal locus of control" (p. 203-204).

The issue of LOC and goal orientation were evaluated in a study done utilizing students aged 16-19 in India (Gupta & Sinha, 2004). The multidimensional academic locus of control scale developed by Palenzuela was utilized to determine LOC and the learning and performance

goal orientation questionnaire looked at goal orientation. One of the research questions examined whether students with an internal LOC would have a greater degree of academic achievement. The researchers also speculated that those with better goal orientation would also have a higher level of academics. Findings indicated that while those internal LOC students did have better academic results, they were not significantly different than those with an external LOC ( $F(1, 168)=3.73, p>.05$ ). The goal orientation of individuals was found to be significant related to achievement ( $F(1,168)=5.60, p<.05$ ).

In Marra's (1997) study comparing a new curriculum against the older curriculum, students were compared using a critical thinking instrument, the Adult Nowicki-Strickland I-E (ANSIE) scale, to measure locus of control and Kolb's learning style inventory. The ANSIE consist of 40 yes-no items in which the student makes a choice which is most appropriate for them. The scale is scored toward the external with scores ranging from 0-40. The ANSIE showed that scores ranged from 1-21 for the total group and the old curriculum group. The new curriculum group scores ranged from 2-13. In addition, when scores were broken down, a high internal score (0-9.75) accounted for 73% of the sample. Those with scores of (29.2-40) highly external were 0% of the sample. In the moderate range, 23.8% were internal and 3.2% were external. Individuals in the highly internal group had the highest critical thinking scores. Findings indicated that students classified as moderately external were more likely to have lower scores on the critical thinking tool used (Watson-Glaser Critical Thinking Appraisal-WGCTA). Of interest is the finding that these "individuals were high in the Abstract Conceptualization (learn by thinking) mode and the Concrete Experience (learn by feeling) mode" (p. 74).

Eksterowicz (1999) examined LOC using both Rotter's (1966) I-E scale and Trice's ALOC scales in terms of how they related to academic achievement when measured by GPA.

Eksterowicz cites Findlay & Cooper's (1983) review of literature in which the authors discovered of "98 related studies, and 275 hypotheses, they found that across all studies that positive correlations were found between internality and greater academic achievement in 193 hypotheses" (p. 25).

Eksterowicz's study utilized 59 volunteer subjects enrolled in various psychology courses in a university setting. As part of this study, the two LOC scales were compared. Means were found to be very similar and included a positive correlation ( $r=.558, p<.01$ ). These results supported original findings by Trice (1985) when comparing the ALOC to Rotter's I-E scale. A significant negative correlation was found utilizing Trice's ALOC scale and GPA/grades. In looking at GPA ( $r=-.258, p<.05$ ) and grades ( $r=-.306, p<.05$ ), the negative direction demonstrates a student with an external LOC will more likely have lower GPAs and grades compared to persons with an internal LOC who will have greater academic achievement.

In 1985 a concern was identified that students appeared to be exhibiting a more external LOC. The belief was that for the nursing profession to progress, it needed students with an internal LOC willing to accept responsibility for learning and actions to further nursing (Dufault, 1985). To help alleviate this trend, a class was developed to help nursing students develop more internal LOC skills. Positive characteristics identified by Dufault through a review of the literature included personal motivator, team player, change agent, responsible, able to evaluate potential consequences, and able to perform better in situations of stress. A higher degree of academic performance has been noted in individuals with an internal LOC (Trice, 1985; Trice, 1987; Trice & Milton, 1987; Uguak, Elias, Uli & Suandi, 2007; Wood, Saylor & Cohen, 2009).

Dufault (1985) set up a course for nursing students that looked at the future of nursing, "Futuristics emphasizes the individuals' taking charge of their own lives by identifying not only

how they fit into the future, but also how they can change it” (p. 316). The study consisted of 32 students each in either an experiment or control group. The samples were equal for gender and race. All students took the Rotter I-E scale followed by the experimental group participating in a one credit class that focused on values, professionalism, history of nursing, role transition, and the future of nursing. After the course, Rotter’s I-E scale was again administered. Results indicate that the experimental group moved toward the internal side of LOC, while the control group moved slightly more external. As covariates, the pretest Rotter’s I-E score and the years of experience of the student were included. The class was found to be significant  $F(3,60) = 49.55$ ,  $p < .0001$  in terms of helping students move toward a more internal LOC.

Wood, Saylor & Cohen (2009), asked how LOC related to a nursing student’s academic performance. The other question asked was whether or not there was a difference in LOC in terms of ethnicity. They supported Rotter’s (1966) contention that individuals with a high level of internal LOC are often found to have, “higher levels of personal satisfaction, motivation, and the achievement of positive personal outcomes, including academic success” (p. 291). Wood, Saylor & Cohen conducted a quantitative and qualitative study with 106 nursing students from a convenience sample in a baccalaureate nursing program after taking two medical/surgical classes. To determine academic abilities, the researchers used GPA before the program, grades in medical/surgical didactic classes, and scores from any standardized tests. Results were that a significant negative association existed with medical/surgical didactic grades and LOC. The more external the LOC, the worse the student’s grade ( $r = -0.21$ ,  $p = .034$ ). There was nothing found to be significant with those with an internal LOC. In terms of ethnicity, students in the Filipino group were found to be more external than Caucasians or Hispanics. The researchers found that “the Asian groups, including the Filipino students, were more likely to attribute

academic outcomes to forces beyond their personal control, such as extenuating circumstances in their daily life,” (Wood, Saylor, & Cohen, 2009, p.292).

### **Self-Efficacy**

Self-efficacy was developed out of social learning theory by Albert Bandura. He held that an individual has a self-belief system that helps them to be able to control what they believe in and what actions they take. Parajes (2002) in his outline on Bandura’s work discusses the importance of self-reflection. The process of self-reflection helps individuals to evaluate events that have occurred and to identify future actions. Consequently, self-efficacy creates an influence on decisions made and the amount of work directed toward those decisions. Parajes further states that, “individuals’ self-beliefs are critical forces in their academic achievement (para 29).”

Individuals develop self-efficacy by four processes, the first being mastery. Through the process of mastery, persons evaluate previous experiences or actions and generate a decision as to whether or not the result was a positive or negative one. A positive result usually results in an increase in self-efficacy. The second process referred to by Bandura is vicarious experience, in essence, assessing the actions of others. Social persuasion is another process by which an individual develops self-efficacy. Persuasion comes from others, what message are they giving the individual verbally, is the message a positive one (increasing self-efficacy) or a negative message (decreasing self-efficacy)? Physiological and emotional status also affects self-efficacy. A person experiencing anxiety related to a given situation may see a decrease in their self-efficacy. Does the student’s emotional status create a positive or negative impact (Pajares, 2002a)? Pajares ties the role of self efficacy to education when identifying the following key points:

- that students' difficulties in basic academic skills are often directly related to their beliefs that they cannot read, write, handle numbers, or think well - that they cannot learn - even when such things are not objectively true;
- that many students have difficulty in school not because they are incapable of performing successfully but because they are incapable of believing that they can perform successfully - they have learned to see themselves as incapable of handling academic work or to see the work as irrelevant to their perceptual world; and
- that many, if not most, academic crises are crises of confidence (para 30).

Educators need to evaluate a student closely to see what might truly be affecting their academic performance.

### **Self-Regulated Learning**

Students entering college are challenged with adapting to a new environment in terms of learning. Methods of studying previously used in high school may no longer be effective or additional skills may need to be incorporated to facilitate a positive end result, mastery of the content. Pintrich and Johnson (1990) stressed that issues of motivation and use of strategies for learning may not have been previously thought about by students. A student may need assistance determining what the motivation for taking a particular course may be and the best learning strategies needed to be successful. The belief is that students can learn to adapt strategies they are using to the course they are taking. In other words, the student takes the essential knowledge from a class, relates the knowledge to what they previously knew and then decides the best method to remember this new knowledge.

Montalvo and Torres (2004) sum up the traits of individuals who utilize SRL by referring to these persons as active participants who are aware of their actions. They believe that learning is a dynamic practice. Other traits of individuals using SRL are that the individuals choose to be self-motivated and incorporate methods that will help them be successful.

SRL includes not only the student's use of cognitive strategies, but also examines the effect of self-motivation, issues of test anxiety, and goal orientation (Pintrich, 1999; Pintrich,

2004). Pintrich (1999) defines SRL “as the strategies that students use to regulate their cognition (i.e., use of various cognitive and metacognitive strategies) as well as the use of resource management strategies that students use to control their learning” (p. 459). In outlining the conceptual framework for SRL, Pintrich (2004) uses a model that is based on four assumptions, the first being “active, constructive assumption” (p. 387). This means that the person is engaged in the process, is a dynamic contestant, and takes his or her cues from both the world around and also from his or her own personal thoughts and reflections. A second assumption is referred to as the “potential for control assumption” (p. 387). The belief here is that the individual is capable of controlling his/her own learning and is able to self-motivate. Again, this may not be true in all situations. The third assumption is “goal, criterion, or standard assumption” (p.387). The model of SRL presumes that the individual has set some goal or has a target in mind and as a result, is able to modify his or her learning to help achieve that goal. In the case of a nursing student, the goal he or she might set is that of passing the NCLEX-RN exam to obtain a license to practice.

The concept of SRL recognizes that an individual may be functioning at many different levels and have goals established to fit within any one of those other areas. Students are multidimensional and able to accomplish a multitude of tasks. The fourth assumption is, “self-regulatory activities are mediators between personal and contextual characteristics and actual achievement or performance” (Pintrich, 2004, p. 388). Distinctiveness within the individual, uniqueness of the classroom, or learning environment can affect how goals are achieved. Mediators for the individual can be cognition and motivation in terms of how the ultimate goal is attained.

Additionally, when looking at SRL several key components have been identified in the literature. Zimmerman (1999) refers to these as the ability to set goals, the effective use of

learning strategies, the context needed for the academic task, the use of social supports, and the capability to scrutinize one's own actions. The first component of setting goals for one's self is considered a critical element. The individual must have a true understanding of the task or assignment. How the assignment is defined then determines additional self-regulatory skills that will be used such as "planning, executing, and monitoring" (p. 545).

The use of strategies is another component of SRL. Students are taught at many times throughout their education the use of different learning strategies yet, for whatever reason, they do not always employ them when needed. Zimmerman (1999) points out that the Motivated Strategies for Learning Questionnaire (MSLQ) looks at the utilization of learning strategies and the concept of self-regulation independently, realizing that knowing and actually using are not necessarily connected.

The context of the assignment or the course will affect the strategies utilized by the student (Zimmerman, 1999). The amount of self-regulation necessary is determined by the learner based on their assessment of the situation. Additionally, the component of social support affects SRL. In this component, one must consider whether or not the individual is regulating the situation on his or her own (internal) or if he or she has outside influences (external) such as parents, peers, and teachers affecting their decisions. Again, not all external forces are of a positive nature and one does not know if the individual can deal with the negative forces effectively. Zimmerman supports the belief that individuals who request help can be considered to be functioning at a higher level of self-regulation. The last key component according to Zimmerman is that of scrutinizing one's own action. Individuals able to self-assess where they are in terms of their goals and to adapt the learning strategies they are using are much more effective.

Pintrich (2004) outlines the key components much like Zimmerman does. He has defined four phases and then goes on to consider within those phases how different areas of self-regulation are utilized in trying to oversee, organize, and manage. The first phase is that of preparation and determining the outcomes desired in terms of what the task means to the individual. The second phase involves managing the task, environment and meaning to the individual. Phase three is keeping one's self in control and management of resources. The final phase involves reflecting on the task and how the individual accomplished the task. A key point made by Pintrich is that the individual does not have to move through the process in an orderly or linear fashion as several phases may be completed at one time. Pintrich illustrated his thoughts in a table that compares the four phases then applied the self-regulation areas of cognition, motivation/affect, and behavior (see Table 2). He clarified the first three columns in his table which refer to a basic view of the "different areas of psychological functioning..." (p. 391). He then added a context column to embrace the social impact.

The initial column in Table 2 incorporates what the student does to "plan, monitor, and regulate their cognition" (Pintrich, 2004, p. 392). The student needs to determine goals, what he or she previously knew related to the subject, what strategies will best facilitate additional learning and then be able to monitor his or her progress toward goal achievement. Based on the specific goal, previously used learning strategies may not be appropriate. Can the student then incorporate the use of new strategies to accomplish the identified goal? The MSLQ use the subscales of Rehearsal, Elaboration, Organization, Critical Thinking, and Metacognition to measure a student's regulation of cognition.

The second column on Pintrich's (2004) table refers to the regulation of motivation and affect. Within this column consideration is given to why students are doing the assignment, their

perceived ability to do the assignment, and whether the assignment is of value to their learning. From an affective domain, consideration is given to how the individual copes. The MSLQ looks at intrinsic orientation which refers to the value of mastery of knowledge. This is compared to extrinsic orientation, which could be described as motivation to get a good grade. Another key consideration is the meaning or value of the class or information to the student. Is the material of interest to the student and consequently is the student more interested in learning (Pintrich, 1999; Pintrich, 2004)? Vansteenkiste, Lens and Deci (2006) also support the belief that intrinsic orientation is related to learning for the sake of learning and having an interest in the subject. Extrinsic orientation refers to the tangible effects such as a good grade or doing better than other classmates. The MSLQ subscales measures related to regulation of motivation and affect are: intrinsic goal orientation, extrinsic goal orientation, task value, control beliefs, self-efficacy, and test anxiety. A major difference between the MSLQ and other tools is that the MSLQ focuses on a student's motivation toward an individual course, not the individual's use of strategies.

The third column examines the regulation of behavior (Pintrich 2004). To control behavior students may reflect on the amount of time and energy needed to complete the assignment and how the assignment is going to get completed. How does the student use his or her environment to get the job done? Does he or she ask for help from others? The MSLQ subscales of effort regulation, help-seeking, and time/study environment relate to control of behavior. The last column refers to the context of the assignment or task. The student may have

Table 2

Pintrich's Four Phases & Areas of Self-Regulated Learning

-----Areas of Regulation-----

<b>Phases</b>	<b>Cognition</b>	<b>Motivation/Affect</b>	<b>Behavior</b>	<b>Context</b>
Phase 1 Forethought, Planning, Activation	Setting of goals Prior knowledge related to content, Use of metacognitive knowledge	Adopting goals, how difficulty is task? Initiation of task value & interest	Planning of time & effort to be spent, self-reflecting on behaviors	Task & Context Perceptions
Phase 2 Monitoring	Metacognitive perception and awareness of cognition	Awareness & monitoring of motivation and affect	Monitoring of effort, is additional assistance needed, self-reflection	Any changes to the task or context?
Phase 3 Control	What cognitive strategies should be utilized?	What strategies are needed for motivation, managing & affect	Level of effort: Needs to increased or decreased, Is help needed?	Is the task still the same? Are changes needed?
Phase 4 Reaction & Reflection	Cognitive Judgments	Affective Reactions	Choice of behavior	Evaluation of the task & context
Relevant MSLQ Scales	Rehearsal, Elaboration, Organization, Critical Thinking, Metacognition	Intrinsic Goals, Extrinsic Goals, Task Value Control of Learning Beliefs, Self-Efficacy, Test Anxiety	Effort Regulation, Help-Seeking, Time/Study Environment	Peer Learning, Time/Study Environment

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational Psychology Review*, 16(4), 385-407.

little control depending on how the class is structured. While the students may not have control over the classroom, he or she does control over his or her study atmosphere. For example he or she could study in the library instead of a dorm room, listen to music, or set a specific time to study for a course. Another important aspect in terms of context is whether or not a student chooses to use his peers for help or support. The MSLQ subscales measuring the regulation of context are: peer learning and time/study environment.

The use of SRL can be critical to a student's academic success. The recognition of strategies to increase the individual's ability to succeed is one thing but the actual use of these strategies is of key importance. The interest in the subject, value of the task, and goal orientation are also significant.

“Self-regulated learning is a fusion of skill and will. The strategic learner is one who has learned to plan, control and evaluate his or her cognitive, motivational/affective, behavioral and contextual processes. This learner knows how to learn, is self-motivated, knows his or her possibilities and limitations, and as a function of this knowledge, controls and regulates learning processes in order to adjust them to the task objectives and to the context, to optimize his or her performance and improve skills through practice” (Montalvo & Torres, 2004, p. 22).

### **Motivated Strategies for Learning Questionnaire**

The importance of assessing a student's level of motivation and use of learning strategies can be critical in helping educators assist students in improving their learning process. The Motivated Strategies for Learning Questionnaire (MSLQ) (see Appendix B) gives faculty members a tool to identify those areas of motivation, task value, test anxiety, use of learning

strategies and management of resources that may help or hinder a given student in his or her learning.

The MSLQ utilizes the concept of self-regulation and draws upon the belief that students should be using a higher level of thinking than solely memorization of knowledge. There is a need for students to develop and use critical thinking skills and other learning strategies (McKeachie, Pintrich, & Lin, 1985). Duncan & McKeachie (2005), in discussing the development of the MSLQ, identified the extensive research (over 50 studies) across a variety of disciplines that have been done using the MSLQ. The benefit of the instrument is that it can be used in its entirety or with which ever subscales the researcher deems appropriate for his or her study. “Although content knowledge is important, it is not sufficient for effective learning....Individuals who can adapt their thinking to a variety of situations in a flexible manner are much better prepared to be lifelong learners” (McKeachie, Pintrich, & Lin, 1985, p. 153). The belief is that students could be taught how to use resources and improve critical thinking, and as a result be more effective learners.

The MSLQ was designed to be used either as a whole (all 81 items), or in modular or subscales. If a research question involved the concept of motivation, the motivation section or scale could be utilized with all 31 items or selected subscales out of the six could be chosen. The same is true for the learning strategy section, 50 items or nine subscales (Pintrich, Smith, Garcia, & McKeachie, 1991). The model was developed with the belief that a student’s actions or use of strategies are related to the specific course he or she is taking. It was strongly encouraged that the questionnaire be given during class time to reinforce the relationship to the specific course (Artino, 2005; Duncan & McKeachie, 2005; Garcia & Pintrich, 1995; Pintrich, Smith, Garcia & McKeachie, 1991).

The motivational section is based on the constructs “expectancy, value, and affect (Garcia & Pintrich, 1995, p. 8). Specifically, the subscales relating to expectancy are Control of Learning Beliefs and Self-Efficacy for Learning and Performance. The subscales that focus directly on the construct of value are Intrinsic Goal Orientation, Extrinsic Goal Orientation and Task Value Beliefs. The final construct, affect, is measured by the subscale of Test Anxiety. The subscales are grouped by category in table 3.

Table 3

MSLQ Motivation Section Subscales

<b>Expectancy</b>	<b>Value</b>	<b>Affect</b>
Control of Learning Beliefs	Intrinsic Goal Orientation	Test Anxiety
Self-Efficacy for Learning and Performance	Extrinsic Goal Orientation	
	Task Value Beliefs	

The learning strategies section of the MSLQ examines strategies of learning based on “a general cognitive model of learning and information processing (Weinstein & Mayer, 1986). There are three general types of scales: cognitive, metacognitive, and resource management” (Garcia & Pintrich, 1995, p. 8). The specific subscales related to the use of cognitive strategies are Rehearsal, Elaboration, Organization, and Critical Thinking (see Table 4). The metacognitive subscale encompasses one large subscale which “includes planning (setting goals), monitoring (of one’s comprehension), and regulating (e.g. adjusting reading speed depending on the task)” (p.9). The last general area of resource management includes the subscales of Time & Study Environment, Effort Regulation, Peer Learning and Help Seeking.

