

AN INVESTIGATION
OF PREDICTORS OF NCLEX-RN OUTCOMES
ON THE FIRST-ATTEMPT AMONG STANDARDIZED TESTS

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ABSTRACT

Nursing shortage is one of the critical issues in the United States. In order to meet increased demands for qualified RNs and prevent negative effects on graduates, nursing programs, stakeholders, and society from graduates' NCLEX-RN failure, it is important to support nursing students to succeed on the NCLEX-RN. By utilizing effective NCLEX-RN predictors, students at risk for NCLEX-RN failure can be identified, and early remediation can be provided to support them. This study was to investigate effective predictors of NCLEX-RN outcomes on the first-attempt among standardized tests (adult medical-surgical, fundamentals for nursing, pharmacology, maternal-newborn, nursing care of children, mental health, community health, and leadership and management) conducted throughout the nursing program. NCLEX-RN outcomes and individual adjusted scores on the standardized tests of 151 participants, who were composed of 118 graduates who passed the NCLEX-RN on the first-attempt and 33 graduates who failed the NCLEX-RN on the first-attempt, were analyzed by a *t*-test and logistic regression. The investigation found that there were significant statistical differences between the two groups with NCLEX-RN success and failure in the individual adjusted scores on the adult medical-surgical, pharmacology, maternal-newborn, mental-health, community health, and leadership and management standardized tests. Only in individual adjusted scores on the fundamental and nursing care of children standardized tests, there were no significant statistical differences between the two groups. In addition, the result of logistic regression indicated that the overall regression models were significant in predicting both NCLEX-RN success and failure.

Adult medical-surgical, pharmacology, and community health standardized tests were central in the prediction of both NCLEX-RN success and failure; however, a much lower percentage of NCLEX-RN failure than success was classified. It can be concluded that the adult medical-surgical, pharmacology, and community health standardized tests were less effective to predict NCLEX-RN failure than NCLEX-RN success. It is recommended to use different standardized test products as variables, have a larger sample size of those who fail the NCLEX-RN, have a more diverse group of participants, and continue longitudinal and replicated studies for future studies.

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CHAPTER 1

INTRODUCTION

Nursing students develop competencies to become registered nurses (RN) in nursing programs, and nursing programs are responsible for fostering qualified graduates having competencies to provide safe and effective nursing care. In order to ensure that graduates have competencies to start their nursing careers as entry-level RNs, they must pass the National Council Licensure Examination-Registered Nurse (NCLEX-RN), which measures competencies required to provide quality nursing care and ensures the public's safety (National Council of State Boards of Nursing [NCSBN], 2012a). Therefore, the NCLEX-RN is the last step to become a RN for nursing students and a critical benchmark standard to assess outcomes of nursing programs.

Nursing programs have to support their students to pass the NCLEX-RN because they have to produce qualified graduates in order to meet demands of stakeholders and society. Therefore, identifying accurate predictors of the NCLEX-RN is needed to detect students at risk of NCLEX-RN failure and support them to succeed on the NCLEX-RN.

Problem Statement

The United States (U.S.) has a problem of nursing shortage. It is expected that the nursing shortage will get worse and will not be solved soon due to several factors. Two leading factors are that, the 'baby boomer' generation is aging and demands for qualified nurses

continue to increase while nursing schools have limitations to expand the number of their students (American Association of Colleges of Nursing [AACN], 2011; Roa, Shipman, Hooten, & Carter, 2011). In order to meet the demands, enhancing the NCLEX-RN pass rate is very important since it is one of the ways to produce more RNs. According to the NCSBN (2012b, para. 1) states that 144,583 candidates educated in the U.S. took the NCLEX-RN, and only 87.89 percent of them passed the licensure exam in 2011. This means that about 1.3 students out of 10 students failed the NCLEX-RN. Nursing programs and educators need to find more accurate predictors to identify students at risk of NCLEX-RN failure and support the students to pass the exam on the first-attempt.

Nursing Shortage

Currently, there are more than 3.1 million RNs in the U.S., and 84.8 percent of the RNs, approximately 2.6 million, work in the nursing profession. However, research indicates that the RN position is one of the fastest growing and highly demanded jobs and that the nursing shortage will not be resolved with the current number of RNs. The problem of the nursing shortage is expected to get even worse since the demands for RNs are outstripping the supply. There will be more than 581,500 new position openings for RNs through 2018, demands for RNs in acute care will increase by 36 percent through 2020, and a lack of more than 260,000 RNs will affect the U.S. health care system by 2025 (AACN, 2012, para. 10). Also, as the *Patient Protection and Affordable Care Act* was passed in 2010, it is expected that more than 32 million people will soon be newly eligible may seek healthcare services including services provided by RNs (AACN, 2011).

Even though demands for RNs has dramatically increased, enrollment of baccalaureate nursing students increased only 5.7 percent in 2010. The increase in the enrollment is not

enough to meet the increased demands for RNs. Furthermore, it is expected due to the increase in the average age of a RN, that there will be an additional loss of a large number of RNs due to retirement over the next 20 years. While at the same time the demands for RNs will increase as baby boomers age and need health care services during that time (AACN, 2011, para. 7 & 12). It is expected that the enduring nursing shortage will intensify in the U.S.

AACN (2011) indicates that the nursing shortage can be a contributing factor to increase the stress level of RNs, impair job satisfaction, and make RNs leave the profession. More than 75 percent of RNs indicate that the nursing shortage impairs their work life, quality of care, and spending time with their patients. Ninety-eight percent of RN respondents agree that RNs' stress level is increased by the nursing shortage (para. 17). The impaired job satisfaction and increased stress level due to the nursing shortage perpetuate RNs to leave their profession. Their leaving aggravates the nursing shortage more, and the deepened nursing shortage contributes to more RNs leaving; therefore, the vicious circle of shortage repeats.

One of the strategies to resolve the problem of the nursing shortage would be the expansion of nursing program enrollments. However, enrollments are limited due to inadequate numbers of nursing faculty (AACN, 2011). Despite the limitation, nursing programs are still accountable for resolving the nursing shortage. It is a critical duty of nursing faculty to foster graduates by providing excellent nursing education, and supporting nursing students to pass the NCLEX-RN. Failure of graduates on the NCLEX-RN deepens the nursing shortage.

NCLEX-RN Failure

The graduates' NCLEX-RN failure negatively affects stakeholders such as the graduates, health care organizations, and nursing programs. According to Roa, Shipman, Hooten, and Carter (2011), graduates who fail the NCLEX-RN experience feelings of embarrassment,

anxiety, loss of self-esteem, and social stigma, and those feelings may negatively affect the graduates' further NCLEX-RN attempts. After NCLEX-RN failure, the graduates feel “an uncertain future and disappointing others” (Roa et al., 2011, p. 374), and it causes “emotional connections that may prevent goal achievement” (p. 374). They also may feel guilt about their employers, family members, and other dependents. In addition, Roa et al. (2011) indicate that the NCLEX-RN failure causes financial loss to the graduates. The graduates expect to be compensated for tuition and other school related expenses through work as RNs after graduation. However, if they fail the NCLEX-RN, they cannot work up to a minimum of 45 days while they wait to be eligible for the next attempt. They also spend more money for remediation and fees for retaking the NCLEX-RN.