Table 4

MSLQ Learning Strategy Section Subscales

<b>Cognitive</b>	<b>Metacognitive</b>	<b>Resource Management</b>
Rehearsal	Metacognitive Self-regulation	Time & Study Environment
Elaboration		Effort Regulation
Organization		Peer Learning
Critical Thinking		Help Seeking

Chen (2002) utilized the MSLQ to compare the use of self-regulated learning in a traditional classroom setting using primarily lectures versus a “hands-on computer lab” (p.11). She used only five of the nine subscales from the learning strategies section for purposes of the study. Sample size included 197 students from a business course that included both a lecture portion and a computer lab section. She found effort regulation to be the best learning strategy for those students in the lecture setting, compared to time & study environment management for those students doing the lab via computer. Chen was unsure if the sample size affected the results. Also the sample consisted of first and second year students who have a much higher level of comfort with the computer. Further research was recommended in this area.

Lin & McKeachie (1999) examined both intrinsic and extrinsic motivation in a group of college students. The group was part of the Learning to Learn course taught at the University of Michigan. In this study rather than using the entire fifteen subscales of the MSLQ, only the two subscales of goal orientation were used those of intrinsic and extrinsic. Study results indicated that a moderate or medium amount of extrinsic orientation was a better predictor of student success. Results also indicated that if the student also has a greater intrinsic motivation along

with moderate extrinsic orientation the student had a stronger performance. Extrinsic orientation refers to the outward results of the learning, such as the course grade or how the student does compared to others. Consequently, a student who values the grade he or she receives and the results compared to his or her peers and who has an interest in the knowledge learned will do well.

Yost (2003) utilized the MSLQ to study the academic performance of students in one associate degree nursing program. The assumption was that the motivation of a student had an influence on the student's use of SRL strategies. Her study replicated a previous study of Pintrich & DeGroot (1990) with a group of associate degree nursing students. Within the motivation category, Yost utilized correlation to find that "significant relations were found between the motivational subcomponents of intrinsic value and task value and three of the cognitive/metacognitive subcomponents: elaboration, critical thinking, and metacognitive self-regulation....Extrinsic value was significantly related to elaboration and self-regulation" (Yost, 2003, p. 70).

When looking at resource management strategies, the relationship between intrinsic value and peer learning was found to be statistically significant (Yost, 2003). Yost pointed to the highly motivated student understanding the value of learning from their peers. Within the construct of expectancy Yost found "Self-efficacy for learning and performance was significantly correlated with elaboration, critical thinking and metacognitive self-regulation with metacognitive self-regulation being the highest" (p. 71). When the subscale of test anxiety was evaluated, the learning strategies of rehearsal and critical thinking had a higher correlation. Yost found that of the two, rehearsal was used more frequently. When looking at the construct of resource management and the subscale of test anxiety, "test anxiety was positively related to peer

learning and help seeking, with peer learning the strongest” (p. 71). The study supports the belief that students who have a stronger sense of motivation were more likely to utilize self-regulated learning strategies, such as the student who is anxious related to test performance seeking the support of peers to facilitate learning.

Harris, Edmundson, & Jacobson (2006) conducted a study using 158 community college students from four different schools to test an online adaptation of the MSLQ. The coefficient alphas from the version were consistent for six of the subscales with the original version of the MSLQ. The subscales with greater coefficient alphas in this study were: “extrinsic goal orientation, control of learning beliefs, elaboration, organization, and time/study environment” (p.7). The authors conclude that “while the MSLQ has adequate external validity, there may be differences in the pattern of responses for different cultural groups” (p. 8).

Richardson (2007) used the MSLQ to compare the study’s results with results obtained using the Revised Approaches to Studying Inventory (RASI) in a survey done through the mail. The RASI examines how a student studies. It consists of thirteen different subscales, some of which include relating ideas, time management, and seeking meaning. Richardson’s intent was to examine how motives, feelings related to studying, and one’s study habits related to a distance learning class. In comparing the two tools, the researchers found that 62 out of 78 correlation coefficients were statistically significant. The significance of the results, maintain “the relationship between students’ motives and attitudes and their study behavior” (p. 397).

Mullens (2007) used the MSLQ to investigate the use of SRL strategies by students in an accelerated BSN program in a descriptive exploratory study. Students were compared based on levels of completion of the program, one-third or two-thirds of the way through the program. Subscale scores were found to be more significant for the group further along in the accelerated

program. The belief was that the student more advanced in the curriculum had more clinical experience on which to base his or her learning and also had a better sense of organization. Time & study environment and the subscale of effort regulation were also higher for the group further along in the program. The student in this group had developed SRL strategies that allowed him or her to study smartly and to use resources wisely. The scores were high related to peer learning for the group completing their last semester. It was believed to be a result of the group having already completed two-thirds of the program being paired in small groups of three during their studies compared to the other group starting the second third of the program who had only worked in large groups. The results support the benefit of small groups in facilitating learning. Mullens' results demonstrated that the learner with more knowledge has a greater use of SRL strategies and understanding of the value of time spent studying.

Gilles (1994) compared the MSLQ to the tools: Learning and Study Strategies Inventory (LASSI) and the Test of Reactions and Adaptation to College (TRAC). Gilles stated that the MSLQ provides a means to look at motivation and a student's desire to do the work required for a course. The inclusion of intrinsic and extrinsic goal orientation helps give more information related to the student's motivation toward the material. The subscales of effort regulation and self-regulation, provides insight into how a student feels about a task and his or her ability to be successful academically. Gilles further addresses validity of all three tools; all were said to have outstanding face validity, in that, the tools were very easy to understand. In evaluating concurrent validity, the MSLQ self-efficacy subscale was determined to be strongly connected to a student's grades. Test anxiety subscale scores were negatively correlated with grades, meaning the higher the level of anxiety, the lower the grade. Using Cronbach's alpha as a measure of

reliability, while they found all of the subscales to be reliable, some were stronger than others. The other two tools were also found to be reliable.

Pintrich and Johnson (1990) stressed that students are “information processors” (p. 85) and choose what information is a priority to know. The next step is for the student to process the new information with his or her prior knowledge. The final step would then be remembering the information and then utilizing the information. Students that have better scores related to the motivation subscales and then use more learning strategies are more likely to succeed in classes. Students who can adapt their learning strategies again increase their chances of success.

### **Summary**

Schools of nursing are doing their best to prepare students that are competent and ready to enter the workforce upon graduation. The ultimate goal is to have a graduate successfully complete the NCLEX-RN and be able to practice nursing. A student’s locus of control, level of motivation, use of learning strategies, and resource management strategies may play a significant role in how he or she approaches his or her education. The individual with an internal locus of control may have a better understanding that his or her degree of preparation and comprehension of the content will directly influence the end result, such as success on the NCLEX-RN. By identifying a person’s LOC, an individual with an external locus of control may be able to take this knowledge and assume a greater degree of responsibility for his or her learning. Study time expended can have a direct influence on one’s beliefs related to ability to demonstrate mastery of the content and to achieve his or her goals. Nursing educators have previously looked at the variables of GPA, science and math grades, nursing courses GPA, medical-surgical nursing course grade, pharmacology grade, among others; still, it is difficult to predict when a student may be at risk of failure.

Limited information is available related to ALOC and MSLQ related to a student in a baccalaureate of nursing program. These instruments may provide valuable information in terms of nursing student's performance on the ATI Comprehensive Predictor Exam and the NCLEX-RN. Does a student with an internal LOC perform better on these exams and if LOC is known can a student be helped to improve his or her chances of success. The MSLQ provides information related to student motivation and use of learning strategies as it relates to a course or an examination. In addition the student's management of resources can also be assessed. The MSLQ provides a great deal of information related to student learning which can assist students and educators to improve students' chances of success. This study provided valuable information to nursing educators, present additional means to predict a student's success, and provide early intervention for those students identified as at-risk. These instruments may provide schools of nursing additional ways to help students and more importantly, place qualified nurses into the workforce.

## **CHAPTER THREE**

### **METHODOLOGY**

This chapter will detail the methodology used in a descriptive study using Bachelor of Science in nursing students (BSN) from four different nursing programs. The Academic Locus of Control (ALOC) and Motivated Strategies for Learning Questionnaire (MSLQ) instruments used in the study will be reviewed. The process of data collection used is discussed. Potential limitations will also be examined.

#### **Participants**

A descriptive study was conducted using four Midwestern schools of nursing. All schools were BSN programs. All but one school incorporated the use of the ATI comprehensive predictor exam prior to graduation and to prepare for the NCLEX-RN. The intent of the ATI exam was to provide the student and the school a gauge of the student's preparation for the NCLEX-RN. While many schools have begun to utilize progression policies to ensure that its graduates are better prepared (required remediation, hold on graduation until the test passed); the presence of a progression policy for purposes of graduation related to ATI and NCLEX-RN was not a requirement for participation in the study.

The schools of nursing requested to participate in this study were both private and public institutions. All students in the May 2010 graduating classes were invited to participate in the study. A convenience sample was used with all students present the day class was visited asked to participate. In addition, several students out of the country at the time class was visited were given the opportunity to participate when they returned to the United States. Demographic data collected included age, gender, ethnicity, English as a second language, number of hours worked per week, and if the job was healthcare related in positions such as Certified Nurse's Aide,

Patient Care Technician, or Unit Secretary. Informed consent was obtained during each session with an opportunity to answer questions prior to students signing the tear-off consent form. The release of ATI comprehensive predictor exam scores, ATI medical/surgical exam score, NCLEX results (pass/fail) and course grades (pathophysiology, pharmacology and two medical/surgical courses) were obtained from each student's school of nursing. Prior to visiting with the students to obtain consent, the researcher received approval from the Human Subjects Committee at the University of Kansas and at the four institutions participating in this study. The goal was to receive approval for the study by each institution prior to the fourth week of the spring 2010 semester. All invited schools agreed to participate.

The researcher either attended a senior nursing class or visited with the students, right after class at all schools of nursing during the second through fourth week of the students' final semester, depending on when IRB approval from that institution was obtained. One institution was seen in the tenth week of the semester due to waiting on IRB approval and receiving permission for a time to meet with the students. All graduating seniors in the May 2010 class were eligible to participate. The student's participation was strictly voluntary, and no points or grades were awarded as a result of their decision to participate or not participate in this research study. One school independently offered students one extra credit point for staying after class to participate in the study; for those students who did not wish to participate, the school had a different activity the student could complete to receive the same extra credit point. Each student was assigned an identification code in order to be able to match all of his/her individual data. The codes were set so that data could be retrieved per school. The first institution was numbered 0 – 99, the second school in the 100s, the third in the 200s and the last school in the 300s. Data was reported as an aggregate for purposes of this study.

## **Instruments**

### **Academic locus of control.**

The Academic Locus of Control Tool (ALOC) (see Appendix A) developed in 1985 by Ashton Trice was given to each of the students to complete. It took approximately ten minutes for students to finish this instrument. The ALOC consisted of 28 statements related to academics. The 28 items were marked either true or false by the individual based on his or her academics; in other words, was the statement more like the participant (answer true) or less like the participant (answer false). This tool was selected based on its relationship with LOC and academics. Trice sought to develop a tool that would more accurately reflect a college student's LOC. Rotter supported the belief that tools more specific to the area being studied would more accurately reflect the individual's LOC, which resulted in Trice's development of the LOC tool specific to academics (Janssen & Carton, 1999). Students scoring 13 or less on the tool are said to have an internal locus of control. Those scoring 14 or higher are identified as having an external locus of control (Trice, 1985).

Trice's (1985) original instrument utilized 89 questions based on Rotter's (1966) work on locus of control. Included were "areas related to academic success and control orientations, such as chance, effort, ability, and influence by powerful others" (Trice, 1985, p. 1044). Two groups of students participated in Trice's initial study; the first group contained 107 individuals enrolled as second and third year education majors, while the second group contained 82 first year attendees enrolled in a basic psychology class. The education majors were used to determine the items to be kept for the final tool. The author used "response diversity", "temporal stability" and "internal consistency" to narrow down the 89 items to the 28 items retained for the final tool (p. 1044). The psychology students were then used to determine reliability. Two

measures used to examine academic ability were the final exam score and extra credit obtained in the psychology course. “The test-retest interval was five weeks and the internal consistency analysis was based on the second administration” (p. 1044).

Participants were given several other measures to serve as a comparison, including the Rotter’s I-E scale. Trice found the “test-retest reliability was .92 and KR-20 internal consistency was .70. Product-moment correlations with this group were .50 with the Rotter I-E scale, -.31 with the Achievement Motivation Checklist (nACH).” (p. 1045) Correlations between the two scales mentioned above were found to be significant and were found to be in a direction allowing them to prove construct validity. The authors also found a relationship with the amount of extra credit earned by the student. Permission for use of the tool has been obtained by this author.

#### **Motivated strategies for learning questionnaire.**

The other instrument students were asked to complete was the MSLQ, consisting of 81 items. It was a self-report tool developed to examine the motivational and learning strategies used by college students (Pintrich, Smith, Garcia, & McKeachie, 1991). The tool (see Appendix B) was developed over a number of years and was funded by a grant from the Office of Educational Research and Improvement (Artino, 2005). The researchers developed the tool using social cognitive theory and the concept of self-regulated learning. This framework “assumes that motivation and learning strategies are not traits of the learner, but rather that motivation is dynamic and contextually bound and that learning strategies can be learned and brought under the control of the student” (Duncan & McKeachie, 2005).

The original tool was developed to guide a “Learning to Learn” course that the authors were teaching (McKeachie, Pintrich & Lin, 1985). Studies were conducted during 1986-1988, with sample sizes of 326, 687, and 758 respectively (Artino, 2005: Pintrich, Smith, Garcia &

McKeachie, 1991). Item and factor analysis was done for both the motivation items and then the learning strategies (Artino, 2005, Benson, 2004; Duncan & McKeachie, 2005; Pintrich, Smith, Garcia, & McKeachie, 1993). In 1990 a completed tool was tested on 380 students in a university setting, twenty-four of these came from a community college (Pintrich, Smith, Garcia, & McKeachie, 1991; Benson, 2004). The students sampled covered a variety of classes and a number of educational disciplines (Pintrich & DeGroot, 1990). Of the 15 subscales, in the MSLQ nine had a Cronbach's alpha greater than .70. The other six scales were less than .70 with the lowest .52 (Artino, 2005). Table 5 shows the 15 subscales of the MSLQ and the items related to that specific subscale along with the Cronbach's alpha.

Table 5  
Coefficient Alphas and Items Comprising the 15 MSLQ Scales

Scale	Items Comprising the Scale	$\alpha$
Motivation Scales		
Intrinsic Goal Orientation	1, 16, 22, 24	.74
Extrinsic Goal Orientation	7, 11, 13, 30	.62
Task Value	4, 10, 17, 23, 26, 27	.90
Control of Learning Beliefs	2, 9, 18, 25	.68
Self-Efficacy for Learning and Performance	5, 6, 12, 15, 20, 21, 29, 31	.93
Test Anxiety	3, 8, 14, 19, 28	.80
Learning Strategies Scales		
Rehearsal	39, 46, 59, 72	.69
Elaboration	53, 62, 64, 67, 69, 81	.75
Organization	32, 42, 49, 63	.64
Critical Thinking	38, 47, 51, 66, 71	.80
Metacognitive Self-Regulation	33r, 36, 41, 44, 54, 55, 56, 57r, 61, 76, 78, 79	.79
Time and Study Environment Management	35, 43, 52r, 65, 70, 73, 77r, 80r	.76
Effort Regulation	37r, 48, 60r, 74	.69
Peer Learning	34, 45, 50	.76
Help Seeking	40r, 58, 68, 75	.52

Duncan, T.G. & McKeachie, W.J. (2005). The making of the motivated strategies for Learning Questionnaire, *Educational Psychologist*, 40(2), 119.

The tool was intended to evaluate learning related to a course, but can be used in many contexts, such as being used with all 81 items or in a modular fashion, allowing the researcher or instructor to use only the section he or she chooses (Pintrich, Smith, Garcia, & McKeachie,

1991). The tool has been translated into many languages (Artino, 2005; Duncan & McKeachie, 2005). Predictive validity was determined by evaluating the responses related to the student's final course grade, and scores were found to be predictive. For the purposes of this study, all 15 subscales were utilized. The author had originally intended to use a self-efficacy tool but instead has utilized the MSLQ as it assessed self-efficacy along with other indicators. The tool took approximately 20 - 30 minutes for the student to complete. Scoring was outlined in the manual for the MSLQ (Pintrich, Smith, Garcia & McKeachie, 1991). Permission for use of the tool was obtained from the University of Michigan.

Each subscale is scored separately by summing the responses to the questions within that subscale, adding them together, and then dividing by the number of items within the scale. Questions are answered by using a seven point Likert scale. Several of the items are reverse coded; consequently, in order to obtain a score for a reverse coded item, the instructions are to take the number for the answer given and then subtract that from eight. As an example, if an individual had answered three (3) the researcher would calculate  $(8-3)$  and the new score would be five (5). The manual for the MSLQ describes each subscale and clearly explains the scoring (Artino, 2005; Duncan & McKeachie, 2005; Pintrich, Smith, Garcia & McKeachie, 1991). A higher score would mean that the student is "exhibiting more of the cognitions, emotions, and behaviors that each of the scales is trying to assess" (Mullens, 2007, p. 407). The authors purposely did not provide any norms for the tool. (Duncan & McKeachie, 2005)

### **Study Time.**

Study time is an important variable in evaluating what action the student took to prepare for the ATI Comprehensive Predictor Exam and the NCLEX-RN. To evaluate time spent in preparation, a study log was created. Students were asked to log each week the amount of time

doing NCLEX-RN questions, ATI content review or questions, or any other preparation for the ATI comprehensive predictor or NCLEX-RN. Total time was calculated and then divided by the number of weeks to determine study hours per week for each study log. Of interest were the types of materials the students were using and the amount of time they actually spent preparing for this exam. Study logs were reviewed for the type of NCLEX preparation materials used. Of additional interest was when in the semester the student began this preparation.

## **Procedures**

During the second through the fourth week of the semester, the researcher administered the academic locus of control scale (ALOC) and the motivated strategies for learning questionnaire (MSLQ) to the students at three of the schools after gaining consent to participate. This was completed at the fourth school during the tenth week of the spring semester. The study log was given to each student along with an explanation on how to record his/her individual data. Key instructors at each school were asked to help provide a reminder each week to update their study logs.

Each school administered the ATI Comprehensive Predictor Exam prior to the end of the semester. After obtaining support from one of the schools to participate, it was learned that ATI was not used. Instead this group of students took the Kaplan readiness exam. ATI was contacted and agreed to fund the cost of the exam for the participating students. ATI requires that the test be given in a monitored setting. Due to the students being on campus infrequently, as they moved into their internship experiences, the decision was made to give the students the ATI Comprehensive Predictor Online Practice Exam without rationales (online practice exam that provides the student with the rationale for each answer). This test is closest to the predictor exam. As with the monitored predictor, the students do not see rationales. The students at this

school were asked to set up an ATI account and then to take the test prior to the end of semester and sitting for the NCLEX-RN. Results were to be obtained through the ATI website by using the assessment ID test codes, but the schools chose to provide this information to the researcher in a spreadsheet. The ATI predictor exam in many programs can be given more than one time. For purposes of this study, the first predictor results were the only results utilized. NCLEX results were obtained via a postcard sent to the researcher after testing or by looking on the Kansas State Board of Nursing (KSBN) website. The website only provides information on the student passing. Only those students completing the NCLEX-RN testing by the end of August 2010 were included in the logistic regression for NCLEX-RN.

### **Group Design**

Each participant was assigned an individual number which was then coded according to his or her school for purposes of data collection. Data was analyzed by school and was shared with each school, but was only reported for purposes of this study as an aggregate. No individual student information was reported.0020

### **Data Analysis**

Hypotheses one and two related to the ATI comprehensive predictor exam were analyzed through the use of regression analysis as well as the ATI Medical/Surgical Content Mastery Exam. As hypothesized, those individuals having an internal locus of control and having higher MSLQ subscales scores would be expected to have higher ATI comprehensive predictor exam scores. The interaction of study time was also examined in sub-hypotheses one (a), two (a) and hypothesis three. Study time was analyzed based on the number of hours a person spent preparing for ATI and included how much additional NCLEX study time was utilized after completion of the ATI. The MSLQ and ALOC were analyzed by determining the coefficient

alpha. Split-half reliability for the motivation section of the MSLQ instrument was also completed. The literature has consistently reported a high coefficient alpha for the ALOC instrument. All data will be analyzed using SPSS for Windows, Release version PASW 18.0 (© SPSS, Inc, 2009, Chicago, IL, www.spss.com) and SAS, version 9.1, (© SAS Inc., 2004, Cary, North Carolina, www.sas.com). The alpha level will be set at 0.05 for statistical significance on all hypotheses.

The hypotheses related to the NCLEX-RN were analyzed through the use of logistic regression. This method of data analysis allows researchers to look at the odds of a student passing or failing. The NCLEX-RN results are reported strictly as pass or fail, because no score is received. The lack of a score makes logistic regression the appropriate method of evaluation.

The additional variables of English as a second language, number of Cs in nursing classes, grades in the two medical/surgical nursing course, grades in a pharmacology or pathophysiology course, and number of hours worked per week were evaluated also using a regression analysis. These variables have been identified in the literature to affect performance, although not as significant as previously believed. Data on the participants in terms of age, gender, and ethnicity were also included to see if there was any statistically significant correlation between these variables.

### **Internal Validity**

Internal validity examines the cause and effect relationship between variables. Every effort was made to address any threats to internal validity. It was estimated that if the majority of students participated from the four schools of nursing, the number of participants would be over 150, but based on actual participation that number was lower. The question whether to use a

convenience sample to increase the power and as a result increase generalizability or to utilize random sampling was discussed. For the purpose of this study, convenience sampling was used. All potential subjects were students that met the entrance criteria for their school of nursing and were at the same point in their education, their last semester. All subjects were treated justly to prevent any bias. To prevent low reliability of measures, the instruments chosen have high internal reliability. Cronbach alpha scores were obtained for a MSLQ subscales. A correlation matrix was produced for scores from the 15 subscales and the ALOC. Variables which correlate with each other higher than .60 may be removed from the regression analysis or combined with each other for the analysis. Regression analysis was used to ensure robust statistical testing. The assumption should be that those individuals having a higher score on the MSLQ and those with an internal locus of control will have a higher score on the ATI comprehensive predictor exam and subsequently, the NCLEX-RN.

### **External Validity**

In terms of construct validity, the ALOC has been utilized in many studies and has demonstrated validity. The constructs of locus of control and self-regulated learning will be clearly defined and will be measured by the tools selected. Since the constructs were evaluated on more than one dependent variable (ATI Comprehensive Predictor score and the NCLEX-RN) generalizability should increase.

The populations were well defined and can be compared to the four samples from the different schools of nursing using the demographic data. The four schools provided a slight variation in the settings to improve generalizability. Previous studies have looked at only one school of nursing at a time, decreasing the ability to generalize results. Again, the issue of

random assignment would improve validity. Using a convenience sample may be a limitation of the study.

### **Limitations**

Using four schools of nursing with different curriculums may impact results. Each school chosen uses the *Essential for Baccalaureate Education* developed by the American Association of Colleges of Nursing (AACN, 2008) as the framework for developing their curriculum. A limitation may be that only schools of nursing in the Midwest are being included. A difference could be found compared to schools on the coasts. Since this study is a quantitative study, a mixed method could have been a better approach to determine additional barriers to studying (children, ADHD, socioeconomic status, etc.). Other barriers could have been emotional states (test anxiety, stress, lack of support). The MSLQ does address the issue of test anxiety but only to a limited extent. The MSLQ only has five questions related to test anxiety. A tool designed specifically for test anxiety might have provided additional data.

### **Significance of the Study**

If the hypotheses of this study are supported, a positive implication would be that schools of nursing would be able to identify earlier in the program of study those students at risk for not passing. These students would be able to receive additional advising, support, and/or remediation. Students could be provided counseling to help them identify learning strategies that could help them succeed. The number of hours studying and possibly the materials used could assist all students and faculty in knowing an appropriate amount of study time to be successful. A structured study program could then be developed for students to help improve their success. Again, if the hypotheses are true, the student with an internal locus of control and high use of self-regulated learning (SRL) may not need to have a structured study time. The negative impact

could be that the students with low levels of motivation and limited use of self-regulated learning may see a further decrease in their abilities after identification of their weakness. If the hypotheses are not supported, the researcher will have to question further what the variables are that predict a student's success on these exams. Further studies will need to be conducted to determine what analysis will most accurately predict student success and what affects students' accountability for being successful on examinations.

## **CHAPTER FOUR**

### **RESULTS**

#### **Introduction**

This chapter discusses study results related to the dependent variables, the ATI Comprehensive Predictor Exam and the NCLEX-RN. Based on the review of the literature independent variables were chosen to evaluate predictability of success on both of these exams. In addition, academic locus of control (ALOC) was measured to determine whether or not an individual with an internal LOC is more likely to be successful passing these two exams. The fifteen subscales of the Motivated Strategies for Learning Questionnaire (MSLQ) were also analyzed to determine whether the motivation or learning strategies subscales were predictive of a student's success. The chapter will first describe the sample and then examine statistical data relative to the study hypotheses.

#### **Characteristics of the Sample**

The sample for this study included students in the May 2010 graduating class from four Midwestern, baccalaureate of nursing programs. The schools were both private and public institutions located within the same state. The researcher visited each school during the first month of the semester with the exception of one school which was visited during the tenth week. All students present during the researcher's visit were invited to participate. Additionally, several students studying outside the country were allowed to participate when they returned to campus. The sample included a total of 132 students and results were reported as an aggregate.

Table 6

## Sample Demographic Data

Gender	Frequency	Percent
Female	118	89.4%
Male	13	9.8%
Age		
18-23 years	76	57.6%
24-29 years	37	28.0%
30-35 years	6	4.5%
36-40 years	5	3.8%
40-45 years	3	2.3%
46 & over years	5	3.8%
Ethnicity		
White	122	92.4%
Hispanic	3	2.3%
Black (African- America)	5	5.0%
Native Hawaiian, Pacific Islander	1	.8%
Asian	1	.8%

The results in Table 6 related to gender show that the sample was predominantly female, 89.4% with the remaining 9.8% male. This demographic was consistent with other studies that have examined predictors of NCLEX success (Beeman & Waterhouse, 2001; Beeson & Kissling, 2001; Daley et al., 2003; Engelmann, 2002; Higgins, 2005; Peterson, 2009).

The participants were asked to identify their age according to a range instead of listing a specific age (Table 6). The initial demographic tool was clarified so that participants could

correctly identify themselves as 40-45 or 46 and over. This instruction was given verbally to the first group while completing the form and also communicated in writing on the board. The correction was made for all other groups on the demographic form. Over half of the sample was between the ages of 18-23 years (57.6%). A significant number of the students entered college immediately upon completion of high school. Individuals between the ages of 24-29 accounted for 28% of the sample population, and those in their thirties accounted for 8.3% of the population. A total of eight students fell in the categories over age 40, totaling 6.1% of the sample. For future studies the researcher would recommend that students be asked to self-report their specific age and would add an additional question to determine if the baccalaureate in nursing was a second degree for the student. Previous knowledge from obtaining a college degree may influence the student's probability of passing as well as his or her study habits.

Upon review of the demographic data related to ethnicity (Table 6), 92.4% or 122 students classified themselves as Caucasian. The next two most frequently identified ethnic groups were that of black or African-American (5.0%) and Hispanic (2.3%). The remaining two students identified themselves as Native Hawaiian, Pacific Islander and Asian.

Table 7

English as a Second Language

Language	Frequency	Percent
English	128	97.7%
ESL	3	2.3%

Of those students participating in the study, 97.7% identified English as their primary language (Table 7). One student left this question blank and the other three indicated they spoke English as their second language (2.3%). This data may be inaccurate related to the wording on

the demographic data sheet. The demographic data form asked whether English is not my primary language. Upon reviewing the language the researcher determined this wording may have caused a number of students to incorrectly classify themselves. The belief is that students who should have identified themselves as non-native English speakers misinterpreted the question and as a result marked their language as primary English.

Table 8 Student Employment

Hours worked per week	Frequency	Percent
0 hours	38	29.0%
2-9 hours	7	5.4%
10-19 hours	43	32.6%
20-29 hours	30	22.7%
30-39 hours	7	5.4%
40 hours	3	2.3%
50 hours	3	2.3%
Employment		
Healthcare related	80	60.6%
Not healthcare related	15	11.4%

Of the 132 students in the sample 29% (n=38) stated they were not employed. Students were asked to list an approximate number of hours they worked per week. The numbers reported were between 0 – 50 hours. Data listed in Table 8 includes the data in increments of 10 hours. A majority of the students (55.3%) indicated that they are working between 10 – 30 hours per week. Three students reported working 40 hours per week (2.3%) and three students reported that they worked 50 hours per week (2.3%). One student’s answer was unclear as to the number of hours, so data was not included. The primary form of employment for the nursing students in this sample 60.6% (n=80), was healthcare related.

Table 9

## Course Grade Frequency

<b>Grade</b>	<b>Patho Grade Frequency</b>	<b>%</b>	<b>Pharm Grade Frequency</b>	<b>%</b>	<b>M/S I Grade Frequency</b>	<b>%</b>	<b>M/S II Grade Frequency</b>	<b>%</b>
A	50	37.9	47	35.6	35	26.5	39	29.5
B	60	45.5	54	40.9	78	59.1	60	45.5
C	22	16.7	30	22.7	19	14.4	33	25
Mean Grade	3.21		3.13		3.12		3.05	
Median	3		3		3		3	
Std Dev.	0.71		0.76		0.63		0.74	
<b>*A=4</b>								
<b>*B=3</b>								
<b>*C=2</b>								
N	132		131		132		132	

Course grades were collected from school of nursing staff for all students participating in the study. Of interest were student grades in pathophysiology, pharmacology and the two medical/surgical nursing courses in each program (these will be referred to in the discussion as med/surg 1 and med/surg 2). Initially the plan had been to use one medical/surgical grade, but since all four schools participating had the content broken into two separate courses, data was available for both. Not all schools taught pathophysiology and pharmacology separately; when taught together but over two semesters, the first class was used for the pathophysiology grade and the second course for the pharmacology grade. The average grade for all four classes was a letter grade of B (3.0). The number of individuals with Cs in the four courses in table 9 ranged from 14 – 25 %.

When evaluating the number of Cs a student received in all nursing courses, the numbers ranged from 0 – 11 with a mean of 1.83 (SD = 2.73). Results showed that 50% of the students had no Cs in nursing course work; 13.6% had one grade of C and 12.1% had two Cs. The other most frequently reported numbers of Cs were three, five and seven (5.3%, 5.3%, and 6.1% respectively). A total of 66 students had one or more Cs in nursing course work. Grades were reported by staff from each nursing program instead of relying on student self-report to improve accuracy of information.

Table 10

ATI Medical/Surgical Content Mastery Exam Proficiency

Level	Frequency	Percent
Below Level 1	13	9.8%
Level 1	55	41.7%
Level 2	44	33.3%
Level 3	10	7.6%
Not available*	10	7.6%

Mean = 1.42

Std Dev. = 0.791 n=122

\*\*Did not take this exam so not results available (n=10).

Previous studies have examined a student’s knowledge of medical/surgical nursing content related to performance on the NCLEX exam. The ATI Medical/Surgical Content Mastery Exam scores (Table 10) provided the student and faculty information related to the student’s understanding of this content area. According to ATI (ATI Faculty Resource Guide, 2007) a student has obtained mastery if they have achieved a level two proficiency score. An even higher level of understanding is said to be held by those having proficiency at level three.

One school utilized for the study did not use the ATI products, (n=10). ATI had agreed to make the exams available at no cost to the student but, the decision was made not to ask the student to take the medical/surgical exam, instead choosing to ask the students to complete the ATI Comprehensive Predictor. Based on ATI's recommendations for proficiency, 39.9% of the sample had achieved mastery of the medical/surgical content, while 51.5% could not demonstrate mastery of the content at the time the exam was given. The value of students knowing where they stand related to knowledge of this content is the ability to use the exam results to remediate.

Table 11

LOC Scores and Statistics

Score	Frequency	Percent
1	1	0.8
2	1	0.8
4	5	3.8
5	5	3.8
6	8	6.1
7	15	11.4
8	10	7.6
9	18	13.6
10	11	8.3
11	19	14.4
12	11	8.3
13	11	8.3
14	5	3.8
16	4	3
17	2	1.5
21	1	0.8
Total	127	

The 28 item ALOC tool developed by Trice (1985) was designed to assess LOC as it related to a student's academics. The tool asks the student to make a decision whether or not the

statement is more like them (true) or less like them (false) related to their academic abilities and performance. For this study the frame of reference given to the students was preparing for the ATI Comprehensive Predictor exam and the NCLEX-RN. A person with a score of 13 or higher is said to have an external LOC. A student with an ALOC score of 13 or less was said to have an internal LOC. An individual with an internal LOC would be expected to take more responsibility for his or her actions in terms of achieving a good grade and understand that performance in a course is related to the amount of preparation (Carden, Brynat & Moss, 2004; Cook & Brown, 2009; Landis, Altman, Gavin, 2007; Onwuegbuzie & Daley, 1998; Rotter, 1966; Trice, 1985; Trice & Hackburt, 1987). Of the 127 students who completed all 28 items on the ALOC, 90.55% (n=115) had an internal LOC (score 13 or less) while 9.45% (n=12) had an external LOC. Five students did not complete the back page of the ALOC tool so their ALOC score was not able to be calculated.

Students were also asked to complete the 81 item Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, McKeachie, 1991) as a part of this study. The questionnaire was typically used by faculty to assess student motivation and use of learning strategies related to a particular course (Artino, 2005; Duncan & McKeachie, 2005; Garcia & Pintrich, 1995). For purposes of this study students were asked to consider their course as preparation for the ATI Comprehensive Predictor Exam and NCLEX-RN. Students are asked to respond to the 81 items by using a Likert scale to indicate whether the statement was “more true” or “not true” for them. The student was asked to circle where on the scale of 1 – 7 he or she fit for each item. Several items are reverse coded, in order to obtain the score for these items the number circled is subtracted from the number eight to get the new score. The questionnaire consists of two scales: motivation (6 subscales) and learning strategies (nine subscales). Items for

each subscale are randomly distributed throughout the questionnaire (Duncan & McKeachie, 2005; Pintrich, Smith, Garcia & McKeachie, 1991). The response for each item on a student's questionnaire were entered into SPSS and then subscales scores were computed from those individual responses. The subscales scores were calculated by taking the scores for the items in that subscale and then dividing by the number of items in the subscale. To assess reliability of the MSLQ instrument Cronbach's alpha was completed for each subscale. The Cronbach alphas in this study ranged from .53 - .91. The reliability testing with the original instrument shows Cronbach's alphas that are fairly consistent. The current study and original study (Pintrich, Smith, Garcia & McKeachie, 1991) Cronbach alphas can be found at the bottom of tables 12 and 13. The original study had nine subscales that had a Cronbach alpha greater than .70 this study had seven subscales above the .70 level. Six subscales were in the range of .60 - .69. Split-half reliability was calculated for the six motivation subscales. The two halves of the subscale scores were fairly consistent with one another although the items in each subscale are very small (see Appendix N). The Cronbach alpha provides the best information related to reliability for the MSLQ.

Table 12 Motivational Scale MSLQ Results

	Intrinsic	Extrinsic	Task Value	Control Learning Beliefs	Self-Efficacy	Test Anxiety
Mean	5.38	5.09	5.86	5.61	5.7623	3.93
Median	5.25	5.25	6	5.75	5.875	4
Standard Deviation	0.79	1.14	0.91	0.91	0.8063	1.65
# of item per subscale	4	4	6	4	8	5
Cronbach alpha	0.53	0.72	0.89	0.64	0.91	0.90
Cronbach alpha Original study	0.74	0.62	0.90	0.68	0.93	0.80

The motivation scale has six subscales: intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs, self-efficacy and test anxiety. The first three are considered value components, referring to what value the student places on the course or successful completion of the exam. The student can have a higher level of intrinsic motivation as a result of wanting to gain the knowledge from a class or the subject interested him or her, this may or may not be coupled with extrinsic motivation, getting a good grade, being recognized by peers or faculty, passing the test (Pintrich, 1999; Pintrich, 2004). Along with this is the value placed on the task or assignments. The mean for intrinsic goal orientation was 5.38 (SD= .79) (see Table 12). The extrinsic goal orientation subscale mean was slightly lower at 5.09 (SD=1.15). When looking at task value 62.1% of the scores were 5.83 or higher with a mean of 5.86, (SD= .91). These higher numbers would indicate that students placed a high value on doing

well, understanding the content, doing the assignments as they relate to successful completion of the ATI Comprehensive Predictor Exam and NCLEX-RN.

Additional subscales under the motivation scale of the MSLQ are the expectancy components of control of learning beliefs and self-efficacy for learning and performance. The control of belief subscale examines how the student feels in terms of control over his or her learning. The student may question whether he or she is engaged in the course and assignments will make a difference in the final outcome, a good grade or success on an exam. Self-efficacy for learning and performance subscale evaluates whether the student believes he or she can achieve a positive outcome in the course or on the test and believe that he or she has the ability to complete the job (Pintrich, Smith, Garcia & McKeachie, 1991). When students were evaluated for this study, over 80% delineated scores of 5 or greater. Students had a strong belief that they had control over their learning, the mean was 5.61 (SD=.91). In the self-efficacy category scores had a wide distribution with the highest frequency being 5.38 (9.1%). These numbers might indicate that students are unsure as to whether or not they can master the task of successful completion of the ATI and NCLEX-RN exams (mean= 5.76, SD=.81). The final subscale of the motivation category is test anxiety. This scale consists of five items that relate to the student's anxiety in terms of how they feel about testing and what physical and psychological symptoms they might exhibit. The mean for this subscale was 3.93 (SD=1.65). In this case the higher the number the greater a student's level of test anxiety.