Health care organizations expect that graduates will pass the NCLEX-RN when they hire the graduates. When the newly hired graduates fail the NCLEX-RN, health care organizations must fill positions vacated by graduates failing with temporary nursing staff or they must increase the overtime pay of existing employees. This causes not only higher costs for the organizations, but also a lack of qualified nurses within the organizations and increases the staff-patient ratio (Roa et al., 2011).

Without a doubt, nursing programs are affected by their graduates' NCLEX-RN failures. According to Norton, Rele, Cox, Farley, and Tucker (2006), the NCLEX-RN pass rates on the first-attempt are a major factor of evaluating the nursing programs' effectiveness used by Boards of Nursing, the National League for Nursing Accrediting Commission (NLNAC), and the Commission on Collegiate Education (CCNE). Roa et al. (2011) indicate that if nursing programs do not meet the national benchmark standards, they become at risk of being placed on probation or losing their accreditation. Also, the nursing programs, colleges, and universities

with low NCLEX-RN pass rates may have financial risks. The information of each nursing program's NCLEX-RN pass rates is open to the public to view, and prospective students may evaluate the pass rates to decide which programs they will apply and enroll in to meet their needs. The nursing programs, colleges, and universities with lower pass rates may experience decreased enrollments, and it negatively affects the operational budget of them (Roa et al., 2011). In order to prevent those negative impacts of the graduates' NCLEX-RN failures, nursing educators have to support students to pass the NCLEX-RN on the first attempt.

Purpose Statement

For nursing educators, it is very important to predict students' outcomes on the NCLEX-RN. Through utilizing effective NCLEX-RN predictors, nursing educators can identify students at risk for NCLEX-RN failure to support them for their success on the NCLEX-RN by providing early remediation. The purpose of this study was to investigate effective predictors of NCLEX-RN outcomes on the first-attempt among standardized tests conducted throughout the nursing program. In the traditional baccalaureate program of a public university located in the Midwest, which is the setting for data collection in this study, students take fundamentals and mental health standardized tests during their sophomore year, maternal newborn, nursing care of children, and pharmacology standardized tests during their junior year, and adult medical-surgical, community health, and leadership and management standardized tests during their senior year.

This study also compared students' individual adjusted scores on standardized tests of the eight nursing subjects between groups of students with NCLEX-RN success and failure on the first-attempt. It is to determine if there are significant differences in the adjusted individual

scores of the standardized tests between the two groups of students with NCLEX-RN success and failure on the first-attempt.

Research Questions

The followings research questions guided the investigation of this study.

1. Are there significant differences in the individual adjusted scores of the standardized tests (adult medical-surgical, fundamentals, pharmacology, maternal-newborn, nursing care of children, mental health, community health, and leadership and management) between the two groups of students with NCLEX-RN success and failure on the first-attempt?
2. Can the NCLEX-RN outcome (success or failure) on the first-attempt be correctly predicted from the standardized tests?
3. If the NCLEX-RN outcome on the first-attempt can be predicted correctly, which variables are central in the prediction of the NCLEX-RN outcome on the first-attempt?
4. How many the NCLEX-RN successes on the first-attempt are classified correctly? How many the NCLEX-RN failures on the first-attempt are classified correctly?

Definitions of Terms

Descriptions of the terms used in this study are provided for consistency and clarity to the reader.

- **Adult Medical-Surgical Standardized Test (2010):** A test developed by Assessment Technologies Institute, LLC. (ATI) and designed to measure a student's academic proficiency in the medical-surgical nursing area associated with the NCLEX-RN test plan.
- **Community Health Standardized Test (2010):** A test developed by ATI and designed to measure a student's academic proficiency in the community nursing area associated with the NCLEX-RN test plan.

- First-attempt: Initial try at passing the NCLEX-RN
- Fundamentals Standardized Test (2010): A test developed by ATI and designed to measure a student's academic proficiency in the fundamentals of nursing area associated with the NCLEX-RN test plan.
- Individual adjusted score: A score calculated by the number of questions answered correctly divided by the number of questions on the test with adjustment for the differences in the difficulty of the form taken (ATI, n.d.).
- Leadership and Management Standardized Test (2010): A test developed by ATI and designed to measure a student's academic proficiency in the nursing leadership and management area associated with the NCLEX-RN test plan.
- Maternal-Newborn Standardized Test (2010): A test developed by ATI and designed to measure a student's academic proficiency in the maternal newborn nursing area associated with the NCLEX-RN test plan.
- Mental Health Standardized Test (2010): A test developed by ATI and designed to measure a student's academic proficiency in the psychiatric nursing area associated with the NCLEX-RN test plan.
- NCLEX-RN Remediation: Supportive interventions, such as a review course and study plan, for students at risk for NCLEX-RN failure to pass the NCLEX-RN.
- NCLEX-RN Success: Passing the NCLEX-RN at the first attempt.
- NCLEX-RN Failure: Failing to pass the NCLEX-RN at the first attempt.
- Nursing Care of Children Standardized Test (2010): A test developed by ATI and designed to measure a student's academic proficiency in the pediatric nursing area associated with the NCLEX-RN test plan.

- Pharmacology Standardized Test (2010): A test developed by ATI and designed to measure a student's academic proficiency in the pharmacology area associated with the NCLEX-RN test plan.

Significance of the Study

Nursing programs are ethically responsible to their graduates who were qualified and met academic standards for graduating but failed the NCLEX-RN (Roa, Hooten, & Carter, 2011). Nursing programs are “challenged to facilitate knowledge development, ensure competence of their new graduates, and demonstrate organizational and curricular effectiveness through identification and remediation of students at high-risk of failure among first-time test candidates” (Norton, Rele, Cox, Farley, & Tucker, 2006, p. 322). Before providing remediation, identification of those students should be preceded; therefore, nursing educators have a duty to find effective NCLEX-RN predictors. With the effective NCLEX-RN predictors, students' success on NCLEX-RN can better be predicted, and educators can better support students at risk through developing and providing early remediation so that the NCLEX-RN pass rates will be improved. Such predictive measures can result in decreasing the nursing shortage and its negative effects; therefore, stakeholders also benefit from identifying effective NCLEX-RN predictors. In these days, many nursing programs use standardized assessments purchased from outside companies to predict their students' first attempt outcome on the NCLEX-RN. Nursing educators need to distinguish more powerful and effective subjects of the tests from all of the possible subjects. This study would contribute to the identification of effective predictors of NCLEX-RN on the first-attempt among standardized tests of the eight nursing subjects at one program.

Summary

Nursing programs are responsible for providing quality nursing education and fostering competence to meet the demands of stakeholders and society. The U.S. has a problem of nursing shortage, and it is expected to worsen since the demand for RNs exceeds the number of graduating RNs. Therefore, nursing programs need to enhance the NCLEX-RN pass rates to produce more qualified RNs in order to meet the demands for RNs, and nursing educators have to support nursing students to pass the NCLEX-RN on the first- attempt. In order to provide appropriate remediation for students who are at risk for NCLEX-RN failure, utilization of effective NCLEX-RN predictors is essential because it helps nursing educators to identify those students at risk for NCLEX-RN failure. The purpose of this study was to investigate effective predictors of NCLEX-RN success on the first-attempt among standardized tests conducted throughout the nursing program. Through identifying effective NCLEX-RN predictors, students at risks of NCLEX-RN failure can have early remediation, and the NCLEX-RN pass rates can be improved. This can result in having more qualified RNs available to provide excellent nursing care.

CHAPTER 2

LITERATURE REVIEW

Introduction

In this chapter, the theoretical framework of the study and related literature are discussed. In the theoretical framework section, Constructivism, Adult Learning Theory, and Bloom's Revised Taxonomy, which were used as a framework for this study, are explained. The literature review section addresses NCLEX-RN structure, NCLEX-RN predictors, previous ATI testing studies, and NCLEX-RN remediation.

Theoretical Framework

Constructivism, Adult Learning Theory, and Bloom's Revised Taxonomy were used as a theoretical framework in this study. These theories provided the framework explaining how students gain knowledge and skills, and how students' successes on the NCLEX-RN can be promoted. Also, intended learning outcomes to succeed on the NCLEX-RN is explained in the theoretical framework.

Constructivism

Constructivism is a conceptual framework focusing on how individuals learn rather than what they learn, and it relates to building and constructing new ideas and knowledge based on their own background and schema (Brandon & All, 2010). Constructivism presents the change on cognitive development and social relationships in learning when individuals construct their

knowledge. Piaget's (1953) cognitive constructivism organizes and describes active processes of learning systematically. *Assimilation* presents absorption of new knowledge and information in individuals' own schemas. It means that they do not take the world as it is, but accept their knowledge through active processing in their own schemas. *Accommodation* presents the change of their existing schemas for adaptation through interaction with the environment. *Equilibration* is associated with resolution of the conflict between their existing knowledge and new knowledge from the environment, through lasting interaction with the circumstance in order to change their existing knowledge. Equilibration is achieved by a suitable balance between assimilation and accommodation. Learners obtain and construct their new knowledge by repeating actions of assimilation, accommodation, and equilibration.

Constructivism is not just a theory, but it provides a practical approach for problem solving and critical thinking in learning (Wittmann-Price, 2009). Learners can improve problem-solving and critical thinking skills through interaction with the environment when they meet difficult situations. They actively build and construct their knowledge based on personal experience in order to solve problems. Because knowledge is not fixed, it can be changed according to the influence of prior knowledge and experience (Lambert & Walker, 1995).

Adult Learning Theory

According to Yannacci, Roberts, and Ganju (2006), Adult Learning Theory developed by Knowles, indicates that adult learning occurs differently than learning in children. Adult Learning Theory is based on humanistic theory that individuals endeavor to improve themselves and have enough potential to accomplish it. However, Adult Learning Theory includes context on the learning process while other theories do not. Knowles identifies ways of adults leaning that offers practical principles on how to design teaching methods and facilitate learning in order

to effectively promote the utilization and proficiency of new knowledge learned. In Knowles's theory, adult learners are considered "as one who is independent and has a need to understand how to learning something new will benefit them, how it fits into their existing knowledge, and reinforces their autonomy to learn in a way that works for them" (Yannacci et al., p. 5).

Knowles, Holton, and Swanson (1998) describe adult learners based on six assumptions including the need to know, the learner's self-concept, the role of the learners' experiences, readiness to learn, orientation to learning, and motivation.

Knowles et al. (1998) indicate that the need to know is the first assumption of adult learning. Adults need to understand the reasons of learning before they start learning new knowledge. When adults know advantages that will come from the learning, they are encouraged to learn effectively. Therefore, in order to promote adult learning, a facilitator has important roles to assist adults to realize the need to know by providing intellectual opportunities for learning that improves the quality of their lives. Also, more strategies should be used to increase the awareness of gaps between their current levels and desired levels that they hope to achieve.

Knowles et al. (1998) describe that the self-concept is the second assumption of adult learning. Once the self-concept is developed, individuals recognize the responsibility of making decisions for their lives. Adults have deep psychological need to be treated as self-directed people by others; therefore, adults tend to avoid circumstances that others press them for accepting their desires. This assumption reflects a difficulty in adult education. When adults are experiencing new education, they tend to be reminded of their previous experience of education, which required dependency. If adults are treated like children, a conflict occurs between the required dependency and the deep psychological need to be treated as self-directed people, and

they try to escape. Adult learning can be optimized by support to move to self-directed learning and away from dependent learning.

The role of the learner's experiences is the third assumption indicated by Knowles et al. (1998). Each adult has different values based on the volume of experiences accumulated. This in turn develops their mental habits and perceptions, and those influences on their ways of thinking and learning. A group of adult learners has a broad spectrum in "background, learning style, motivation, needs, interests, and goals" (Knowles et al., 1998, p. 66) than a group of children; therefore, individualized teaching and learning methods are important to enhance adult learning. Also, experiences of adult learners are abundant resources that can be used for their learning. Methods for utilizing experiences include reflective activities such as a group discussion, problem-solving activity, and case study. Although adults may avoid new ideas and ways of thinking due to their preferred mental habits and perceptions, they are still able to learn through the support of educators to accept new ideas. Adults may feel rejected as people if their experiences are ignored.

Knowles et al. (1998) indicate that the fourth assumption of Adult Learning Theory is the readiness to learn explaining that "adults become ready to learn those things they need to know and be able to do in order to cope effectively with their real-life situations" (Knowles et al., 1998, p. 67). Readiness means the learner is capable of moving to the next developmental stage. Although developmental readiness may not be possible for the next level, career counseling, simulation exercise and other techniques can help to lead into readiness rather than just waiting for naturally developed readiness.

Knowles et al. (1998) describes orientation to learning as the fifth assumption of adult learning theory. Adults are motivated to learn by life-centered orientation while children use

subject-centered orientation. When new ideas, knowledge, skills, understandings, values, and attitudes are presented in the context of application to real-life situations, adults learn those more effectively.

The last assumption of adult learning theory identified by Knowles et al. (1998) is motivation. Internal motivation (e.g., job satisfaction, self-esteem, and quality of life) is more important than external motivations (e.g., promotions, higher salaries, etc.) in adult learning. All adults have motivations to keep developing; however, there are some barriers, such as “a student, inaccessibility of opportunities or resources, time constraints, and programs that violate principles of adult learning” (Knowles et al., 1998, p. 68), that may hinder the learner’s motivation.

Those principles of adult learning defined by Knowles are very important to optimize adult learning, since those help to develop practical teaching strategies that promote students’ accomplishment to meet learning outcomes. Dumchin (2010) states that educators have responsibility to be well-acquainted with the principles of adult learning in order to offer adult education effectively and efficiently, as well as applying those principles.

Bloom’s Revised Taxonomy

According to Su and Osisek (2011), Bloom and his colleagues categorized cognitive domains to develop educational objectives. The taxonomy is composed of six cognitive categories: (1) Knowledge, (2) Comprehension, (3) Application, (4) Analysis, (5) Synthesis, and (6) Evaluation, and those are ordered from simple to complex and concrete to abstract.