Table 13 Learning Strategies MSLQ Results

<b>Learning Strategies</b>	<b>Rehearsal</b>	<b>Elaboration</b>	<b>Organization</b>	<b>Critical Thinking</b>	<b>Self Regulation</b>	<b>Time &amp; study</b>	<b>Effort Regulation</b>	<b>Peer Learning</b>	<b>Help Seeking</b>
Mean	4.79	5.25	4.47	3.97	4.60	5.18	5.36	3.90	4.49
Median	5	5.25	4.5	4	4.61	5.25	5.5	4	4.75
Std Dev.	1.25	0.97	1.30	1.17	0.78	0.94	0.94	1.33	1.17
# of items per subscale	4	6	4	5	12	8	4	3	4
Cronbach alpha Current Study	0.65	0.74	0.66	0.79	0.68	0.75	0.59	0.60	0.62
Cronbach alpha Original study	0.69	0.76	0.64	0.80	0.79	0.76	0.69	0.76	0.52

The second part of the MSLQ is the learning strategies scale. This section consists of nine subscales, with five focusing on cognitive and metacognitive skills, and four that examine how a student manages his or her resources. The information related to study results can be found in table 13. The learning strategy of rehearsal looks at techniques the student uses to learn the material such as repeating the information or making a list. This technique does not see the student correlating the information to learning at an earlier time (Pintrich Smith, Garcia & McKeachie, 1991). The mean for rehearsal was 4.77 (SD=1.25). This is a simple technique which does not work well for learning information at the application level of Bloom’s taxonomy (format for most NCLEX-RN questions), but could be used for memorization of common lab values and medication conversions. The learning strategy of elaboration attempts to link new

knowledge to what has been previously learned. A student might use paraphrasing or use summarization. The mean for elaboration was 5.25 (SD=.97). Organization as a strategy helps the learner link information or concepts. A key skill utilized is outlining (Pintrich, Smith, Garcia & McKeachie, 1991). This subscale had a lower mean 4.47 (SD=1.30), which may have to do with the large volume of information a student must learn in nursing school. A significant amount of time is also spent in the clinical setting working with patients instead of at home reading information.

Critical thinking is a subscale within the cognitive & metacognitive skills component and, is a key skill for a nursing student. A student must be able to assess the situation and then make a decision on the next course of action. The mean for this subscale was 3.97 (SD=1.18). This value is lower than would be expected of graduating nursing students. In evaluating student scores there was a wide range of responses from 1.0 to 6.8. The final subscale that deals with cognitive activities is metacognitive self-regulation. This subscale evaluates the student in terms of his or her “planning, monitoring and regulating” (Pintrich, Smith, Garcia & McKeachie, 1991, p. 23). The student plans study time and sets expectations for what needs to be accomplished, scrutinizing where he or she is in terms of understanding of the material and then making sure to stay on schedule to achieve his or her goal. This is the largest subscale in terms of items on the questionnaire (12 items). The scores ranged from 2.0 to 6.25 with a mean of 4.60 (SD= 0.78).

The last four subscales within the learning strategies section are those of resource management, time and study environment, effort regulation, peer learning, and help seeking. These subscales look at whether the student is able to manage his or her learning environment and his or her ability to seek help from faculty, university services and peers when needed. Time and study environment refers to the student being able to manage his or her time and plan study

time accordingly. This section also evaluates the student's ability to deal with distractions within his or her study environment. The mean for this section was 5.18, (SD= .94). As graduating seniors, the student may perceive an ability to control his or her study environment, yet communicate that time to study is very difficult between completing multiple assignments, as well as working and dealing with other personal responsibilities (personal communication).

Effort regulation is a key part of self-regulated learning, as this evaluates whether the student is able to manage tasks to get to the end result. Pintrich, Smith, Garcia & McKeachie (1991) defined effort regulation as follows "effort management is important to academic success because it not only signifies goal commitment, but also regulates the continued use of learning strategies" (p. 27). The results showed a higher mean, 5.36 (SD = 0.94). The subscale, peer learning, results showed a lower mean, 3.90 (SD = 1.34). This would indicate that students were not using peers as a means to clarify what they don't know or using them as a support system. The final subscale is that of help seeking or asking others for assistance, this could include both fellow classmates and faculty members. The mean for the study sample was 4.49 (SD = 1.17).

## **Correlations**

To evaluate the independent variables a correlation matrix was created utilizing ALOC scores and the fifteen subscales of the MSLQ. A total of 155 correlations were created with 59 statistically significant at alpha = .01 level and 14 at the alpha = .05 level. When looking at the variables of the MSLQ it had been previously determined that if any correlated with each other higher than .60 they could be removed or combined with each other for purposes of the statistical analysis. In the 155 correlations with LOC and the MSLQ subscales only one correlation was found to be above the .60 level. The correlation between self-regulation metacognitive skills and elaboration were found to be statistically significant, ( $r=.603$ ,  $p<.000$ ). As this was the only value

out of all the correlations and it was only .03 higher the decision was made to use all fifteen subscales. The correlation matrix can be found in Appendix C.

LOC was found to have significant correlations with seven of the subscales of the MSLQ at the .01 level and one at the .05 level (See Appendix C). The subscales included intrinsic goal orientation, extrinsic goal orientation, task value from the motivation scale; the learning strategy subscales that were significant included organization, self-regulation, time & study environment, and effort regulation. An individual with an internal LOC is believed to take responsibility for learning and is aware the amount of effort put into a course or preparation for an exam influences the end result (Rotter, 1966; Trice, 1985). To do well the student must prepare by planning, monitoring and regulating his or her activities, control one's learning environment in terms of time and distractions, and amount of effort put into preparing (Pintrich, 2004; Pintrich, Smith, Garcia & McKeachie, 1991).

Intrinsic goal orientation also had eight correlations that were statistically significant. The strongest correlation was between intrinsic goal orientation and task value ( $r=.596, p<.001$ ). A desire to do well in terms of the ATI Comprehensive Predictor Exam and the NCLEX-RN relates to the value of the assignments or the activities used to prepare for these exams. The learning strategies of elaboration, critical thinking were moderately correlated with intrinsic goal orientation ( $r=.492$  &  $.368$  respectively,  $p<.001$ ). Extrinsic goal orientation had eight correlations that were statistically significant at the .01 level. Task value was again positively correlated ( $r=.340, p<.001$ ), with extrinsic goal orientation, the outcome such as a good grade or passing the exam is important, as a result the assignments or tasks related to the goal may be considered important. Task value had six correlations that were statistically significant, with time and study environment and effort regulation the two highest ( $r=.368$  &  $.352, p<.001$

respectively). A moderate correlation existed between the task value and the amount of time and effort put into preparation for the two exams. This also includes the student's ability to complete an assignment on time and the ability to deal with distractions.

The learning strategy subscale of rehearsal had seven statistically significant correlations at the .01 level. The values were slightly higher with elaboration, organization, self-regulation metacognitive skills, and peer learning all having a correlation of .4 or higher ( $r=.455$ ,  $.495$ ,  $.488$ ,  $.425$  respectively). Rehearsal is a simpler learning strategy that may have more value when used with other learning strategies such as the strategies listed above. Also found to be statistically significant but at a level less than .40 were the learning strategies of critical thinking, time & study environment, and help seeking ( $r=.278$ ,  $.352$ , &  $.354$  respectively).

The learning strategy of elaboration is strongly correlated with the strategy of organization ( $r=.524$ ,  $p<.001$ ). Elaboration is defined in the manual for the MSLQ as a way for learners to "store information into long-term memory by building internal connections between items to be learned. Elaboration strategies include paraphrasing, summarizing, creating analogies, and generative note-taking. These help the learner integrate and connect new information with prior knowledge" (Pintrich, Smith, Garcia & McKeachie, 1991, p. 20). Organization can help the student in positive ways to store and retain information, critical thinking uses the information stored to make decisions ( $r=.457$ ,  $p<.001$ ). The strongest correlation is between elaboration and that of metacognitive self-regulation ( $r=.603$ ,  $p<.001$ ). As mentioned previously the learning strategy of metacognitive self regulation is where the student plans activities or develops a study schedule, monitors progress toward completion, and finally regulates where they are in terms of goal attainment. Metacognitive self-regulation has a strong correlation with the subscales of rehearsal, elaboration, organization and critical thinking

( $r=.488, .603, .496, \& .479$  respectively). There is value in the use of these skills when a student is planning, monitoring and regulating his or her learning.

### **Hypothesis 1**

Students with an internal locus of control will more likely be successful on the ATI Comprehensive Predictor exam and on the NCLEX-RN than those with an external locus of control.

- a. Students with an internal ALOC will spend a greater percentage of study time preparing for the ATI Comprehensive Predictor and the NCLEX-RN.
- b. Students with an internal ALOC will be more likely to achieve Level II proficiency on the ATI Medical-Surgical Nursing Proctored Exam.

Based on what is known about LOC the first hypothesis held the belief that those with an internal LOC or a score of 13 or less would be more likely to pass the ATI Comprehensive Predictor and the NCLEX-RN. Individuals with an internal LOC do not leave things subject to chance or fate. They understand that their level of preparation will dramatically influence the final outcome (Rotter, 1966; Trice, 1985). Of the individuals with an external LOC ( $n=11$ ) 63.63% passed the NCLEX-RN ( $n=7$ ), four individuals with an external LOC failed the exam (36.3%). One student identified as having an external LOC did not have NCLEX-RN results and was not included in the percentages above. The individuals with an internal LOC ( $n=106$ ) 92.45% passed the NCLEX-RN ( $n=98$ ), eight individuals with an internal LOC failed the exam (7.55%).

Table 14

ATI Comprehensive Predictor Exam Means: Internal LOC

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0=External LOC; 1=Internal LOC  
Statistics

Variable	Internal_LOC	N	Mean	Std Dev
ATIcomp	0	12	72.25	7.1743
ATIcomp	1	106	74.36	6.3542
ATIcomp	Diff (1-2)		-2.117	6.4365
DF	t Value	Pr >  t		
116	-1.08	0.2825		

---

Individuals with an internal LOC had a higher ATI Comprehensive Predictor Exam score. Results in Table 14 show that those students with an internal LOC have a two point higher score but based on study results this is not significant statistically.

In order to further evaluate the hypothesis related to the ATI Comprehensive Predictor Exam a multiple regression analysis was conducted on all of the independent and demographic variables by entering each of the variables independently. The full regression table can be found in Appendix D, with those variables statistically significant reflected in Table 15. The variables from the MSLQ found to be statistically significant were self-efficacy and test anxiety, although they only explained a very small portion of the variability. In addition the independent variables of the number of Cs, pharmacology grade, pathophysiology grade, medical/surgical I and II grades were also significant. The pharmacology grade was able to explain 33% of the variability for the study group. The first medical/surgical course accounted for 32% of the variability when evaluated alone whereas the second medical surgical course only explained 18% of the variability.

Table 15

## Multiple Regression ATI Comprehensive Predictor Significant Variables

Variable	R-Square	F Value	Pr > F
SelfEfficacy	0.0549	6.68	0.0110
TestAnxiety	0.1034	13.26	0.0004
# of Cs	0.2671	41.92	<.0001
Pharm	0.3383	58.79	<.0001
Patho	0.2182	32.10	<.0001
MedSurg	0.3253	55.43	<.0001
TmedSurg	0.1808	25.37	<.0001

The next step taken was to complete a multiple regression analysis of the ATI Comprehensive Predictor Exam on all of the independent variables using a stepwise procedure. The variables of study hours and LOC were not included due to missing data, five students did not complete the ALOC tool and a total of only 35 study logs were returned. Using Cp and AIC statistical criteria a model was created that included seven variables (Table 16 and Appendix E). A few of the variables when used independently were not significant but were found to be significant after adjusting for other variables. This model was able to explain 54.6% of the variability in the ATI Comprehensive Predictor exam score (Appendix F shows full results).

Table 16

Multiple Regression of ATI Comprehensive Predictor on Best 7 variables by AIC

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R-Square = 0.5463

Variable	DF	tValue	Pr >  t
Intercept	1	18.77	<.0001
TestAnxiety	1	-2.47	0.0150
Organization	1	2.17	0.0317
SelfReg	1	-2.30	0.0233
Pharm	1	4.08	<.0001
MedSurg	1	2.68	0.0084
Job1	1	-1.79	0.0765
ATImedSurg	1	4.19	<.0001

---

All included variables are significant at the alpha .05 level with the exclusion of Job 1 which is significant at the .10 level. With a job not in healthcare (Job1) the parameter estimate is -2.278, indicating that when an individual has a job that is not related to healthcare their score is on average about 2.3 points lower when compared to those individuals with either no job or a healthcare related job. Adding the number of Cs to the above model was only able to explain an additional 0.8% of the variance and was not significant. When attempting to evaluate whether LOC was significant it did not appear in the model until nine other variables were added first. Based on study results, having an internal LOC did not statistically increase a student chance of passing the ATI Comprehensive Predictor Exam and hypothesis one is not supported.

When comparing ATI Comprehensive Predictor Exam scores to the RN Comprehensive Predictor 2007 Expectancy Table (ATI website) for those students identified as having an internal LOC, nineteen students passed that exam, with an 89-93% predicted probability of passing the NCLEX-RN. Sixteen students who passed were shown to have a 94-95% predicted probability of passing, and 46 successful on the exam had a 96% or higher predicted probability of passing the NCLEX-RN. The ATI Comprehensive Predictor Exam score considered passing for purposes of this study was chosen as 70.7% and above, as this equated to an 89-90% or higher predicted probability of passing NCLEX-RN. Using this score, 81 students out of 108 students were said to have passed the ATI Comprehensive Predictor Exam (75%). This is compared to seven of the twelve students with an external LOC who passed the ATI Comprehensive Predictor Exam score (58.33%).

To address the second part of hypothesis one that a student with an internal LOC is more likely to be successful on the NCLEX-RN, a logistic regression was run using only course related and personal variables, the variable internal LOC and ATI Comprehensive Predictor exam were significant. By looking at the odds ratio an individual with an internal LOC was 6.7 times more likely to pass the NCLEX-RN. In terms of the ATI Comprehensive Predictor exam, for each one point increase in the exam score, the student's odds of passing the NCLEX-RN increased 1.2 times (see Appendix J). These were significant statistically at the .05 level. In this model none of the other variables were statistically significant. Hypothesis one is true related to the NCLEX-RN exam, a student with an internal LOC is more likely to be successful on the NCLEX-RN.

Table 17 Multiple Logistic Regression Internal\_LOC & ATI Comprehensive Predictor Exam

Odds Ratio Estimate			
Effect	Point Estimate	95% Wald Confidence Limits	Pr >ChiSq
Internal_LOC	6.686	1.132 – 39.503	0.0360
ATIcomp	1.257	1.105 – 1.430	0.0005

When logistic regression was done including the MSLQ subscales the model containing the ATI Comprehensive Predictor Exam, internal LOC, Control of Learning Beliefs, and Organization was the best model. Initially the pharmacology course was also included in the model but it was not statistically significant and was removed (Appendix H & I).

The sub-hypothesis one (a) addresses the issue of study time as it relates to a student with an internal LOC and exam results. A total of 35 study logs were returned to the researcher in the mail. The logs varied in their level of completion. The hours listed ranged from .75 hours per week to a high of 21. Those students with an internal LOC studied on average 5.8 hours per week compared to 2.3 hours for the external LOC group. Based on the limited amount of data available it is not possible to determine if this hypothesis is true or false.

In response to the sub-hypothesis one (b) that students with an internal LOC will more likely be successful on the ATI Medical/Surgical Content Mastery Exam, this hypothesis was not supported (Table 18). According to ATI a passing score on this exam is considered to be Level II or III proficiency (ATI faculty resource guide, 2007). When looking at the data from this sample, of those with an external LOC, 50% of the sample of twelve students would be said to have passed this exam (n=6); the 106 students with an internal LOC demonstrated a 45.28% pass rate (n=48).

Table 18

ATI Medical/Surgical Proficiency Level 2 & Internal LOC

Internal_LOC Level2			
Frequency			Total
Percent			
Row Pct			
Col Pct	0	1	
0	6	6	12
	5.08	5.08	10.17
	50.00	50.00	
	9.38	11.11	
1	58	48	106
	49.15	40.68	89.83
	54.72	45.28	
	90.63	88.89	
Total	64	54	118
	54.24	45.76	100.00

**Hypothesis 2**

Students with a higher score on the Motivated Strategies for Learning Questionnaire (MSLQ) subscales will be more likely to be successful on the ATI comprehensive predictor exam and on the NCLEX-RN.

- a. Students with higher MSLQ subscale scores will utilize a higher percentage of study time for the ATI Comprehensive Predictor and the NCLEX-RN.
- b. Students with higher MSLQ subscale scores will be more likely to achieve Level II proficiency on the ATI Medical-Surgical Nursing Proctored Exam.
- c. Students with a higher score on the MSLQ test anxiety subscale will have a lower score on the ATI comprehensive predictor exam and will be at greater risk for failing the NCLEX-RN.

When the MSLQ subscales were investigated in terms of student performance on the NCLEX-RN a univariate analysis was conducted using logistic regression, with entering each variable in a separate model. (Complete results can be found in Appendix G, the independent variable significant at the .05 level or below are listed in table 19). When looking at the MSLQ subscale of Control of Learning Beliefs for each one point increase in his or her score the student's odds of passing NCLEX-RN are 2.136 times greater. In assessing the effect of the number of Cs in a separate model the odds of a student are only 75% as favorable to pass for each additional C the student receives, or in other words, for each decrease in a C, the student's odds of passing increase 2.49 times. The first medical/surgical grade provides a 4.87 times increase for each one letter grade improvement. In terms of the ATI Medical/Surgical Content Mastery Exam, a student with a level II proficiency has a 3.335 times better odds of passing NCLEX-RN than a student with a level one proficiency.

Table 19 Logistic Regression of NCLEX-RN (Significant Results)

Effect	Odds RatioEst	LowerCL	UpperCL	ProbChiSq
Internal_LOC	0.143	0.034	0.594	0.0074
Control Learning Belief	2.136	1.157	3.944	0.0153
Self Efficacy	2.106	1.064	4.168	0.0326
Test Anxiety	0.658	0.440	0.984	0.0415
# of Cs	0.751	0.620	0.910	0.0034
Pharm	3.434	1.438	8.202	0.0055
Patho	3.884	1.561	9.663	0.0035
MedSurg	4.871	1.736	13.665	0.0026
TMedSurg	3.021	1.242	7.347	0.0148
ATImedSurg	3.335	1.384	8.036	0.0073
ATIcomp	1.239	1.103	1.393	0.0003

The logistic regression of NCLEX-RN using a stepwise selection found the best model included the ATI Comprehensive Predictor, Internal LOC, Control for learning beliefs, Organization and pharmacology (Table 20). The pharmacology grade was not significant at the .05 level, and was removed from the model (see Appendix H and Appendix I). When using a logistic regression stepwise approach hypothesis two can be said to be true for control of learning beliefs and organization.

Table 20 Multiple Logistic Regression of NCLEX-RN Model

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Odds Ratio Estimates

Effect	Point	95% Wald		Pr > ChiSq
	Estimate	Confidence Limits		
ATIcomp	1.306	1.119	1.524	0.0009
Internal_LOC	9.209	1.279	66.303	0.0007
ConLBelief	2.867	1.184	6.942	0.0275
Organization	0.407	0.166	0.998	0.0494

---

Using this model a predicted probability of passing was created for each student. When using a cut-off score of .60 the predicted probability model showed that 41.67% of the students below the .60 level actually passed the exam while 94.90% above .60 passed the exam (Table 21). Of the 13 failures in the study sample, eight were correctly identified at risk when the predicted probability was less than .60.

Table 21

Predicted Probability of Passing, Cut-off Score 0.60

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Table of Pred Pass by NCLEX

PredPass	NCLEX (NCLEX)		
	0	1	Total
Frequency			
Percent			
Row Pct			
Col Pct			
-----+-----+-----+			
No	7	5	12
	6.36	4.55	10.91
	58.33	41.67	
	58.33	5.10	
-----+-----+-----+			
Yes	5	93	98
	4.55	84.55	89.09
	5.10	94.90	
	41.67	94.90	
-----+-----+-----+			
Total	12	98	110
	10.91	89.09	100.00

Frequency Missing = 22

---

In response to hypothesis two this can be said to be true related to the MSLQ and passing the NCLEX-RN when independently entering into a model the subscales of Control of Learning Beliefs, Self-Efficacy, and Test Anxiety. The MSLQ subscale of organization was statistical significant when entering independently into a model and when using a stepwise approach.