Knowledge indicates a learner’s capacity to recall information, comprehension indicates a learner’s ability to identify the meaning of concepts, and application means a learner’s capacity for utilizing knowledge or ideas in practical circumstances. Analysis indicates that a learner can

consider elements of information or ideas and find relationships, synthesis means a learner's capacity for combining information or concepts to make plans or operations, and evaluation means that a learner can examine internal evidence and judge external criteria.

The revision of Bloom's Taxonomy was developed 45 years later from the original taxonomy developed by Bloom and his colleagues (Krathwohl, 2002). The Revised Bloom's Taxonomy was developed to help educators provide a framework to design learning activities and develop intended learning objectives and assessment strategies. The Revised Taxonomy emphasizes learners' learning while the original taxonomy focused on assessing learners' performances, (Su & Osisek, 2011). Krathwohl (2002) points out that the Revised Taxonomy defines four knowledge categories within the knowledge dimension: (1) Factual Knowledge, (2) Conceptual Knowledge, (3) Procedural Knowledge, and (4) Metacognitive Knowledge, as well as six cognitive categories within the cognitive process dimension: (1) Remember, (2) Understand, (3) Apply, (4) Analyze, (5) Evaluate, and (6) Create. Those are ordered from simple to complex like the original taxonomy. Factual knowledge is the basic elements to acquire discipline or solve problems, conceptual knowledge is "the interrelationships among the basic elements within a larger structure", procedural knowledge is about "how to do something", and metacognitive knowledge is "knowledge of cognition in general as well as awareness and knowledge of one's own cognition" (Krathwohl, 2002, p. 214). Also, the categories and cognitive processes are defined as shown in Table 1.

Table 1

The Cognitive Dimension of Bloom's Revised Taxonomy

Categories	Cognitive Process
Remember	“Retrieving relevant knowledge from long-term memory” (Krathwohl, 2002, p. 215). : Recognizing and recalling
Understand	“Determining the meaning of instructional messages, including oral, written, and graphic communication” (Krathwohl, 2002, p. 215). : Interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining
Apply	“Carrying out or using a procedure in a given situation” (Krathwohl, 2002, p. 215). : Executing and implementing
Analyze	“Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose” (Krathwohl, 2002, p. 215). : Differentiating, organizing, and attributing
Evaluate	“Making judgments based on criteria and standards” (Krathwohl, 2002, p. 215). : Checking and critiquing
Create	“Putting elements together to form a novel, coherent whole or make an original product” (Krathwohl, 2002, p. 215). : Generating, planning, and producing

Bloom's Revised Taxonomy provides a framework to classify learning objectives as well as outcomes. By using Bloom's Revised Taxonomy, nursing educators can develop instructional design that accommodates with learning contents and cognitive processes. Also, cognitive level required for NCLEX-RN success are classified by the taxonomy. Figure 1 show how constructivism, Adult Learning Theory, and Bloom's Revised Taxonomy are blended as the theoretical framework used for this study.

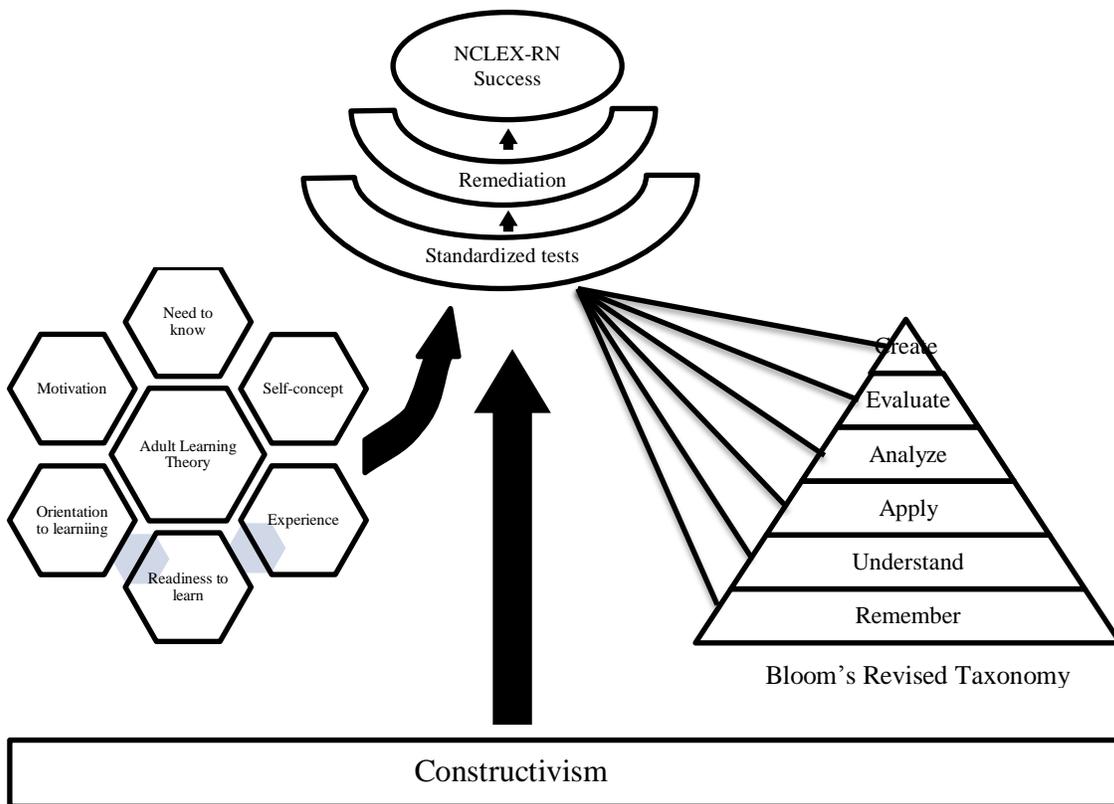


Figure 1. A diagram of the theoretical framework used for this study

Nursing Literature

NCLEX-RN Structure

The NCLEX-RN is developed by National Council of State Boards of Nursing (NCSBN), which is a non-for-profit organization found in 1978 and comprised of the member boards, to be utilized for assisting in making decisions if candidates are competent to provide safe nursing care as an entry-level RN. The licensure exam has implemented computer adaptive testing (CAT) since 1994 and is reviewed by the NCLEX Examination Committee every three years. The committee uses various resources in order to reflect current state nursing practice in the revised test plan. The recent practice of the entry level RNs is researched by asking 12,000 newly licensed RNs about “frequency and importance of performing 155 nursing care activities” (NCSBN, 2010, p. 2), and opinions of experts, such as the NCLEX Examination Committee,

NCSBN content staff, and boards of nursing, are collected. Then, the data of nursing care activities is analyzed “in relation to the frequency of performance, impact on maintaining client safety and client care settings where the activities are performed” (NCSBN, 2010, p. 2) as well as the experts’ opinions. Therefore, the entry-level RN’s nursing practice meeting client needs and fundamental processes required for the nursing practice are identified and used to develop the framework of the NCLEX-RN test plan (NCSBN, 2010).

The NCLEX-RN is to assess candidate’s knowledge, skills and abilities, which are required to provide nursing care for health promotion, maintenance or restoration of clients. Candidates are required to apply their knowledge, skills, and abilities by using critical thinking to answer the test items. The NCLEX-RN test plan is composed of four client needs categories; (1) Safe and effective care environment: Offering nursing care that improves the care delivery setting to protect clients and other health personnel, (2) Health promotion and maintenance: Offering and directing nursing care that be applied from the knowledge of development principles, promotion of health, and early detection of health problems, (3) Psychosocial integrity: Providing and directing nursing care that enhances and helps the emotional, mental, and social wellness of the client, and (4) Physiological integrity: Managing health and offering nursing care that promotes comfort and reduces risks. The category of the safe and effective care environment is divided into two subcategories; (1) Management of care: Offering nursing care that improves the care delivery setting to protect clients and other health personnel, and (2) Safety and infection control: Preventing health and environmental hazards and protecting clients and health care providers from the hazards. The category of the physiological integrity is divided into four categories; (1) basic care and comfort: “Providing care and comfort, reducing client risk potential and managing health alterations” (NCSBN, 2010, p. 7), (2) pharmacological

and parenteral therapies: Administering medications and carrying out parental therapies safely, (3) reduction of risk potential: Reducing the possibility of developing complications or health problems, and (4) physiological adaptation: “Managing and providing care for clients with acute, chronic or life-threatening physical health conditions” (NCSBN, 2010, p. 7). Nursing process, caring, communication and documentation, and teaching/learning are integrated throughout each category and subcategory of the client needs since the processes are considered essential for nursing practice (NCSBN, 2010).

The examination is mostly composed of multiple-choice items; however, other formats, such as multiple responses, fill-in-the blank, drag and drop, and hot spots, are also provided on the NCLEX-RN examination. The portion of test items assigned to each category and subcategory of the client needs in the NCLEX-RN test plan is decided by the result and findings of the 2008 RN Practice Analysis and the NCLEX Examination Committee member’s judgment (NCBSN, 2010). The percentage of items from each category and subcategory is shown in Table 2.

Table 2

The Percentage of Items from Each Category and Subcategory of the Client Needs in NCLEX-RN Test Plan

Categories/Subcategories	Percentage of Items
Safe and Effective Care Environment	
• Management of Care	16-22 %
• Safety and Infection Control	8-14 %
Health Promotion and Maintenance	6-12 %
Psychosocial Integrity	6-12 %
Physiological Integrity	
• Basic Care and Comfort	6-12 %
• Pharmacological and Parenteral Therapies	13-19 %
• Reduction of Risk Potential	10-16 %
• Physiological Adaption	11-17 %

(NCBSN, 2010, p. 4)

NCLEX-RN Predictors

In order to meet the demand of increased entry level RN's competence, the minimum score for passing on the NCLEX-RN has been raised by the NCBSN. Because nursing programs have been challenged by the change, educators have put efforts into finding strong predictors of NCELX-RN success and provide interventions to ensure that their students pass the NCELX-RN (Sifford & McDaniel, 2007). Educators utilize strong predictors of the NCLEX-RN outcomes to identify students at risk and provide effective interventions; therefore, there has been useful research about the predictors.

Uyehara, Magnussen, Itano, and Zhang (2007) reviewed previous studies about the predictors of NCLEX-RN success. In a study of the predictors from 1988 to 1994, the verbal score on the Scholastic Assessment Test (SAT) was found to be as a strong predictor of the

future NCLEX-RN outcomes on the first-attempt. Another study indicated that there was a statistically significant correlation between composite score on the Nursing Entrance Test (NET) and NCLEX-RN outcome on the first-attempt, and it could be concluded that the future NCLEX-RN outcome can be predicted by the NET composite score. In addition, there were researchers studying if there was correlation between performance in specific courses and NCLEX-RN success on the first-attempt. In the studies, pathophysiology, adult health nursing, mental health nursing, maternal-newborn nursing, pediatric nursing, and high-acuity nursing were identified as predictors of NCLEX-RN success on the first-attempt.

Humphreys (2008) studied academic and nonacademic predictors of success on the NCLEX-RN. Academic records of 338 graduates from an associate degree nursing program were analyzed by descriptive and inferential statistics. It was found that academic predictors (composite, math, and science scores on ACT and college GPA) strongly indicated success on NCLEX-RN while nonacademic predictors (gender, ethnicity, and marital status) except age at NCLEX-RN sitting did not.

Seldomridge and Dibartolo (2004) studied the best models of predicting NCLEX-RN outcome on the first-attempt. In the study, NCLEX-RN outcome was the dependent variable, and 13 independent variables were set in three groups in order of timeframe: preadmission (cumulative GPA in pre-nursing and grades on Anatomy and Physiology I, Pathophysiology, Chemistry, and Statistics), after completion of the first year of the nursing major (cumulative GPA after completion of the first semester of junior nursing courses and the number of failing grades [C] in junior nursing courses), and last semester of the nursing program (number of failing grades [C] in all nursing courses and percentile score on the National League for Nursing Comprehensive Achievement Test for Baccalaureate Students [NLNCATBS]). The sample of

the study was 186 graduates from a rural baccalaureate program from 1998 through 2002. While 19.3 percent of the samples failed the NCLEX-RN on the first-attempt, 80.6 percent of the samples passed the NCLEX-RN on the first-attempt. A *t*-test and logistic regression were used to analyze the data in order to identify correlations between dependent and independent variables and predictors of NCLEX-RN outcome among the independent variables. The result of the study showed that the most accurate predictors of both NCLEX-RN success and failure were the combination of the composite score on the NLNCATBS and grade in pathophysiology. They predicted 93.3 percent of NCLEX-RN success, and 50 percent of NCLEX-RN failure. Each of these variables still predicted NCLEX-RN success accurately alone; however, a few of NCLEX-RN failures (2.8 percent by the grade in pathophysiology and 25 percent by the score on the NLNCATBS) were not predicted (p. 364). Although the mean score in Medical-Surgical Nursing course, the number of failing grades in nursing courses, cumulative GPA in pre-nursing and nursing courses effectively predicted NCLEX-RN success, these were not accurate to predict NCLEX-RN failure.

Baker (2008) studied if there were correlations between the number of prerequisite, science courses, and standardized preadmission testing and NCLEX-RN success on the first attempt. The researcher focused on prerequisite and admission criteria as a predictor of NCLEX-RN success. In the study, a combination of qualitative and quantitative research methods was used. Directors of 10 associate nursing programs in Arizona were contacted to identify their prerequisite and admission requirements, and then the data and their NCLEX-RN pass rate were analyzed by Chi square and Spearman rho measurements. The result showed that there were not statistical correlations between the number of prerequisite courses, science courses, and standardized preadmission testing and NCLEX-RN success, although many

directors stated that those factors helped to select students prepared for nursing programs and were utilized as early predictors of success on the NCLEX-RN.

Vandenhouten (2008) studied predictors of NCLEX-RN success on the first-attempt through analyzing data of samples that were composed of 296 graduates from one baccalaureate nursing program. Logistic regression was used to analyze the data, and it was found that older age on admission, ACT cumulative score, performance in pharmacology, adult medical-surgical nursing, and community health nursing, and cumulative GPA predicted success on the NCLEX-RN while attending commercial NCLEX-RN review course did not predict NCLEX-RN success. However, all of the admission variables, performances in nursing courses except pharmacology course, and cumulative GPA did not predict NCLEX-RN failure. Only lower performance in pharmacology course indicated more likely failure on the NCLEX-RN.