The sub-hypothesis two (a) stated that a student with higher scores on the MSLQ will utilize a higher percentage of study time in preparation for the ATI Comprehensive Predictor and NCLEX-RN exams. Again, a limited number of study logs were returned. As stated previously the hours reported ranged from .75 – 21 hours per week. Study hours per week and study time total were compared to the 15 subscales of the MSLQ, none of the correlations were significant statistically. Based on the correlation matrix the hypothesis is not true for this sample. Additional

research is needed, results for this study may have been different had a larger number of study logs been returned.

To determine whether or not hypothesis two (b) was true a logistic regression was conducted using each subscale to predict if Level II proficiency would be reached. The MSLQ subscales significant at the .05 level or below were Self-Efficacy, Test Anxiety, Rehearsal, Organization, and Peer Learning (See Table 22). When looking at the subscale Self-Efficacy as the student's score increases one point they are 2.3 times more likely to pass the ATI Medical/Surgical Exam, with Level II proficiency. A student's score related to test anxiety finds that for each one point increase the student's odds of passing are only 67% as good. Test anxiety has a negative effect on how a student perceives they will perform on an exam or a course (Pintrich, Smith, Garcia, & McKeachie, 1991). The means for the difference subscales of those passing the ATI Medical/Surgical Content Mastery Exam, with Level II proficiency and above, compared to those not passing show a very small difference. The hypothesis two (b) would be said to be true for the MSLQ subscales listed in Table 22.

Table 22

Logistic Regression, Level 2 Proficiency on MSLQ subscales

Effect	Odds Ratio Est	Lower CL	Upper CL	Prob ChiSq
Self-Efficacy	2.303	1.365	3.887	0.0018
Test Anxiety	0.677	0.533	0.860	0.0014
Rehearsal	0.601	0.438	0.825	0.0016
Organization	0.686	0.512	0.919	0.0115
Peer Learning	0.628	0.469	0.840	0.0017

In answering the hypothesis two (c) which states that a student with a higher test anxiety score on the MSLQ will have a lower score on the ATI Comprehensive Predictor exam, the first

step to answer this hypothesis was to complete a correlation matrix. Included in the matrix were the ATI score, the grades from four courses (Pathophysiology, Pharmacology, Medical/Surgical I & II), and test anxiety. Test anxiety was negatively correlated with everything except the number of Cs that a student had. This would seem true as someone with test anxiety may be more likely to obtain the letter grade of C in a course. The strongest negative correlation was between the ATI Comprehensive Predictor Exam and test anxiety ( $r = -.325, p < .001$ ). Results of the correlation matrix can be found in Appendix M. In addition, students who had test anxiety scores between 1.0 – 2.9 (low test anxiety) and 5.0 – 7.0 (high test anxiety) were reviewed based on their ATI Comprehensive Predictor Score and whether or not they passed the NCLEX-RN exam (Table 23). Of the 35 students at the lower end of test anxiety 30 students had a passing ATI

Table 23

Test Anxiety Scores Compared to ATI Predictor & NCLEX-RN

Test Anxiety	N	Fail ATI	Pass ATI	Fail NCLEX	Pass NCLEX
1.0 – 1.99	19	1	18	0	18
2.0 – 2.99	16	2	12	0	14
5.0 – 5.99	18	2	12	2	14
6.0 – 6.99	18	8	10	2	14

ATI Comprehensive Score: Failing < 70.6, Passing > 70.7

score (2 missing an ATI score) and 32 passed the NCLEX-RN (3 scores not available). Of the 36 students with a higher test anxiety score (5.0 and above) 22 passed the ATI (4 ATI scores missing) and 28 passed the NCLEX exam. This group also had four failures (two scores were not available). The data supports that hypothesis two (c) can be said to be true, students with higher

scores on the MSLQ test anxiety subscales are more likely to fail the ATI predictor and the NCLEX-RN.

### **Hypothesis 3**

Students who indicate using a higher percentage of study time will be successful on the ATI comprehensive predictor exam and the NCLEX-RN.

A total of 35 study logs were returned to the researcher via the mail. The logs ranged from having information for 1-4 weeks to being filled out from the start of the study until NCLEX completion. When looking at the information based on the data available students with an internal locus of control did report a higher number of hours per week devoted to studying. When doing a correlation neither study time per week or study hours total were significant statistically to either the ATI Comprehensive Predictor exam or NCLEX-RN. Based on the limited number of study logs returned, it would have to be stated that this hypothesis is not true.

### **Hypothesis 4**

Students who achieve a Level II proficiency (indicating mastery of the content) on the ATI Medical-Surgical Nursing Proctored Exam will be successful on the ATI Comprehensive Predictor and the NCLEX-RN.

In order to answer hypothesis four, an ANOVA of ATI Comprehensive Predictor and the ATI Medical/Surgical proficiency level was conducted  $F(3,118) = 17.48, p < .001$  (see Appendix L for full results). The ATI medical/surgical exam has four levels of proficiency (Below level 1, Level 1, Level II, & Level III), those at a Level II or III have mastery of the content (ATI Faculty Resource Guide, 2007). The pairwise comparison of the four levels after a Bonferroni adjustment for multiple comparisons found that except for the Level III to Level II all were significant statistically. When looking at the model a student who has a Level 2 is found to score on average

9.4 points higher on the ATI predictor than a student in the Below Level 1 category and 4.391 points higher than those at Level 1. The highest difference is seen for those at a Level 3 compared to the Below Level 1 group; in this group, on average there is a 13.383 point increase for those students scoring a Level 3. When looking at the means of those scoring at Level 2 or higher compared to those below Level 2, those above scored on average 6.087 points

Table 24

Pairwise Comparison ATI Medical/Surgical Content Mastery Exam

ATI med/surg Comparison	Difference between Means	95% Confidence Limits	
3 – 2	3.980	-1.062	9.022
3 – 1	8.372	3.424	13.319***
3 – 0	13.383	7.329	19.437***
2 – 1	4.391	1.480	7.302 ***
2 – 0	9.403	4.859	13.946***
1 – 0	5.012	0.573	9.450***

\*\*\*Statistically significant at the 0.05 level.

higher (mean of 71.507 compared to mean of 77.594). Further analysis of the ATI Medical/Surgical exam levels of proficiency compared to passing NCLEX demonstrated that of those students scoring Below Level 1 only 58.33% passed the NCLEX-RN. As the level of proficiency goes up so does the percent of students passing (Level 1, 90.2% passed; Level 2, 92.68% passed; and Level 3 100% passed). Hypothesis four can be said to be true, students scoring a Level 2 or above proficiency on the ATI Medical/Surgical Content Mastery Exam perform better on the ATI Comprehensive Predictor Exam.

When looking at the additional independent variables of course grades 100% of the students who received the letter grade of A in pathophysiology, as well as medical/surgical 1 and

2 passed NCLEX-RN, only 97.78% with an A in pharmacology passed NCLEX-RN. When looking at students who obtained a C in pharmacology only 75% passed the NCLEX-RN. Of those who earned a C in pathophysiology, 76.47% passed NCLEX-RN. When looking at age 100% of those individuals over the age of 30 passed the NCLEX-RN. Those in the first two age categories 18-23 years and 24-29 years had 87.50% and 88.24% pass rates (See Appendix K for Frequency tables).

### **Summary**

The sample consisted of 132 BSN students from four schools of nursing. A majority of the sample is female, Caucasian, under the age of 30 years. A total of 108 students (89.26%) passed the NCLEX-RN while 13 students (10.74%) failed. Data was unavailable for 11 students.

The ATI Comprehensive Predictor Exam and the NCLEX-RN were the study dependent variables. Three of the four schools participating utilized ATI products, students at the fourth school were asked to complete at no charge the ATI Online Practice Comprehensive Predictor Exam with no rationales as this is the exam closest to the proctored predictor. The decision to give the test as a non-proctored exam was made as the students were ready to begin their internship experience and would have limited time on campus. In retrospect, the exam should have been given proctored as none of the students chose to take the test (n=10).

The first hypothesis stated that students with an internal LOC would more likely to be successful on the ATI Comprehensive Predictor Exam and the NCLEX-RN. This hypothesis did not prove true related to the ATI exam. The sample only had twelve students classified as having an external LOC (score of 14 or higher). While individuals with an internal LOC had a higher mean on their ATI Comprehensive Predictor Exam the difference was not significant statistically.

The hypothesis related to internal LOC and NLCEX-RN was true. A student with internal LOC was 6.7 times more likely to pass NCLEX-RN. The ATI Comprehensive Predictor Exam also was predictive of a student passing the NCLEX-RN, for each one point increase in exam score, the student's odds of passing increased 1.2 times.

The sub-hypothesis (1a) looked at study time, internal LOC, and success on the two dependent variables. A limited number of study logs were returned making it difficult to evaluate the hypothesis. The small sample size (n=35) did show that individuals with an internal LOC did have more hours of study but this is not sufficient to answer this hypothesis.

The final sub-hypothesis (1b) related to internal LOC indicated that students with an internal LOC would be more successful on the ATI Medical/Surgical Content Mastery Exam. Success was defined as Level II proficiency. This hypothesis was also not supported. Individuals with an external LOC had a 50% pass rate compared to a 45.28% pass rate for those with internal LOC. Again the sample size was very small for those with external LOC. One school did not take this ATI exam (n=10).

The study's second hypothesis stated that students with higher scores on the MSLQ would be more likely to be successful on the ATI Comprehensive Predictor Exam and NCLEX-RN. The univariate analysis was conducted using logistic regression as the student either passes or fails the exam. This analysis found Control of Learning Beliefs, Self-Efficacy, and Test Anxiety statistically significant. After completing a stepwise approach the best model for predicting NCLEX-RN success was the one which included the ATI Comprehensive Predictor Exam, internal LOC, Control of Learning Beliefs, and Organization. Hypothesis two can be said to be true for the MSLQ subscales of Control of Learning Beliefs and Organization. A lower score on Test Anxiety would correspond to an increased probability of passing NCLEX-RN.

The sub-hypothesis (2a) stated that a student with increased MSLQ subscale scores would have a greater amount of study time. A correlation matrix was done between study hours per week and total time, none were significant statistically. For this sample the sub-hypothesis (2a) was not true. Based on the limited amount of study logs returned it is not possible to answer hypothesis three related to those who study more and a student's success or failure.

The sub-hypothesis (2b) stated that students with higher MSLQ scores will be more likely to achieve Level II proficiency on the ATI Medical/Surgical Content Mastery Exam. A logistic regression was done with each subscale individually. Those statistically significant were Self-Efficacy, Test Anxiety, Rehearsal, Organization, and Peer-Learning related to achieving Level II proficiency. This hypothesis can be said to be true for the sample and these five subscales.

Sub-hypothesis (2c) related to Test Anxiety is true. As the MSLQ Test Anxiety increased for an individual, the odds of passing decreased. Of the individuals with a Test Anxiety subscale score of 2.9 or less all were successful on the NCLEX-RN.

The ATI Medical/Surgical Content Mastery Exam was predictive of success on the ATI Comprehensive Predictor Exam, hypothesis four was true. A student scoring at Level II proficiency will score 9.4 points higher on the predictor exam than a person below Level I proficiency. As the student's level of proficiency increases, the likelihood of success increases.

## CHAPTER FIVE

### DISCUSSION, IMPLICATIONS AND CONCLUSIONS

#### **Introduction**

The two purposes of this study were to determine whether locus of control (LOC) was predictive of how a student would perform on the ATI Comprehensive Predictor Exam and the NCLEX-RN, and whether the Motivated Strategies for Learning Questionnaire (MSLQ) provided information that would help determine predictors of success on these two exams. The study examined additional variables prominent in the literature including but not limited to, the number of Cs a person earned while in nursing school, and grades in courses such as pharmacology, pathophysiology, and medical/surgical nursing. The influence of a job was also investigated. Information from this study will be discussed in terms of the relationship to previous literature, along with implications for future research.

#### **Predictors of Success**

Many studies found in the literature have looked at variables prior to a student entering a nursing program, within the nursing program, and at the end of the program (Alexander & Brophy, 1997; Daley et al., 2003; Seldomridge & DiBartolo, 2004; Stuenkel, 2002; Uyehara, Magnussen, Itano, & Zhang, 2007; Yin & Burger, 2003). One component included in many of these studies was that of GPA; GPA has been examined in terms of science grades, admission into the program, nursing course, and cumulative. Several studies found GPA to be predictive of a student's success (Beeman & Waterhouse, 2001; Haas, Nugent & Rule, 2004; Yin & Burger, 2003). Beeman & Waterhouse, (2001) in developing a predictive model using a discriminant analysis found a student with higher grades was more likely to be successful. Yin & Burger

(2003) in their predictive model found as the GPA increased, the chances of passing NCLEX-RN increased.

In terms of previous course work prior to entering a nursing program, grades obtained in science courses may have been of interest. The literature supports a student's performance in anatomy and physiology, as well as grades in biology being predictive of his or her likelihood of success on the NCLEX-RN (Higgins, 2005; Percoco, 2001; Yin & Burger, 2003). Schafer (2002) believed that the GPA from the first semester was predictive in terms of how a student would perform based on the fact that in the program used for her study, pathophysiology and pharmacology were included in this semester.

For purposes of this study only end of program variables were examined. A student entering into a school of nursing has to meet the same stringent standards of every other student in terms of admission GPA; consequently, GPA may no longer have a direct influence on a student's progression and success on any end of program testing. Participants in this study came from four schools of nursing within one state, with no restraints on where the student may have taken his or her prerequisites courses. The programs were also not standard in terms of prerequisites required, and as a result, GPA was not included. The influence of science course grades may be of interest in future research.

Several studies previously determined that the number of Cs a student earns while in nursing school has a direct influence on a student's likelihood of passing NCLEX-RN (Beeman & Waterhouse, 2001; Beeson & Kissling, 2001; Endres, 1997; Waterhouse & Beeman, 2003). Beeman & Waterhouse (2001) in their retrospective study of 538 students found the amount of Cs to be highly predictive of a student's probability of success on the NCLEX-RN. In addition, Waterhouse & Beeman (2003) also found the number of Cs had an influence on a student's

performance. Beeson & Kissling (2001) also determined the number of Cs to be predictive in their retrospective study with 505 students. In Beeson & Kissling's study the best model included a low number of Cs, a high GPA and a higher score on the Mosby Assess Test. Seldomridge & DiBartolo (2004) found that students with Cs in five or more classes had only a 50% chance of passing NCLEX-RN, and when students had no Cs they were 100% successful.

In this study the number of Cs a student had ranged from 0-11. Fifty percent of the sample had no Cs during his or her nursing course work, 13.6% had one C, and 12.1% had at least two Cs. A multiple regression model looking at the independent variable of the number of Cs related to predicting success on the ATI Comprehensive Predictor Exam, when entered by itself, was statistically significant ( $F(1, 117) = 41.92, p < .001$ ). The number of Cs was able to explain approximately 26% of the variability in the sample. Analysis determined that with a decrease in Cs the student was 2.49 times more likely to pass the NCLEX-RN. When entered into the stepwise model with the best 7 variables, the number of Cs was not found to be significant when added to the model related to the ATI Comprehensive Predictor Exam. Logistic regression with each variable entered independently found the number of Cs to be statistically significant. When entered using a stepwise technique, the number of Cs again, did not enter into the model.

A student's performance in a pathophysiology class was found to be significant in numerous studies found in the literature (Beeman & Waterhouse, 2001; Daley et al., 2003; Schafer, 2002; Seldomridge & DiBartolo, 2004). Beeman & Waterhouse (2001) found with their discriminant analysis that they were able to identify 94% of the students passing when looking at number of Cs, pathophysiology, and the foundational course. Seldomridge & DiBartolo demonstrated a strong relationship to success in their study ( $r = .377, p < .000$ ). Daley et al.,

(2003) found that students who had higher grades in pathophysiology had a greater percentage of success on the NCLEX-RN.

In this study, of the 13 students who had a grade of C in pathophysiology, only 76.47% were successful on the NCLEX-RN, and of those with the letter grade of B, 83.93% passed. Those students with an A in pathophysiology, had a 100% pass rate on the NCLEX-RN. When entered independently using regression analysis, both pathophysiology and pharmacology were statistically significant; yet, when using a stepwise approach, neither of the two courses entered into the model. In looking at the frequency table for pharmacology related to NCLEX-RN, only 75% of the students with a grade of C passed the exam. A student's grades in these two courses, pathophysiology and pharmacology, which are typically taught early within a nursing program, may be important in identifying students who are high risk (Schafer, 2002).

The medical/surgical class was found to be important related to a student's success on the NCLEX-RN in previous studies (Alexander & Brophy, 1997; Daley et al., 2003; Haas, Nugent & Rule, 2004; Jeffreys, 2007; Seldomridge & DiBartolo, 2004; Waterhouse & Beeman, 2003). Jeffreys (2007) found that when a student had a higher letter grade in the first medical/surgical class he or she was more likely to progress within the program and to be successful on the NCLEX-RN. Each school of nursing used for this study taught the medical/surgical content as two separate classes within two different semesters. Grades for students participating were obtained from the schools to ensure accuracy instead of relying on the student's self-report. The first medical/surgical class (referred to as MedSurg on statistical reports) demonstrated that for students in this study, as the letter grade increased so did the likelihood of passing the NCLEX-RN. This was also true for the ATI Comprehensive Predictor Exam. Of the students obtaining a letter grade of C in the first medical/surgical class, 70.59% passed the NCLEX-RN, of those with

a letter grade of B, 88.41% passed and if a letter grade of A, was obtained 100% passed NCLEX-RN. In terms of the second medical/surgical class (referred to as TMedSug on statistical reports) when a student received a letter grade of C, only 80.77% passed the NCLEX-RN. Using regression analysis, when entered independently, both medical/surgical courses were statistically significant related to passing the ATI Comprehensive Predictor Exam. However, the first class was able to explain 32.5% of the variability compared to the second course which only explained 18% of the variability. When looking at the best model with a stepwise approach related to the ATI Comprehensive Predictor Exam, the first medical/surgical class entered the model and when combined with the other variables (test anxiety, organization, self-regulation, pharmacology, ATI med/surg, and Job1) was able to account for 54.6% of the variability in the ATI Comprehensive Predictor Exam score. All of the variables were significant at the .05 level except for Job1 (a job not healthcare related) which was significant at the .1 level. When using a logistic regression to evaluate the NCLEX-RN both medical/surgical courses were statistically significant with the odds ratio for the first medical/surgical course being 4.871 compared to 3.021 for the second course. When using a stepwise approach neither class entered into the model. These two classes are extremely important as a large portion of the content on the NCLEX-RN is medical/surgical related (NCLEX-RN test blueprint).

The ATI Medical/Surgical Content Mastery Exam was highly predictive of how a student would perform on the NCLEX-RN. Study results showed that of the sample scoring at a below level 1 proficiency only 58.3% passed the NCLEX-RN. As the proficiency level increased so did the percentage of those students passing the NCLEX-RN (see Appendix K). When doing a pairwise comparison between Level 2 to below level 1, the student with a Level 2 proficiency scored 4.391 points more on the ATI Comprehensive Predictor Exam. Of the 13 students in the

sample who failed NCLEX-RN, ten of the students had a level 1 or below proficiency on the ATI Medical/Surgical Content Mastery Exam. When comparing means for the ATI Comprehensive Predictor Exam, as the level of proficiency increases on the ATI Medical/Surgical Exam the mean increased (below level 1 = 67.45; level 2 = 76.85). The ATI Medical/Surgical Content Mastery Exam when entered into the model explained 54.6% of the variability related to the ATI Comprehensive Predictor Exam. While the ATI Medical/Surgical exam is not entered into the logistic regression model for NCLEX-RN, the ATI Comprehensive Predictor Exam reflects the medical/surgical performance measure and influenced the predictor performance. It is extremely important that students master the medical/surgical content and prepare for the ATI medical/surgical exam. Additionally, it is imperative that a student complete remediation for content not mastered in this area prior to taking the NCLEX-RN.