Upon introducing standardized tests in nursing education, many nursing programs have used the standardized tests as predictors to promote their students' success on the NCLEX-RN. Crow, Handley, Morrison, and Shelton (2004) surveyed 160 baccalaureate nursing programs and identified that 90 percent of the programs utilized a standardized comprehensive examination, and 29.4 percent of the programs used cumulative GPA in order to predict their students' success on the NCLEX-RN. According to Hedderick (2009), 92.10% of 76 accredited nursing programs in Pennsylvania preparing students to take the NCLEX utilized a NCLEX predictor assessment, which was purchased from a vendor to assess students' readiness to pass the NCLEX (p. 73). Seventy-one nursing programs utilized NCLEX predictor assessment products throughout the nursing curriculum. Among the programs, 15 programs marked the first-attempt NCLEX pass rate in the high range (90-100 percent), 34 programs marked that in the medium range (80-89 percent), and 22 programs marked that in the low range (70-79 percent). In addition,

Comprehensive NCLEX predictor assessment was implemented at the end of the program in 73 nursing schools. Fifteen schools had a NCLEX pass rate on the first-attempt in the high range, 36 schools had the pass rate in the medium range, and 22 schools had the pass rate in the low range. Therefore, the study showed that there was no statistical significance to use NCLEX-RN predictor assessment products throughout the nursing curriculum and at the end of the program when compared to NCLEX success rates on the first-attempt (p. 76-77).

Standardized tests have been used in many nursing programs as a predictor of NCLEX-RN success on the first-attempt. These types of tests are developed by outside commercial vendors, with the most commonly used being the Educational Resources, Inc. (ERI), ATI, the Health Education Systems, Inc. (HESI) Exit Examination, and the Mosby Assess Test (MAT) (Harding, 2010). In addition, a comprehensive assessment has been the most popular type of standardized test used as a predictor of success on the NCLEX-RN. The assessment is a comprehensive examination, conducted usually in the last semester of the nursing program. The Health Education Systems, Inc. (HESI) Exit Exam is a method commonly used in many nursing programs to predict students' outcomes on the NCLEX-RN (Spurlock & Hunt, 2008).

Harding (2010) reviewed 16 studies to identify the accuracy of standardized comprehensive assessment products developed by commercial vendors on predicting NCLEX-RN success. Most of the 16 studies found predictability of the HESI Exit Exam on NCLEX-RN outcomes on the first-attempt and found the exam had 96.4 percent to 98.3 percent accuracy in predicting NCELX-RN success. However, the HESI Exit Exam predicted only 34 of the 1,248 NCLEX-RN failures in one study, and another study found that a group of "low scoring students, defined as those scoring in the 690 (69 percent) and below range, was significantly more likely to fail (44.32 percent) the licensure examination than high scoring

students” (Harding, 2010, p. 494). In addition, a study indicated that students with low scores on the HESI Exit Exam more likely (48.1 percent) to fail on the NCLEX-RN than those with high scores on the exam, and only 480 students of the 3,318 with middle scores on the HESI Exit Exam failed on the NCLEX-RN. Also, one of the studies reviewed by Harding (2010) found that the first-attempt score on the HESI Exit Exam had a strong predictability on NCLEX-RN success. As students took the exam multiple times after failure on the exam, the subsequent scores’ predictability decreased.

Spurlock and Hunt (2008, p. 160-161) also studied the effectiveness of the HESI Exit Exam as a predictor of NCLEX-RN failure by analyzing 179 students’ scores on the exam and outcomes on the NCLEX-RN. Students who achieved above 850 on the HESI Exit Exam were expected to pass the NCLEX-RN, and those who achieved below 850 on the exam were expected to fail the licensure test. Among 167 students with scores above 850 on the HESI Exit Exam, 22 of those failed the NCLEX-RN while ten students of 12 with score below 850 passed the NCLEX-RN. The scores on the first HESI Exit Exam were statistically significant predictors of success on the NCLEX-RN; however, these scores poorly predicted failure on the NCLEX-RN.

Other standardized comprehensive assessments were studied by several researchers. Harding (2010) reviewed the studies. One study found that scores on the MAT of students with success on the NCLEX-RN were significantly higher than those of students who failed on the NCLEX-RN. However, another study showed that the MAT score did not significantly predict NCLEX-RN success. In addition, in a study, the NLN achievement test was found to have a correlation with NCLEX-RN success; however, the NLN achievement was not a strong predictor of NCLEX-RN outcomes when analyzed by logistic regression. Moreover, the ERI was researched in only one study. The composite score on the ERI was significantly higher in a

group of students with success on the NCLEX-RN than those with failure on the licensure exam.

Also, two studies compared the predictabilities of the HESI Exit Exam and the MAT.

One study found that the HESI Exit Exam was significantly stronger than the MAT in predicting NCLEX-RN success. Another study also identified that the HESI Exit Exam had higher accuracy (91 percent) than the MAT (57 percent) in predicting success on the NCLEX-RN; however, both assessment's predictabilities of failure on the NCLEX-RN were almost equal. The HESI Exit Exam had 22 percent accuracy, while the MAT had 19 percent accuracy in predicting failure on the NCLEX-RN.

Many researchers have tried to find strong predictors of NCLEX-RN success, and several variables have been studied to identify their effectiveness as a predictor. A summary of the literature reviewed is shown in Table 3. Although performances in science courses and on comprehensive predictor exam have been identified as effective predictors in the studies, there are still controversies surrounding this question, since studies about the predictors showed inconsistent results.

Table 3

A Summary of NCLEX-RN Predictors Literature Review

Authors & Year	Findings	Significances
Uyehara, Magnussen, Itano, and Zhang (2007)	<ul style="list-style-type: none"> Verbal scores on SAT, NET composite score, and performance in pathophysiology, adult health nursing, mental health nursing, maternal-newborn nursing, pediatric nursing, and high-acuity nursing course 	(+) NCLEX-RN success
Humphreys (2008)	<ul style="list-style-type: none"> Composite, math, and science scores on ACT, college GPA, and age at NCLEX-RN sitting Gender, ethnicity, and marital status 	(+) NCLEX-RN success (-) NCLEX-RN success