As a way to improve student success on the NCLEX-RN many schools of nursing have required its students to take some type of predictive exam (ATI, HESI, Kaplan, NLN). These tests are similar to the NCLEX-RN test blueprint and provide the student and the school an indication of how the student would perform if he or she took the NCLEX-RN at that time (Davenport, 2007; Nibert, Young, & Britt, 2003; Spurlock, 2004). A number of studies have looked at a variety of these exams and assessed the predictability of each. The NLN Adult Health Care exams were found to be predictive of a student's success (Alexander & Brophy, 1997; Briscoe & Anema, 1999; Uyehara, Magnussen, Itano, & Zhang, 2007). Seldomridge & DiBartolo (2004) used the NLNCATBS in their study and found this test to have the highest relationship to predicting student success on the NCLEX-RN ( $r = .452, p < .000$ ). When evaluating the HESI Exit Exam (E2) there have been many studies demonstrating its ability to determine a student's probability of passing the NCLEX-RN (Lauchner, Newman, & Britt, 2005;

Nibert, Young, & Adamson, 2006; Nibert, Young, & Britt, 2003; Spector & Alexander, 2006). Lauchner, Newman & Britt (2005) determined that of the 2,613 students in their sample, irrespective of the program type, the HESI E2 given in a proctored format had a 99.49% predicted probability. Higgins (2005) found the higher the HESI E2 results the more likely the student was to pass the NCLEX-RN. Hardin (2005) in a logistic regression analysis with a sample of 229 nursing students found the model with admission GPA and HESI E2 to be the most predictive. This model correctly classified 92.6% of the students passing, but was only able to correctly identify four of the nineteen students who did not pass the NCLEX-RN. Sifford & McDaniel (2007) used the HESI E2 results given as a practice exam to help students identified as at-risk improve his or her chances of passing. Frith, Sewell, & Clark (2006) also used HESI E2 results in a review course that was added to the curriculum to help prepare for NCLEX-RN.

Of concern related to the assessment testing is the consequences attached to the exam results. Many programs have tied progression in the curriculum to results of assessment testing, in particular, the HESI E2 and/or the ATI Comprehensive Predictor Exam (Jacobs & Koehn, 2006; Jones & Bremner, 2008; Morrison, Free, & Newman, 2002; Spurlock 2006). Heroff (2009) discussed the need for remediation based on student performance and consequences attached to results, so that students see the value in preparation. Mosser, Williams & Wood (2006) discussed the use of student performance on ATI exams as a means to allowing retesting or progression; with remediation being a requirement to qualify for retesting. The existence of a progression policy was not a consideration for this study. Three programs utilized the ATI Comprehensive Predictor Exam as a predictor of the student's preparation for NCLEX-RN. The other program used the Kaplan Readiness Exam. The Kaplan results were not used in this study. In this study the ATI Comprehensive Predictor exam was highly predictive of how a student would do on the

NCLEX-RN exam. In the logistic regression model for NCLEX-RN, for each one point increase in the ATI Comprehensive Predictor Exam Score the student's odds of passing NCLEX-RN increased 1.2 times.

In evaluating the demographic variables the majority of the sample was female (89.4%). 100% of the male students taking the NCLEX-RN passed the exam compared to 88.29% of the females. When looking at age, students were not asked to report a specific age, and instead identified a range for his or her age. The students reporting ages in the categories at the age of 30 or above had a 100% pass rate on the NCLEX-RN, compared to 87.50% in the 18-23 years category and 88.24%, in the 24-29 years category. Several studies support the findings that the non-traditional student has greater success than the traditional student (Beeson & Kissling, 2001; Briscoe & Anema, 1999; Daley et al., 2003). In ethnic groupings 92.4% of the sample reported being White, with the remaining 7.6% reporting other ethnic groups. The 13 students in this study who failed all had reported themselves in the White ethnic category. Of additional interest was the relationship a student's job had to his or her test performance. In terms of the ATI Comprehensive Predictor Exam, a typical person with a job that is not healthcare related had a score 2.3 points lower than the student who had a job that was healthcare related or had no job.

### **Locus of Control**

LOC has been linked to student academics in terms of performance (Neill, 2006; Rotter, 1966; Trice, 1985). A student who has an internal LOC has been believed to take more initiative and interest related to his or her preparation and performance in a class. This student understands that the amount of effort put into a class will influence the outcome, whereas, an individual with an external LOC may leave performance to chance or belief that the poor grade he or she earned

is due to extrinsic factors rather than his or her responsibility (Carden, Bryant, & Moss, 2004; Eksterowicz, 1999; Rotter, 1966; Trice, 1985).

Hulse et al., (2007) found that when a person believes he or she has control over the end result the individual is more likely to value his or her talents and continue to develop them while not allowing outside forces to distract from the final outcome. Using the ALOC scale, procrastination was found to be decreased for those with an internal LOC (Carden, Bryant, & Moss, 2004; Janssen & Carton, 1999; Trice & Milton, 1987). Absenteeism was also determined to be less for those with an internal LOC (Trice & Hackburt, 1989). Use of study skills was found to be greater for those with an internal LOC (Landis, Altman, & Gavin, 2007; Onwuegbuzie & Daley, 1998). LOC does not always translate to other cultures, as Ibrahim (1996) found when studying Omani students. Because of the parental influence over females in this culture, women reported an external LOC score more frequently. Consequently, ethnicity may need to be examined when looking at LOC.

In terms of nursing students, Dufault (1985) believed that a nurse needed an internal LOC. Characteristics she identified that were important to nursing were that of being a personal motivator, team member, an agent of change, and critical thinker, who assumes responsibility for his or her actions. The characteristics mentioned are believed to be those of a person with an internal LOC, and in order to ensure nursing students developed these skills Dufault developed a course to assist students in gaining these skills. In comparing a pre-class Rotter's I-E scale score to a post-class score, scores improved toward the internal direction for students completing the course. Wood, Saylor, & Cohen (2009) found when studying nursing students that internal LOC translated to greater scholastic performance. LOC in this study was evaluated in hypothesis one, and results were evaluated using a correlation matrix and regression analysis.

The first hypothesis looked at the effect of LOC, with the hypothesis stating that an individual with an internal LOC will be more likely to be successful on the ATI Comprehensive Predictor Exam and on the NCLEX-RN than those with an external LOC. In terms of the internal LOC and its implications relative solely to the ATI Comprehensive Predictor exam, this hypothesis was not true. When entered on its own into the model, LOC was not significant statistically ( $p=.32$ ). When attempting to enter LOC in the model in a stepwise regression analysis, LOC did not enter into the model until nine other variables were entered, and as such was not significant relative to the ATI Comprehensive Predictor Exam. The second part of hypothesis one was true in relationship to internal LOC and the NCLEX-RN. When entered into the logistic regression model independently, internal LOC (score of 13 or less on the ALOC scale) was statistically significant, as a person with an internal LOC is seven times more likely to pass the NCLEX-RN. When looking at the model created using a logistic stepwise regression analysis (ATI Comprehensive, internal LOC, Control of Learning Belief, and Organization), an individual with an internal LOC is 9.2 times more likely to pass NCLEX-RN. When looking at the model that included only internal LOC and the ATI Comprehensive Predictor Exam (this is the best model when not including MSLQ subscales) a person with an internal LOC is 6.7 times more likely to pass NCLEX-RN. This model also supports that the ATI Comprehensive Predictor exam, after adjusting for LOC is a significant predictor of passing NCLEX-RN (Appendix J). This sample had only 12 students identified as having an external LOC after completing the ALOC scale (Trice, 1985). NCLEX-RN results were only available for 11 of the external LOC students; of those students four failed NCLEX-RN.

When looking at the sub-hypothesis 1 (a) which stated that students with an internal LOC will spend a greater percentage of study time preparing for the ATI Comprehensive Predictor

Exam and the NCLEX-RN, very few study logs were actually returned to the researcher making it difficult to determine whether the hypothesis is true or not. Students with an internal LOC did report a slightly greater number of hours per week studying and had more total study hours reported. When looking at study time per week and total study time neither were significant statistically in a correlation matrix with LOC. According to the literature, better study skills, less procrastination, decreased absenteeism, and early completion of assignments was prevalent (, Bryant, & Moss, 2004; Landis, Altman, & Gavin, 2007; Onwuegbuzie & Daley, 1998; Trice, 1985; Trice & Milton, 1987). Based on the information available this sub-hypothesis is said to be not true; however, based on the literature had more external LOC results been available results for this study may have been different.

The sub-hypothesis 1 (b) stated that students with an internal LOC will be more likely to achieve Level two proficiency on the ATI Medical/Surgical Content Mastery Exam. This sub-hypothesis was not true. In this sample, 50% of the individuals with an external LOC (n=6) passed the ATI Medical/Surgical Content Mastery Exam while only 45.28% (n=48) of those with an internal LOC passed the exam at the Level two proficiency (Appendix K). Since the number of students participating in this study that were identified as having an external LOC was very small, a sample with a larger number of students with an external LOC may demonstrate entirely different results.

### **Motivated Strategies for Learning Questionnaire**

The MSLQ was developed to provide students and educators a means to assess motivation and learning strategies related to a specific course. The questionnaire contains 81 items that are divided into fifteen subscales with six subscales focusing on motivation and nine subscales centering on the use of learning strategies. As a student enters college, he or she may

need additional assistance, to determine what learning skills are needed to flourish in the classroom. Pintrich and Johnson (1990) believed that students could learn to adjust the strategies utilized for each course. Pintrich (2004) believed that a person must be an active participant in his or her learning, should be a self-motivator, and be in control of his or her learning. In addition, the student should strive to accomplish identified goals, and adjust his or her learning strategies as necessary. The influence of motivation was a key element to Pintrich's assumptions. Zimmerman (1999) made a key point that while an individual may know about learning strategies, the actual utilization of those strategies may not always be connected to the situation. This statement supports Pintrich and Johnson's (1990) statements that students can be taught to adapt his or her use of learning strategies to different situations.

When evaluating the correlations between the different subscales of the MSLQ based on the study sample, a number of statistically significant correlations were found. Students were asked to complete the MSLQ as if preparation for the ATI Comprehensive Predictor Exam and the NCLEX-RN were the course referred to. The students identified that this information was stressed as part of an end of program or capstone course. A very strong correlation existed between the subscales of intrinsic goal orientation (mean = 5.3825, SD = .7908) and task value (mean=5.8641, SD = .9056) ( $r = .596, p < .001$ ). A student places a strong value on gaining knowledge necessary to achieve the personal goal of passing the ATI exam and the NCLEX-RN. A key component is that the student sees value in assignments given to help the student prepare for these exams. In addition, the motivation subscales of control of learning belief and self-efficacy show positive correlations ( $r = .351$  and  $r = .370$  respectively,  $p < .001$ ) with intrinsic goal orientation. The student's belief that being engaged in the course or the material will make a difference in achieving desired goals and he or she has the ability to finish the job with a positive

outcome. The learning strategy with the highest correlation to intrinsic goal orientation was elaboration ( $r = .492, p < .001$ ). Elaboration helps the student link previously learned knowledge (Pintrich, Smith, Garcia & McKeachie, 1991). A student preparing for the ATI exams and the NCLEX-RN must be able to pull together previously learned information and utilize critical thinking skills ( $r = .368, p < .001$ ). Palmer (2008) found intrinsic goal orientation and self-efficacy to be linked to what a student learned and the grade earned in the class.

The learning strategy subscale of rehearsal showed statistically significant correlations with the subscales of elaboration, organization, self-regulation, metacognitive skills, peer learning, critical thinking, time & study environment, and help seeking (see Appendix C). Rehearsal is a simple learning strategy that involves practicing learning information by repeating or listing. Based on the positive correlations there is value in using this strategy along with the additional strategies listed above.

The strongest correlation for the sample was between the learning strategies of elaboration and metacognitive self-regulation ( $r = .603, p < .001$ ). Metacognitive self-regulation involves the student planning what needs to be accomplished, setting goals, then monitoring the status of accomplishing the goal and regulating activities necessary to accomplish the goals. These activities, along with the strategy of organization (where the learner is establishing connections) ensure that the student can be successful in accomplishing the intended goal. Developing an understanding of the student's identified use of learning strategies can help the educator to draw on the student's strengths and assist the student to incorporate additional learning strategies not used previously.

The second hypothesis stated that students with a higher score on the Motivated Strategies for Learning Questionnaire (MSLQ) subscales will be more likely to be successful on

the ATI Comprehensive Predictor Exam and on the NCLEX-RN. When looking at the MSLQ subscales related to the ATI Comprehensive Predictor Exam when entered independently, Self-Efficacy and Test Anxiety were the only two subscales that were significant statistically at the .05 level. When entered using stepwise selection, the subscales of test anxiety, organization and self-regulation helped to explain 54.6% of the variability in the ATI Comprehensive Predictor exam score. This hypothesis could be said to be true for these three subscales as it relates to the ATI exam.

When looking at the MSLQ subscales and the NCLEX-RN, when doing a univariate logistic regression, the subscales of control of learning beliefs, self-efficacy, and test anxiety were statistically significant at the .05 level. When using a logistic regression, stepwise selection, the subscales of control of learning beliefs and organization were found significant in the model. The hypothesis could be said to be true to these two subscales. An awareness by the nurse educators of the four nursing programs utilized in this study that the MSLQ subscales of test anxiety, organization, self-regulation, and control of learning beliefs are related to a student's success on the ATI Comprehensive Predictor Exam and the NCLEX-RN should assist a student in developing these skills. Organization was involved in the models for both exams.

Isaacson (2005) discussed the challenging situation that many educators have faced, of how to help a student learn to monitor his or her understanding of the content covered. If the student does not have a full appreciation of what he or she does not know it becomes even more difficult for the student to know what learning strategies to use. Often in this situation, the teacher is blamed by the learner. Isaacson acknowledged that most students are extrinsically motivated by the grade instead of valuing the content covered. Isaacson in his course gave students a number of academic choices so that they could use strategies that best fit them. A

major lesson within the course is for a student to reflect on his or her use of learning strategies and determine what they do know, which is referred to as “metacognitive knowledge monitoring” (p. 31). Isaacson states “every facet of the course ‘holds up a mirror’ for a student to assess the impact of their study strategies and metacognition on their learning as measured by a test grade” (p. 31). While a student was not provided with his or her subscale scores as part of this study, a recommendation for the future would be to provide the student with his or her scores along with recommended strategies for improvement (Duncan & McKeachie, 2005; Garcia & Pintrich, 1995; Pintrich, Smith, Garcia & McKeachie, 1991)

In answering sub-hypothesis 2 (a) that students with higher MSLQ subscales will have a higher percentage of study time, the hypothesis was found to be not true. Study time per week and study time total were compared to the fifteen subscales of the MSLQ in a correlation matrix. None of the correlations were found to be statistically significant. Again, a low number of study logs returned provided limited data to evaluate this sub-hypothesis.

To answer sub-hypothesis 2 (b), that students with higher MSLQ subscale scores will be more likely to achieve Level two proficiency on the ATI Medical/Surgical Content Mastery Exam, a logistic regression of Level two proficiency on each MSLQ subscale entered separately was completed. The subscales of self-efficacy, test anxiety, rehearsal, organization, and peer learning were statistically significant at the .05 level (see Table 22). The mean difference between the subscales of those at Level two or below Level two was very small. Sub-hypothesis 2 (b) can be said to be true for the subscales listed in Table 22.

Sub-hypothesis 2 (c) states that students with a higher score on the MSLQ test anxiety subscale will have a lower score on the ATI Comprehensive Predictor Exam and will be at greater risk for failing the NCLEX-RN. To answer this question, initially a correlation matrix

was done, which showed a strong negative correlation between the ATI Comprehensive Predictor Exam and test anxiety ( $r = -.325, p < .001$ ). Low scores for the MSLQ subscale (1.00 – 2.9) were examined as well as high scores (5.0 – 7.0). Of the 35 students who were at the low end of the test anxiety subscale (less anxiety) 30 students passed the ATI exam and 32 passed the NCLEX-RN, three students did not have NCLEX-RN results available, and no students in this group failed the NCLEX-RN. When looking at the 36 students at the high end of the test anxiety subscale (high anxiety), 10 students failed the ATI exam and four failed the NCLEX-RN (see Table 23). Sub-hypothesis 2 (c) can be said to be true for this sample. These results are found to be consistent with Arathuzik & Aber (1998) where they found the lower the test anxiety, the greater the success on the NCLEX-RN. Palmer (2008) also found lower test anxiety scores for those students in the passing group. McGann & Thompson (2008) worked with students on issues of test anxiety, test-taking strategies, and use of study time in a class designed to help students at risk. Students at the end of the course had a .44 increase in their GPA and had an 87% pass rate on the NCLEX-RN. It is critically important to identify students who have issues related to test anxiety so interventions can be implemented early within the nursing program.

Pintrich (2004) provides a framework for students and educators to utilize related to self-regulated learning (see Table 2). It is important to use cognition to identify goals, assess previous knowledge, monitor thinking and use of strategies, and then reflect on progress. Motivation plays an integral role in developing and attaining goals; again, it is key for the student to monitor progress toward goal achievement. The other area of self-regulation refers to the student's actual behavior. Did the student develop a plan and actually invest the time into following through with the plan? Persistence, asking for help of faculty and peers, and monitoring the amount of effort

put into an activity or assignment are important behaviors. Pintrich's framework becomes a valuable tool for assisting students in achieving their goals.

### **Hypotheses 3 & 4**

The third hypothesis dealt with study time, stating that students who indicate a higher percentage of study time will be successful on the ATI Comprehensive Predictor Exam and the NCLEX-RN. This hypothesis was found to not be true based on the correlation matrix completed and the limited amount of study logs returned (n=35). Recommendations would be to have the students complete their log online, for example on Survey Monkey, on a weekly basis with an email reminder sent weekly. Additional information related to study time and materials used may prove beneficial in helping faculty determine how best to help students prepare for these two exams. McKeachie, Pintrich, & Lin (1985) found in their "Learning to Learn" course, that a decrease in test anxiety along with improved use of strategies for test-taking were correlated to an increased GPA.

The fourth hypothesis stated that students who achieve Level two proficiency on the ATI Medical/Surgical Content Mastery Proctored Exam will be successful on the ATI Comprehensive Predictor Exam and the NCLEX-RN. This hypothesis was found to be true for this sample. An ANOVA of the ATI Comprehensive and the ATI Medical/Surgical Exams found that a student with Level two proficiency will score 4.391 points higher on the ATI Comprehensive Predictor Exam. The mean for the Level 2 and higher group was 6.087 points higher than those below Level 2 proficiency (see Table 24). Assessing mastery of content knowledge throughout the program allows the students to address weaknesses prior to taking the comprehensive exam. A key component of assessment is that the student remediates on the content areas where he or she did not demonstrate mastery (Heroff, 2009; Hostein, Zangrilli, &

Taboas, 2006). Mosser, Williams, & Wood (2006) found when comparing two programs that student performances on the ATI content exams was used to determine progression. One of the schools found that when scoring below the 20<sup>th</sup> percentile on the medical/surgical exam those students did not pass the NCLEX-RN. Remediation was recommended at a pre-determined score (Jacobs & Koehn, 2006).