Authors & Year	Findings	Significances
Seldomeridge and Dibartolo (2004)	<ul style="list-style-type: none"> • Composite score on the NLNCATBS and grade in pathophysiology were predictors of success and failure on the NCLEX-RN. • Mean scores in medical-surgical nursing course, the number of failing grades in nursing courses, cumulative GPA in pre-nursing and nursing courses 	<p>(+) NCLEX-RN success and failure</p> <p>(+) NCLEX-RN success, but (-) failure</p>
Baker (2008)	<ul style="list-style-type: none"> • No statistical correlations between the number of prerequisite courses, science courses, and standardized preadmission testing and NCELX-RN success. 	
Vandenhouten (2008)	<ul style="list-style-type: none"> • Older age on admission, ACT cumulative score, performance in pharmacology, adult medical-surgical nursing, and community health nursing, and cumulative GPA • Attending commercial NCLEX-RN review course • Lower performance in pharmacology course 	<p>(+) NCLEX-RN success, but (-) failure</p> <p>(-) NCLEX-RN success</p> <p>(+) NCLEX-RN failure</p>
Hedderick (2009)	<ul style="list-style-type: none"> • There was no statistical significance to use NCLEX-RN predictor assessment products throughout the nursing curriculum and at the end of the program when compared to NCLEX-RN. 	
Harding (2010)	<ul style="list-style-type: none"> • The HESI Exit Exam • MAT • The NLN achievement test 	<p>(+) NCLEX-RN success, but (0) failure</p> <p>(0) NCLEX-RN success</p> <p>(-) NLCEX-RN success</p>
Spurlock and Hunt (2008)	<ul style="list-style-type: none"> • HESI Exit Exam 	<p>(+) NCLEX-RN success, but (-) failure</p>

Note: (+) =can predict, (0) =neutral in predicting, and (-) =cannot predict

Previous ATI Testing Studies

ATI is a vendor that provides assessment products for nursing education. The Test of Essential Academic Skills (TEAS) and Comprehensive Assessment and Review Program (CARP) are the most commonly used assessments among ATI's products. The TEAS is to assess students' readiness for a nursing program, and the CARP is designed to be utilized throughout nursing program and provide resources for remediation to improve NCLEX-RN pass rate (ATI,

2012). The ATI reports that their products have been increasingly used; however, there is a problem of insufficient knowledge about the accuracy of the ATI scores in predicting NCLEX-RN outcomes on the first-attempt in order to identify students at risk for remediation (Carl, 2007).

Vandenhouten (2008) analyzed NCLEX-RN outcomes and scores on the ATI CARP and the ATI RN Comprehensive Predictor 3.0 of 296 graduates from a baccalaureate nursing program by using logistic regression in order to study predictors of NCLEX-RN outcomes. The results of this study showed all of the ATI content exams (Fundamentals, Maternal Newborn, Medical Surgical, Leadership, Community Health, and Pharmacology) significantly predicted NCLEX-RN success; however, those were not effective to predict NCLEX-RN failure. The ATI content exams classified 98.6 percent to 100 percent of success on the NCLEX-RN and 7.7 percent to 30 percent of failure on the NCLEX-RN (p. 113-115). The ATI RN Comprehensive Predictor was also effective to predict success on the NCLEX-RN. The exam classified 100 percent of NCLEX-RN success. However, any NCLEX-RN failure was not classified by the ATI RN Comprehensive Predictor, although low scores in the exam were correlative with NCLEX-RN failure.

Jacobs and Koehn (2006) had a different conclusion in their study from Vandenhouten's (2008) study. Since the researchers' nursing program newly utilized the ATI, students' NCLEX-RN outcomes and scores on the ATI RN Comprehensive Predictor were compared. It was found that "13 percent of the May 2005 class scored less than the national (20th) percentile on the ATI RN Comprehensive Predictor" (p. 376). Fifty percent of those with low scoring on the ATI RN Comprehensive Predictor were unsuccessful on the NCLEX-RN. The researchers concluded that the comprehensive test developed by ATI could be used as an important predictor

to identify students at risk.

Alameida et al. (2011) studied if there was a relationship between the predictive probability on the ATI RN Comprehensive Predictor and success on the first-attempt NCLEX-RN. The researchers analyzed 589 students' data, and the students took different versions of the ATI Comprehensive Predictor, because the versions were changed as the NCLEX-RN test plan changed. Version 3.0 was completed by 367 students, and 222 students took Form A or B. These two sample groups were analyzed separately, since the Form A and B were based on same NCLEX-RN test plan, and Version 3.0 was based on a different test plan. The sample groups were composed of racially diverse students (Asian 38 percent, Caucasian 30.6 percent, African American 7.3 percent, and Hispanic 10.9 percent). Also, there was greater portion of male students (23.3 percent) than typical male portions in other nursing programs. In this study, it was found that there was a significant correlation between success on the NCLEX-RN and the ATI predictive probability on both Version 3.0 and Forms A and B. The mean predictive probability of students with success on the NCLEX-RN was 80.47, and the mean predictive probability of those with failure on the NCLEX-RN was 36.34. By using two-step cluster analysis, three groups of students were identified based on "the range of values on the ATI predictive probability score that indicated first-time success or failure" (p. 265) in the group of students who took Version 3.0. The first group's mean of predictive probability score was 92.04, indicating NCLEX-RN success on the first-attempt. The second group's mean score was 37.55, indicating NCLEX-RN success although these students should fail according to the ATI examination. The last group's mean score was 35.06, indicating NCLEX-RN failure. The researchers interpreted that the second group was composed of students who did not take the exam seriously, because only 3 percent of the course grade came from the exam when the

nursing program utilized Version 3.0. This assumption was strengthened by the following data. As a version of the ATI Comprehensive Predictor changed to Forms A and B, the nursing program increased the portion of the exam in the course grade to 10%. By using the two-step cluster analysis, only two groups were identified in the sample group, which took the Forms A and B. One group's mean of predictive probability was 83.94, which indicated NCLEX-RN success. The other group's mean of predictive probability was 39.31, which indicated NCLEX-RN failure. The researchers stated that using the ATI Comprehensive Predictor helped faculty to identify content areas student performed well in and students' weak areas. Also, it was possible to identify students at risk and provide remediation for them (p. 264-265).

Jacobs and Koehn (2006) described the process of a standardized testing program implementation in a nursing school. The nursing school had a goal to achieve their NCLEX-RN pass rate at or above the national pass rate; however, they had failed to meet the goal for several semesters. Therefore, the faculty of the nursing school decided to utilize a standardized testing program as one of the strategies to improve students' readiness for NCLEX-RN. The ATI tests were chosen as the standardized testing program because students received scores and detailed feedback immediately, student assessment data could be easily accessed online, non-proctored assessments were available, and technical support was provided. The nursing school used the TEAS as one of the admission criteria, the ATI RN Content Mastery Series throughout the nursing program, the RN Comprehensive Predictor at the end of the nursing program. As a result of implementing the ATI testing, their first group of graduates, who had only the ATI RN Comprehensive Predictor, NCLEX-RN pass rate was 92 percent, which increased from a mean of 86 percent from the prior three semesters. Through utilizing ATI testing, faculty took advantage of the standardized testing to identify students at risk of failure on the NCLEX-RN, to

be motivated to review their course contents, and to evaluate their course exam items. The ATI testing was also beneficial to their students. On the exit survey, many students answered that the ATI books were good study material for NCLEX-RN; however, the students indicated that they did not frequently use books as the study aids in the nursing program. The students that expressed positive reaction to the ATI testing consisted of 29 out of 35 students. However, few students negatively indicated that they had lack of time to study for the ATI testing. In the conclusion of the study, researchers stated that utilizing the ATI testing helped faculty in the nursing school to support their students to be prepared for NCLEX-RN success and providing excellent nursing care (p. 377).