### **Implications for Future Research**

The study of LOC provided information related to the likelihood of a student's success on the NCLEX-RN. Additional research related to LOC should be encouraged, as the sample from the current study was found to predominantly have an internal LOC; whether different results would be obtained with a sample that had a higher number of students with an external locus of control is unknown. LOC was found to not be predictive of how a student performed on the ATI Comprehensive Predictor and the ATI Medical/Surgical Content Mastery Exam. LOC may be of importance in early courses within a nursing program and may be significant in terms of predicting student success on other ATI content mastery exams. An internal LOC was highly predictive of how a student would do on the NCLEX-RN.

A strong emphasis in determining a predictor of success is student performance in a nursing foundations or fundamental course (Beeman & Waterhouse, 2001; Jeffreys, 2007; Tipton et al., 2005; Uyhara, Magnussen, Itano, & Zhang, 2007). Assessment of LOC using the ALOC scale and MSLQ would provide faculty with valuable information that could identify students at-risk for early intervention. Jeffreys (2007) stressed the need for students to start with a strong foundation in nursing in terms of how a student progresses through a program and is successful on the NCLEX-RN. In addition, studying the student's ATI TEAS scores in relationship to how the student does in not only the foundations course but also all courses within the first semester

may provide valuable information in terms of identifying students at-risk (Ukpabi, 2008).

Worthy of further study also includes whether the fundamental course, the ATI TEAS, or any of the other ATI Content Mastery Exams are predictive of a student's performance on the ATI Comprehensive Predictor Exam and the NCLEX-RN (Mosser, Williams, & Wood, 2006; Ukpabi, 2008).

The role of consequences, remediation, and progression in relationship to assessment testing may be of key interest. Programs of nursing are under constant scrutiny related to NCLEX-RN pass rates (Aucion & Treas, 2005). An important question to ask would be whether there is a correlation between a student's performance on an assessment test when there are (or are not) consequences involved. What are the test results being used for? In this study, consequences, remediation and progression were not considered related to a student's ATI scores. If remediation is required, what methods are faculty members using, and how is completion evaluated. The benefit to assessment testing is that it provides the student a snapshot of his or her knowledge at that point in time. The test has no value if the student does not take the information and strengthen identified weaknesses.

Additional study is warranted related to the influence of non-academic variables on a student's success. Many educators will agree with the surprise in certain students failing the exam when, from an academic standpoint, there are no indications that the student would be anything but successful (Arathuzik & Aber, 1998; Briscoe & Anema, 1999; Engelmann, 2002; Hopkins, 2008). What non-academic variables place a student at risk and how, can a student be helped to be successful are questions that might be better answered with further study. The use of the MSLQ may also help identify factors that place students at risk.

Of additional interest would be the affect of a previous degree on a student's success. The belief would be that with a previous degree the student would have learned to manage his or her time and developed study skills and habits. This issue becomes important as a number of accelerated nursing programs have been created to deal with the nursing shortage and provide individuals with previous education to enter the workforce more quickly.

### **Limitations**

Limitations to the study included the issue of four different nursing programs being used with four different curriculums. The reason for using more than one school was to increase the ability to generalize results. All data was analyzed in aggregate form. Common core courses were chosen and issues found in all programs such as number of Cs, age, sex, gender, and ethnicity were chosen as independent variables. The choice of independent variables was supported by the literature. All students were given the same instruments to complete with the same set of instructions given by the researcher. What cannot be accounted for is the semester in the particular program's curriculum a specific course was taught. A course taken in the second semester in one school provides the student with additional knowledge a student taking the same course in the first semester may not have. Another uncertainty is that content of the two medical/surgical courses may have been different for the four schools. Most schools when questioned had an older adult focus in one medical/surgical course with the other course dealing with acute care or critical care issues. All schools were located in the Midwest within one state. Results may have been different had students from other states or parts of the country been utilized.

The sample had very few men and was not ethnically diverse. Increased diversity in the sample may have altered the findings. In trying to determine the effect of English as a second

language the question on the demographic data form was misleading; consequently, students who might have identified English as not their primary language did not mark the form correctly. Only three students indicated that English was not their primary language.

A majority of the sample came from two of the schools. The third school had a very small number of graduating seniors and the fourth school had a large number of students that chose not to participate in the study (this was the school visited during the tenth week of the semester). Obtaining NCLEX results for students was also difficult. Schools of nursing must rely on a student's self-report to know if they tested and failed. Many times a student failing will not contact their school due to the embarrassment and frustration of failure. The KSBN sends a report identifying all students testing from a school to the Deans of the program, but this report was not available prior to the time the researcher stopped taking results. If NCLEX-RN results were not known, that information was reported as missing in the data set. Of interest, several students who chose not to participate in the study from different schools did not pass the NCLEX-RN, but those failures could not be included in the analysis.

The ATI assessment testing exams were used for purposes of this study, three of the four schools who participated in the study used the ATI product. ATI made a similar exam available to the ten participating students at the school not using its product for no cost, but since there were no consequences to the students, none of the ten students chose to complete the exam. These students had previously completed another assessment company's assessment exam and were required to take a review course. Each school was different in terms of remediation requirements and progression issues. For each of the ATI exams only the results from the first test were used to eliminate any implications of some schools allowing multiple testing options.

Another limitation is the small number of questions on the MSLQ related to test anxiety. Would an instrument designed to specifically examine test anxiety have provided more information related to a student's risk of failure on the two exams due to test anxiety? It is unknown if those students failing the NCLEX-RN would have self-reported an issue with test anxiety. While the study did show that test anxiety influences a student's performance on the ATI Comprehensive Predictor Exam and the NCLEX-RN, more specific information may provide faculty a means to provide early intervention for those identified as at risk. This may be an area that would have benefitted from a qualitative approach instead of a quantitative approach.

Lastly, the study only looked at the non-academic variable of a job and the number of hours worked. Individuals with a job that was not healthcare related were found to score 2.3 points lower on the ATI Comprehensive Predictor Exam. This information demonstrated that a student does better when either having no job or a job that is healthcare related, instead of a job that is not healthcare related. Other non-academic variables such as family stressors, financial stressors or health stressors may be significant when determining a student's predicted probability of success. These additional stressors were not evaluated in this study.

## **Conclusion**

LOC provides valuable information related to a student's likelihood of success on the NCLEX-RN. When an internal LOC, ATI Comprehensive Predictor Exam score, MSLQ subscales of control of learning beliefs and organization were included in a model a predicted probability of passing NCLEX-RN was created for each student. When using a cut-off score of .60 predicted probability the model was able to correctly identify 94.9% of those students

passing the NCLEX-RN. 41.67% of those students with a predicted probability of passing less than .60 actually passed the exam.

When a student demonstrated Level two proficiency on the ATI Medical/Surgical Content Mastery Exam he or she was likely to score higher on the ATI Comprehensive Predictor Exam. Those at the Level two proficiency had a mean 6.087 points higher than those individuals below Level two. This test influences the ATI Comprehensive Predictor Exam results, and consequently, the NCLEX-RN results as the predictor is included in the predicted probability model. There is a strong need for students to understand the effects of not preparing for either of these exams, and after the ATI exam not completing the remediation. When a weakness has been identified, those areas should be remediated to ensure improved performance on the next exam.

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## APPENDIX A

Trice, A. D. (1985). An academic locus of control scale for college students. *Perceptual and Motor Skills, 61*, p. 1045.

### Academic Locus of Control Scale

1. College grades most often reflect the effort you put into classes (F)
2. I came to college because it was expected of me. (T)
3. I have largely determined my own career goals. (F)
4. Some people have a knack for writing, while others will never write well no matter how hard they try. (T)
5. I have taken a course because it was an easy good grade at least once. (T)
6. Professors sometimes make an early impression of you and then no matter what you do, you cannot change that impression. (T)
7. There are some subjects in which I could never do well. (T)
8. Some students, such as student leaders and athletes, get free rides in college classes. (T)
9. I sometimes feel that there is nothing I can do to improve my situation. (T)
10. I never feel really hopeless—there is always something I can do to improve my situation. (F)
11. I would never allow social activities to affect my studies. (F)
12. There are many more important things for me than getting good grades. (T)
13. Studying every day is important. (F)
14. For some courses it is not important to go to class. (T)
15. I consider myself highly motivated to achieve success in life. (F)
16. I am a good writer. (F)
17. Doing work on time is always important to me. (F)
18. What I learn is more determined by college and course requirements than by what I want to learn. (T)
19. I have been known to spend a lot of time making decisions which others do not take seriously. (F)
20. I am easily distracted. (T)
21. I can be easily talked out of studying. (T)
22. I get depressed sometimes and then there is no way I can accomplish what I know I should be doing. (T)
23. Things will probably go wrong for me some time in the near future. (T)
24. I keep changing my mind about my career goals. (T)
25. I feel I will someday make a real contribution to the world if I work hard at it. (F)
26. There has been at least one instance in school where social activity impaired my academic performance. (T)
27. I would like to graduate from college, but there are more important things in my life. (T)
28. I plan well and I stick to my plans. (F)

## APPENDIX B

Motivated Strategies for Learning Questionnaire retrieved from: Artino, A.R. (2005) Review of the motivated strategies for learning questionnaire. Retrieved from Google scholar.

### MSLQ Item List

The following is a list of items that make up the MSLQ (from Pintrich et al., 1991).

#### Part A. Motivation

The following questions ask about your motivation for and attitudes about this class. Remember, there are no right or wrong answers, just answer as accurately as possible. Use the scale below to answer the questions. If you think the statement is very true of you, circle 7. If a statement is not at all true of you, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

<i>Not at all true of me</i>							<i>Very True of me</i>
1	2	3	4	5	6	7	

1. In a class like this, I prefer course material that really challenges me so I can learn new things.
2. If I study in appropriate ways, then I will be able to learn the material in this course.
3. When I take a test I think about how poorly I am doing compared with other students.
4. I think I will be able to use what I learn in this course in other courses.
5. I believe I will receive an excellent grade in this class.
6. I'm certain I can understand the most difficult material presented in the readings for this course.
7. Getting a good grade in this class is the most satisfying thing for me right now.
8. When I take a test I think about items on other parts of the test I can't answer.
9. It is my own fault if I don't learn the material in this course.
10. It is important for me to learn the course material in this class.

11. The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade,
12. I'm confident I can learn the basic concepts taught in this course.
13. If I can, I want to get better grades in this class than most of the other students,
14. When I take tests I think of the consequences of failing.
15. I'm confident I can understand the most complex material presented by the instructor in this course.
16. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.
17. I am very interested in the content area of this course.
18. If I try hard enough, then I will understand the course material.
19. I have an uneasy, upset feeling when I take an exam.
20. I'm confident I can do an excellent job on the assignments and tests in this course.
21. I expect to do well in this class.
22. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible,
23. I think the course material in this class is useful for me to learn.
24. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.
25. If I don't understand the course material, it is because I didn't try hard enough.
26. I like the subject matter of this course.
27. Understanding the subject matter of this course is very important to me.
28. I feel my heart beating fast when I take an exam.
29. I'm certain I can master the skills being taught in this class.
30. I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.

31. Considering the difficulty of this course, the teacher, and my skills, I think I will do well **in** this class.

### **Part B. Learning Strategies**

The following questions ask about your learning strategies and study skills for this class. Again, there are no right or wrong answers. Answer the questions about how you study in this class as accurately as possible. Use the same scale to answer the remaining questions. If you think the statement is very true of you, circle 7, if a statement IS not at all true of you, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

*Not at all  
true of me*

*Very true  
of me*

1            2            3            4            5            6            7

32. When I study the readings for this course, I outline the material to help me organize my thoughts.

33. During class time I often miss important points because I'm thinking of other things, (reverse coded)

34. When studying for this course, I often try to explain the material to a classmate or friend.

35. I usually study in a place where I can concentrate on my course work.

36. When reading for this course, I make up questions to help focus my reading.

37. I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do. (reverse coded)

38. I often find myself questioning things I hear or read in this course to decide if I find them convincing.

39. When I study for this class, I practice saying the material to myself over and over.

40. Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone. (reverse coded)

41. When I become confused about something I'm reading for this class, I go back and try to figure it out.

42. When I study' for this course, I go through the readings and my class notes and try to find the most important ideas.
43. I make good use of my study time for this course.
44. If course readings are difficult to understand, I change the way I read the material.
45. I try to work with other students from this class to complete the course assignments.
46. When studying for this course, I read my class notes and the course readings over and over again.
47. When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.
48. I work hard to do well in this class even I don't like what we are doing.
49. I make simple charts, diagrams, or tables to help me organize course material
50. When studying for this course, I often set aside time to discuss course material with a group of students from the class.
51. I treat the course material as a starting point and try to develop my own ideas about it.
52. I find it hard to stick to a study schedule. (reverse coded)
53. When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions.
54. Before I study new course material thoroughly, I often skim it to see it is organized.
55. I ask myself questions to make sure I understand the material I have been studying in this class.
56. I try to change the way I study in order to fit the course requirements and the instructor's teaching style.
57. I often find that I have been reading for this class but don't know what it was all about. (reverse coded)
58. I ask the instructor to clarify concepts I don't understand well.
59. I memorize key words to remind me of important concepts in this class.
60. When course work is difficult, I either give up or only study the easy parts. (reverse coded)

61. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.
62. I try to relate ideas in this subject to those in other courses whenever possible.
63. When I study for this course, I go over my class notes and make an outline of important concepts.
64. When reading for this class, I try to relate the material to what I already know.
65. I have a regular place set aside for studying.
66. I try to play around with ideas of my own related to what I am learning in this course.
67. When I study for this course, I write brief summaries of the main ideas from the readings and my class notes.
68. When I can't understand the material in this course, I ask another student in this class for help.
69. I try to understand the material in this class by making connections between the readings and the concepts from the lectures.
70. I make sure that I keep up with the weekly readings and assignments for this course.
71. Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives.
72. I make lists of important items for this course and memorize the lists.
73. I attend this class regularly.
74. Even when course materials are dull and uninteresting, I manage to keep working until I finish.
75. I try to identify students in this class whom I can ask for help if necessary.
76. When studying for this course I try to determine which concepts I don't understand well.
77. I often find that I don't spend very much time on this course because of other activities.  
(reverse coded)
78. When I study for this class, I set goals for myself in order to direct my activities in each study period.
79. If I get confused taking notes in class, I make sure I sort it out afterwards.

80. I rarely find time to review my notes or readings before an exam. (reverse coded)

81. I try to apply ideas from course readings in other class activities such as lecture and discussion.

APPENDIX C – Correlation Matrix ALOC & MSLQ Scales

	LOC	Intrinsic	Extrinsic	Tvalue	ConLBelief	SelfEfficacy	TestAnx	Rehearsal	Elaboration	Organ	Cthinking	SelfReg	Time&St	EffortR	PeerL	Helps	Study/Hr	Study/wk
LOC	1																	
Intrinsic	-.29**	1																
Extrinsic	-.297**	.185*	1															
Tvalue	-.296**	.596**	.340**	1														
ConLBelief	-.093	.356**	-.066	.196*	1													
SelfEfficacy	-.112	.370**	.122	.204**	.593**	1												
TestAnx	.138	.098	.218*	.084	-1.69	-.313**	1											
Rehearsal	.190*	.121	.324**	.270**	-.148	-.195*	.431**	1										
Elaboration	.121	.492**	.371**	.348**	.064	.159	.172*	.455**	1									
Organ	-.234**	.130	.263**	.123	-.034	-.092	.391**	.495**	.524**	1								
Cthinking	-.048	.368**	.228*	.085	.076	.057	.266**	.278**	.457**	.314**	1							
SelfReg	-.349**	.296**	.262**	.144	.156	.064	.134	.488**	.603**	.496**	.479**	1						
Time&St	-.437**	.340**	.247**	.368**	-.039	.008	-.019	.352**	.399**	.359**	.026	.438**	1					
EffortR	-.363**	.317**	.388**	.352**	.109	.159	-.110	.220*	.302**	.050	-.056	.175*	.507**	1				
PeerL	-.100	.005	.266**	.121	-.077	.149	.225**	.425**	.208*	.371**	.264**	.297**	.183*	.147	1			
Helps	-.050	.055	.037	.304**	-.220*	-.269**	.204*	.351**	.140	.155	-.069	.133	.254**	.058	.305**	1		
Study/Hr	.081	-.071	.009	.089	-.054	-.238	.117	-.098	.127	-.070	-.074	.034	.082	.002	.142	-.018	1	
Study/wk	-.015	.099	.097	.157	.030	-.146	.184	.123	.264	.023	.044	.136	.124	.007	.312	.107	.772**	1

## APPENDIX D

Multiple Regression of ATIComp on ALL independent variables

Dependent Variable: ATIComp ATIComp

Number of Observations Read	132
Number of Observations Used	117
Number of Observations with Missing Values	15

Stepwise Selection: Step 1

Statistics for Entry  
DF = 1,115

Variable	Tolerance	Model R-Square	F Value	Pr > F
Intrinsic	1.000000	0.0010	0.11	0.7390
Extrinsic	1.000000	0.0045	0.52	0.4732
TaskValue	1.000000	0.0072	0.84	0.3624
ConlBelief	1.000000	0.0039	0.45	0.5052
SelfEfficacy	1.000000	0.0549	6.68	0.0110
TestAnxiety	1.000000	0.1034	13.26	0.0004
Rehearsal	1.000000	0.0068	0.79	0.3772
Elaboration	1.000000	0.0079	0.92	0.3405
Organization	1.000000	0.0000	0.00	0.9898
CriticalThink	1.000000	0.0139	1.62	0.2059
SelfRegulation	1.000000	0.0027	0.31	0.5770
TimeStudy	1.000000	0.0105	1.22	0.2711
EffortRegulation	1.000000	0.0082	0.95	0.3308
PeerLearning	1.000000	0.0045	0.52	0.4717
HelpSeek	1.000000	0.0001	0.01	0.9042
C	1.000000	0.2671	41.92	<.0001
Pharm	1.000000	0.3383	58.79	<.0001
Patho	1.000000	0.2182	32.10	<.0001
MedSurg	1.000000	0.3253	55.43	<.0001
TmedSurg	1.000000	0.1808	25.37	<.0001
LOC	1.000000	0.0086	0.99	0.3211
Age	1.000000	0.0001	0.01	0.9085
Sex	1.000000	0.0001	0.01	0.9174
Work	1.000000	0.0053	0.61	0.4375
Job0	1.000000	0.0030	0.35	0.5572
Job1	1.000000	0.0016	0.19	0.6674

## APPENDIX E

Step 2 all variables ran except Study Hours variables and LOC (to keep the missing values observations), using stepwise selection. The following is the ANOVA output for the selected model

Multiple Regression of ATIComp on ALL independent variables selected by Stepwise Procedure

The REG Procedure  
 Model: MODEL1  
 Dependent Variable: ATIComp ATIComp

Number of Observations Read	132
Number of Observations Used	122
Number of Observations with Missing Values	10

### Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	2472.29230	618.07308	29.75	<.0001
Error	117	2430.49236	20.77344		
Corrected Total	121	4902.78466			

Root MSE	4.55779	R-Square	0.5043
Dependent Mean	74.20139	Adj R-Sq	0.4873
Coeff Var	6.14246		

### Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	Intercept	1	57.97421	2.72479	21.28	<.0001
TestAnxiety	TestAnxiety	1	-0.54569	0.26271	-2.08	0.0400
Pharm	Pharm	1	2.74814	0.63422	4.33	<.0001
MedSurg	MedSurg	1	2.02272	0.83175	2.43	0.0165
ATImedSurg	ATImedSurg	1	2.37071	0.63058	3.76	0.0003

## APPENDIX F

Step 3 all variables except Study Hours variables and LOC (to keep the missing values observations), using the Cp and AIC criteria. The best model selected uses 7 variables, some of which were not significant alone, but become significant after adjusting for other variables.

Multiple Regression of ATIComp on BEST 7 variables by AIC (this has lowest Cp, 2nd lowest AIC)

The REG Procedure  
Model: MODEL1  
Dependent Variable: ATIComp ATIComp

Number of Observations Read	132
Number of Observations Used	122
Number of Observations with Missing Values	10

### Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	2678.38887	382.62698	19.61	<.0001
Error	114	2224.39579	19.51224		
Corrected Total	121	4902.78466			

  

Root MSE	4.41727	R-Square	0.5463
Dependent Mean	74.20139	Adj R-Sq	0.5184
Coeff Var	5.95308		

### Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	Intercept	1	60.63550	3.23028	18.77	<.0001
TestAnxiety	TestAnxiety	1	-0.67800	0.27452	-2.47	0.0150
Organization	Organization	1	0.85753	0.39435	2.17	0.0317
SelfRegulation	SelfRegulation	1	-1.34055	0.58320	-2.30	0.0233
Pharm	Pharm	1	2.63680	0.64642	4.08	<.0001
MedSurg	MedSurg	1	2.18131	0.81314	2.68	0.0084
Job1		1	-2.27811	1.27453	-1.79	0.0765
ATImedSurg	ATImedSurg	1	2.58440	0.61754	4.19	<.0001

## APPENDIX G

Logistic Regression of NCLEX on Each Variable One at a Time  
(Unadjusted Odds Ratios)

Obs	Effect	Odds RatioEst	LowerCL	UpperCL	Prob ChiSq
1		.	.	.	.
2	Internal_LOC 0 vs 1	0.143	0.034	0.594	0.0074
3	Intrinsic	1.837	0.900	3.749	0.0948
4	Extrinsic	0.964	0.581	1.597	0.8854
5	TaskValue	1.347	0.743	2.442	0.3271
6	ConLBelief	2.136	1.157	3.944	0.0153
7	SelfEfficacy	2.106	1.064	4.168	0.0326
8	TestAnxiety	0.658	0.440	0.984	0.0415
9	Rehearsal	0.843	0.518	1.372	0.4924
10	Elaboration	1.206	0.685	2.123	0.5166
11	Organization	0.743	0.459	1.204	0.2282
12	CriticalThink	0.808	0.494	1.322	0.3964
13	SelfRegulation	1.072	0.521	2.207	0.8494
14	TimeStudy	1.183	0.654	2.137	0.5787
15	EffortRegulation	1.296	0.736	2.282	0.3694
16	PeerLearning	1.139	0.737	1.761	0.5577
17	HelpSeek	0.924	0.561	1.525	0.7582
18	C	0.751	0.620	0.910	0.0034
19	Pharm	3.434	1.438	8.202	0.0055
20	Patho	3.884	1.561	9.663	0.0035
21	MedSurg	4.871	1.736	13.665	0.0026
22	TmedSurg	3.021	1.242	7.347	0.0148
23	Age	1.725	0.718	4.143	0.2227
24	Sex	>999.999	<0.001	>999.999	0.9757
25	Work	1.001	0.952	1.053	0.9579
26	Job 0 vs 2	0.382	0.079	1.845	0.2648
27	Job 1 vs 2	0.727	0.060	8.770	0.8839
28	ATImedSurg	3.335	1.384	8.036	0.0073
29	ATIcomp	1.239	1.103	1.393	0.0003

## APPENDIX H

Multiple Logistic Regression of NCLEX, using Stepwise Selection (Odds Ratios are known as "Adjusted Odds Ratios," since each variable is adjusted for the others.)  
The LOGISTIC Procedure

### Model Information

Data Set	WORK.CARP	
Response Variable	NCLEX	NCLEX
Number of Response Levels	2	
Model	binary logit	
Optimization Technique	Fisher's scoring	
Number of Observations Read		132
Number of Observations Used		110

### Response Profile

Ordered Value	NCLEX	Total Frequency
1	1	98
2	0	12

Probability modeled is NCLEX=1.

NOTE: 22 observations were deleted due to missing values for the response or explanatory variables.

### Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	33.9949	5	<.0001
Score	30.3401	5	<.0001
Wald	14.4485	5	0.0130

### Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-18.3224	6.3079	8.4372	0.0037
ATIcomp	1	0.1971	0.0886	4.9485	0.0261
Internal_LOC	1	2.2273	1.0474	4.5221	0.0335
ConLBelief	1	1.2707	0.5140	6.1112	0.0134
Organization	1	-1.1413	0.5237	4.7491	0.0293
Pharm	1	1.1596	0.7229	2.5732	0.1087

### Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
ATIcomp	1.218	1.024	1.449
Internal_LOC	9.274	1.191	72.244
ConLBelief	3.563	1.301	9.758
Organization	0.319	0.114	0.892
Pharm	3.189	0.773	13.152

### Association of Predicted Probabilities and Observed Responses

Percent Concordant	93.8	Somers' D	0.878
Percent Discordant	6.0	Gamma	0.879
Percent Tied	0.2	Tau-a	0.172
Pairs	1176	c	0.939

## APPENDIX I

Multiple Logistic Regression of NCLEX, without Pharm

The LOGISTIC Procedure

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	31.1356	4	<.0001
Score	29.2134	4	<.0001
Wald	14.4384	4	0.0060

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-20.0288	6.0378	11.0042	0.0009
ATIcomp	1	0.2669	0.0787	11.5000	0.0007
Internal_LOC	1	2.2202	1.0072	4.8588	0.0275
ConLBelief	1	1.0534	0.4511	5.4525	0.0195
Organization	1	-0.9002	0.4581	3.8616	0.0494

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
ATIcomp	1.306	1.119	1.524
Internal_LOC	9.209	1.279	66.303
ConLBelief	2.867	1.184	6.942
Organization	0.407	0.166	0.998

Association of Predicted Probabilities and Observed Responses

Percent Concordant	92.4	Somers' D	0.849
Percent Discordant	7.5	Gamma	0.850
Percent Tied	0.1	Tau-a	0.167
Pairs	1176	c	0.925

## APPENDIX J

Multiple Regression of NCLEX on just the Course related and Personal variables

The LOGISTIC Procedure

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	22.4633	2	<.0001
Score	23.3243	2	<.0001
Wald	14.5759	2	0.0007

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-15.7745	4.7284	11.1294	0.0008
Internal_LOC	1	1.9000	0.9063	4.3949	0.0360
ATComp	1	0.2288	0.0659	12.0656	0.0005

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
Internal_LOC	6.686	1.132	39.503
ATComp	1.257	1.105	1.430

Association of Predicted Probabilities and Observed Responses

Percent Concordant	86.6	Somers' D	0.749
Percent Discordant	11.7	Gamma	0.761
Percent Tied	1.6	Tau-a	0.147
Pairs	1176	c	0.875

Only these two variables were statistically significant, so no others were selected. This model would be the best predictor of passing based only on demographics, grades, the LOC assessment, and the ATIComp predictor test.

## APPENDIX K

The FREQ Procedure

Table of Internal\_LOC by NCLEX

Internal_LOC		NCLEX (NCLEX)		Total
Frequency	Percent	Row Pct	Col Pct	
		0	1	
0	4	7		11
	3.42	5.98		9.40
	36.36	63.64		
	33.33	6.67		
1	8	98		106
	6.84	83.76		90.60
	7.55	92.45		
	66.67	93.33		
Total	12	105		117
	10.26	89.74		100.00

Frequency Missing = 15

The FREQ Procedure

Table of MedSurg by NCLEX

MedSurg (MedSurg)		NCLEX (NCLEX)		Total
Frequency	Percent	Row Pct	Col Pct	
		0	1	
2	5	12		17
	4.13	9.92		14.05
	29.41	70.59		
	38.46	11.11		
3	8	61		69
	6.61	50.41		57.02
	11.59	88.41		
	61.54	56.48		
4	0	35		35
	0.00	28.93		28.93
	0.00	100.00		
	0.00	32.41		
Total	13	108		121
	10.74	89.26		100.00

Frequency Missing = 11

Table of TmedSurg by NCLEX

TmedSurg (TmedSurg)	NCLEX (NCLEX)		Total
Frequency	0	1	
Percent			
Row Pct			
Col Pct			
2	5	21	26
	4.13	17.36	21.49
	19.23	80.77	
	38.46	19.44	
3	8	49	57
	6.61	40.50	47.11
	14.04	85.96	
	61.54	45.37	
4	0	38	38
	0.00	31.40	31.40
	0.00	100.00	
	0.00	35.19	
Total	13	108	121
	10.74	89.26	100.00

Frequency Missing = 11

Table of Sex by NCLEX

Sex (Sex)	NCLEX (NCLEX)		Total
Frequency	0	1	
Percent			
Row Pct			
Col Pct			
0	13	98	111
	10.74	80.99	91.74
	11.71	88.29	
	100.00	90.74	
1	0	10	10
	0.00	8.26	8.26
	0.00	100.00	
	0.00	9.26	
Total	13	108	121
	10.74	89.26	100.00

Frequency Missing = 11

Table of Patho by NCLEX

Patho(Patho)	NCLEX (NCLEX)		Total
Frequency	0	1	
Percent			
Row Pct			
Col Pct			
2	4	13	17
	3.31	10.74	14.05
	23.53	76.47	
	30.77	12.04	
3	9	47	56
	7.44	38.84	46.28
	16.07	83.93	
	69.23	43.52	
4	0	48	48
	0.00	39.67	39.67
	0.00	100.00	
	0.00	44.44	
Total	13	108	121
	10.74	89.26	100.00

Frequency Missing = 11

Table of Pharm by NCLEX

Pharm(Pharm)	NCLEX (NCLEX)		Total
Frequency	0	1	
Percent			
Row Pct			
Col Pct			
2	7	21	28
	5.83	17.50	23.33
	25.00	75.00	
	53.85	19.63	
3	5	42	47
	4.17	35.00	39.17
	10.64	89.36	
	38.46	39.25	
4	1	44	45
	0.83	36.67	37.50
	2.22	97.78	
	7.69	41.12	
Total	13	107	120
	10.83	89.17	100.00

Frequency Missing = 12

The FREQ Procedure

Table of Age by NCLEX

Age (Age)	NCLEX (NCLEX)		Total
Frequency	0	1	
Percent			
Row Pct			
Col Pct			
0	9	63	72
	7.44	52.07	59.50
	12.50	87.50	
	69.23	58.33	
1	4	30	34
	3.31	24.79	28.10
	11.76	88.24	
	30.77	27.78	
2	0	4	4
	0.00	3.31	3.31
	0.00	100.00	
	0.00	3.70	
3	0	4	4
	0.00	3.31	3.31
	0.00	100.00	
	0.00	3.70	
4	0	3	3
	0.00	2.48	2.48
	0.00	100.00	
	0.00	2.78	
5	0	4	4
	0.00	3.31	3.31
	0.00	100.00	
	0.00	3.70	
Total	13	108	121
	10.74	89.26	100.00

Frequency Missing = 11

The MEANS Procedure

Internal_LOC	N Obs	Variable	Label	N	Mean	Std Dev
0	12	StudyHrTot	StudyHrTot	2	30.8750000	23.5113005
		StudyPerWeek	StudyPerWeek	2	2.3300000	0.4242641
1	115	StudyHrTot	StudyHrTot	33	55.0833333	72.6621749
		StudyPerWeek	StudyPerWeek	33	5.8351515	4.4733217

Internal_LOC	N Obs	Variable	Label	Minimum	Maximum
0	12	StudyHrTot	StudyHrTot	14.2500000	47.5000000
		StudyPerWeek	StudyPerWeek	2.0300000	2.6300000
1	115	StudyHrTot	StudyHrTot	1.5000000	419.0000000
		StudyPerWeek	StudyPerWeek	0.7500000	21.1600000

The MEANS Procedure

Job	N Obs	Variable	Label	N	Mean	Std Dev
0	80	ATIcomp	ATIcomp	76	73.9627632	6.0959304
		NCLEX	NCLEX	73	0.8630137	0.3462124
		StudyHrTot	StudyHrTot	23	56.4130435	85.7159556
		StudyPerWeek	StudyPerWeek	23	5.7843478	5.1805807
1	15	ATIcomp	ATIcomp	14	73.5071429	6.6623470
		NCLEX	NCLEX	13	0.9230769	0.2773501
		StudyHrTot	StudyHrTot	3	53.0000000	6.0000000
		StudyPerWeek	StudyPerWeek	3	5.2733333	1.2416253
2	36	ATIcomp	ATIcomp	31	75.3322581	6.9189299
		NCLEX	NCLEX	35	0.9428571	0.2355041
		StudyHrTot	StudyHrTot	10	46.5000000	30.4557967
		StudyPerWeek	StudyPerWeek	10	5.1360000	2.8617563

Job	N Obs	Variable	Label	Minimum	Maximum
0	80	ATIcomp	ATIcomp	58.7000000	87.3000000
		NCLEX	NCLEX	0	1.0000000
		StudyHrTot	StudyHrTot	1.5000000	419.0000000
		StudyPerWeek	StudyPerWeek	0.7500000	21.1600000
1	15	ATIcomp	ATIcomp	60.0000000	83.0000000
		NCLEX	NCLEX	0	1.0000000
		StudyHrTot	StudyHrTot	47.0000000	59.0000000
		StudyPerWeek	StudyPerWeek	4.0700000	6.5500000
2	36	ATIcomp	ATIcomp	59.3000000	87.0000000
		NCLEX	NCLEX	0	1.0000000
		StudyHrTot	StudyHrTot	3.0000000	99.0000000
		StudyPerWeek	StudyPerWeek	1.9200000	9.9000000

## The FREQ Procedure

Table of ATImedSurg by NCLEX

ATImedSurg (ATImedSurg)		NCLEX (NCLEX)		Total
Frequency	Percent	Row Pct	Col Pct	
		0	1	
0	5	7		12
	4.39	6.14		10.53
	41.67	58.33		
	38.46	6.93		
1	5	46		51
	4.39	40.35		44.74
	9.80	90.20		
	38.46	45.54		
2	3	38		41
	2.63	33.33		35.96
	7.32	92.68		
	23.08	37.62		
3	0	10		10
	0.00	8.77		8.77
	0.00	100.00		
	0.00	9.90		
Total	13	101		114
	11.40	88.60		100.00

Frequency Missing = 18

## The MEANS Procedure

Analysis Variable : ATIcomp ATIcomp

ATImedSurg	N Obs	N	Mean	Std Dev	Minimum	Maximum
0	13	13	67.4538462	7.9505362	58.7000000	84.7000000
1	55	55	72.4654545	4.8872934	59.3000000	82.7000000
2	44	44	76.8568182	5.4541811	66.0000000	87.3000000
3	10	10	80.8370000	2.7298191	78.7000000	87.0000000

## APPENDIX L

ANOVA of ATIComp on ATIMedSurg Proficiency Level

The GLM Procedure  
Class Level Information

Class	Levels	Values
ATIMedSurg	4	0 1 2 3
Number of Observations Read		132
Number of Observations Used		122

The GLM Procedure

Dependent Variable: ATIComp					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	1508.192827	502.730942	17.48	<.0001
Error	118	3394.591836	28.767727		
Corrected Total	121	4902.784663			

R-Square	0.307620	Coeff Var	7.228376	Root MSE	5.363555	ATIComp Mean	74.20139
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Source	DF	Type III SS	Mean Square	F Value	Pr > F
ATIMedSurg	3	1508.192827	502.730942	17.48	<.0001

Bonferroni (Dunn) t Tests for ATIComp  
Comparisons significant at the 0.05 level are indicated by \*\*\*.

ATIMedSurg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
3 - 2	3.980	-1.062	9.022
3 - 1	8.372	3.424	13.319 ***
3 - 0	13.383	7.329	19.437 ***
2 - 1	4.391	1.480	7.302 ***
2 - 0	9.403	4.859	13.946 ***
1 - 0	5.012	0.573	9.450 ***

Comparison of those achieving Level 2 versus those who did not

		The TTEST Procedure Statistics						
Variable	Level2	N	Lower CL Mean	Mean	Upper CL Mean	Lower CL Std Dev	Std Dev	Upper CL Std Dev
ATIComp	0	68	70.085	71.507	72.929	5.0267	5.8749	7.0701
ATIComp	1	54	76.154	77.594	79.034	4.4351	5.276	6.5133
ATIComp	Diff (1-2)		-8.114	-6.087	-4.059	4.9885	5.6182	6.4314

		T-Tests			
Variable	Method	Variances	DF	t Value	Pr >  t
ATIComp	Pooled	Equal	120	-5.94	<.0001

APPENDIX M

Correlation Matrix ATI Comprehensive Predictor Exam & Course Grades

	ATIComp	# of Cs	Patho	Pharm	M/S 1	M/S 2	TestAnxiety
ATI							
# of Cs	-.511**						
Patho	.460**	-.673**					
Pharm	.549**	-.493**	.436**				
M/S 1	.562**	-.577**	.658**	.496**			
M/S 2	.424**	-.596**	.650**	.385**	.626**		
TestAnxiety	-.325**	.245**	-.251**	-.151	-.267**	-.269**	
** .01 level * .05 level							

APPENDIX N

Split Half Reliability Motivation Scale MSLQ

MSLQ	1st half	#of items	2nd half	# of items	Spear-man-Bowman
Intrinsic	0.605	2	0.447	2	0.381
Extrinsic	0.576	2	0.551	2	0.727
TaskValue	0.819	3	0.814	3	0.885
ConLBelief	0.59	2	0.674	2	0.517
SelfEfficacy	0.806	4	0.849	4	0.934
TestAnxiety	0.836	3	0.734	2	0.932

## APPENDIX O

1/12/10

HSCL #18441

Jane Carpenter  
3771 SW Stonybrook Dr.  
Topeka, KS 66610

The Human Subjects Committee Lawrence Campus (HSCL) has received your response to its expedited review of your research project

18441 Carpenter/Mahlis (C & T) Locus of Control & Motivation Strategies for Learning Questionnaire: Predictors of Student Success for the ATI Comprehensive Predictor Exam & NCLEX-RN Examination and approved this project under the expedited procedure provided in 45 CFR 46.110 (f) (7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

The Office for Human Research Protections requires that your consent form must include the note of HSCL approval and expiration date, which has been entered on the consent form(s) sent back to you with this approval.

1. At designated intervals until the project is completed, a Project Status Report must be returned to the HSCL office.
2. Any significant change in the experimental procedure as described should be reviewed by this Committee prior to altering the project.
3. Notify HSCL about any new investigators not named in original application. Note that new investigators must take the online tutorial at [http://www.rcr.ku.edu/hscl/hsp\\_tutorial/000.shtml](http://www.rcr.ku.edu/hscl/hsp_tutorial/000.shtml).
4. Any injury to a subject because of the research procedure must be reported to the Committee immediately.
5. When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity. If you use a signed consent form, provide a copy of the consent form to subjects at the time of consent.
6. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.

Please inform HSCL when this project is terminated. You must also provide HSCL with an annual status report to maintain HSCL approval. Unless renewed, approval lapses one year after approval date. If your project receives funding which requests an annual update approval, you must request this from HSCL one month prior to the annual update. Thanks for your cooperation. If you have any questions, please contact me.

Sincerely,

Jan Butin  
Associate Coordinator  
Human Subjects Committee Lawrence