Although there is an argument about the ATI testing's accuracy in predicting failure on the NCELX-RN, most studies indicated that the ATI testing is effective to predict NCLEX-RN success, identify students at risk, and improve NCLEX-RN pass rate. However, there is a need for having longitudinal studies to identify long-term effects of using the ATI testing on program. Also, the ATI Content Mastery Series should be studied to find on how the test can be used effectively in order to enhance students' success on the NCLEX-RN (Alameida et al., 2011). A summary of the literature reviewed is shown in Table 4.

Table 4

A Summary of Previous ATI Testing Literature Review

Authors & Year	Findings	Significances
Vandenhouten (2008)	<ul style="list-style-type: none"> The ATI content exams (Fundamentals, Maternal-Newborn, Medical-Surgical, Leadership, Community Health, and Pharmacology) The ATI RN Comprehensive Predictor 	(+) NCLEX-RN success, but (-) failure
Jacobs and Koehn (2006)	<ul style="list-style-type: none"> The ATI RN Comprehensive Predictor 	(+) NCLEX-RN success, but (-) failure
Alameida et al. (2011)	<ul style="list-style-type: none"> There was a significant correlation between success on the NCLEX-RN and the ATI Comprehensive Predictor's predictive probability. 	(+) NCLEX-RN failure

Note: (+) =can predict and (-) =cannot predict

NCLEX-RN Remediation

Each nursing program uses different methods, usually standardized tests, to identify students at risk for NCLEX-RN failure or with low academic performance. As those students are identified in nursing programs, educational interventions are initiated to support the students. Various interventions have been developed and implemented, and their efficiencies have been studied by researchers (Pennington & Spurlock, 2010).

According to Stark, Feikema, and Wyngarden (2002), in order to succeed on the licensure test, students need to be prepared for taking the test on a computer, managing anxiety and time, and test taking skills as well as knowledge of nursing content. Therefore, it should be included in the remediation plan to help students to manage time while taking test, find key points on question stem, and use relaxation techniques. English and Gordon (2004) found that it was successful to support students who failed on the exit exam with providing sessions of relaxation techniques and test taking skills in the remediation course. The students' levels of stress, anxiety, and learning styles and needs were also assessed in the remediation course. All of the students

who failed on the exit exam on the first-attempt passed on the second-attempt exit exam. However, Sifford and McDaniel (2007) had less satisfied outcomes of remediation, which was similar to English and Gordon's (2004). They provided a two credit graded remediation course for 47 students who failed on the exit exam in the first semester of senior year. The students had instruction on test taking skills, finding key items in the question stem, pacing time, and reducing anxiety as well as nursing process and content. The students' characteristics and learning styles were also assessed to assist finding individual study methods. As a result of the remediation strategy, only 38 percent of the students passed on the exit exam after having the intervention. The researcher assumed that earlier identification, longer hours, and mandatory attendance might be needed to improve the result. Also, "student maturation, concurrent interventions, exposure to additional content via the regular curriculum, and increased pressure to succeed as graduation nears" (Sifford & McDaniel, 2007, p. 36) affected the result since students' performances on the test were influenced by these factors.

A mandatory remediation course is one of the strategies used to assist students at risk. Because students at risk tend not to voluntarily attend supplemental programs or courses, remediation can be more successful when it is mandatory (Heroff, 2009). Norton et al. (2006) indicated that the mandatory remediation with completion of NCLEX-RN questions review was effective to improve NCLEX-RN pass rate. In a nursing program, standardized tests, SAT scores, performances in science and nursing courses, and individual factors (test anxiety and learning disabilities) were used to identify students at risk after completing junior level nursing courses. Then, the students were required to take a mandatory remediation course during their senior year. In the course, case studies were used to improve students' critical thinking skills, and students had review of nursing content and test taking skills. Also, students were required to

complete over 800 NCELEX-RN practice questions and attend a 3 day NCLEX-RN review course. After implementing this remediation strategy, the nursing program's NCLEX-RN pass rate significantly improved.

In some nursing programs, standardized tests are utilized as one of the interventions to improve students' readiness for the NCLEX-RN as well as a predictor of NCLEX-RN outcomes. A study of Morrison, Free and Newman (2002) showed how remediation was implemented based on the HESI Exit Exam in five nursing schools. Students, who did not achieve at or above a benchmark score on the HESI Exit Exam, were required to have remediation. In one nursing program, the students were told to have a copy of their scores that includes content areas, which needed to be studied. In another school, faculty recovered content indicated as weak areas on the HESI Exam. Also, in a different nursing school, the associate dean met and encouraged students and answered their questions, and another school's faculty reviewed exam items included in computer programs with students. Although these were not aggressive interventions, the nursing schools NCLEX-RN pass rate increased 9 to 41 percent, and its range from 77 to 97 percent in two years after implementing the remediation policy. Therefore, the researchers concluded that developing and implementing remediation policy based on the HESI Exit Exam was effective to support students to pass on the NCLEX-RN.

In contrast, Spurlock and Hunt (2008) indicated remediation and progression policy based on the HESI Exit Exam was not effective to improve a NCLEX-RN pass rate. They implemented different remediation from the nursing schools in the study of Morrison, Free and Newman (2002). Students were required to achieve at or above 850 on the HESI Exit Exam, and if not, they were required to take the NCLEX-RN review program. Until the nursing program received a validation of taking the NCLEX-RN review program, a certificate of completion of

the program was not issued. However, the program's NCLEX-RN pass rate was not improved. Therefore, remediation was changed to allow students to retake the HESI Exit Exam until achieving at or above the benchmark score. Until the students achieved the minimum score (850), they received an incomplete grade in a capstone course. However, their NCLEX-RN pass rate still did not improve. This result led their faculty to investigate the accuracy of the HESI Exit Exam as a predictor of NCLEX-RN success.

An individual test plan is one of the remediation strategies. Students can develop a realistic study plan for NCELX-RN with consideration to their circumstances (moving, marriage, divorce, new job, etc.), and the study plan designed by the students can work for them much better than those designed by faculty. Faculty was responsible to review the plan and encourage students to follow the plan (March & Ambrose, 2010). Carr (2011) indicated that individual study plans with taking a remediation course were effective to improve NCLEX-RN pass rate. After identifying students at risk by using standardized tests, they were required to take a remediation course. In the course, students had instruction on test taking strategies and small group or individual meetings with faculty to discuss their individual study plans including reading and practice questions in identified weak areas. The researcher reported that their NCLEX-RN pass rate was significantly improved after having the remediation strategy. March and Ambrose (2010) also indicated an individual study plan was effective to enhance NCLEX-RN success. Students who failed on the standardized tests were required to develop an individual study plan including their strong and weak areas based on the computerized objective analysis provided by the standardized tests results. Faculty met the students individually before their graduations to encourage following the plan and preparing for the NCLEX-RN. This remediation resulted in increasing and keeping the nursing program's NCLEX-RN pass rate to

above 91 percent for four years (p. 232).

Each nursing program develops various types of remediation, and the remediation is usually based on the results of the standardized tests. However, according to Pennington and Spurlock (2010), there is no strong evidence to support remediation's effectiveness. It is ambiguous which remediation strategy positively affects and which does not. Since remediation is implemented as a set of several strategies, it is not easy to evaluate each strategy's efficiency independently.

Summary

Since NCLEX-RN pass rate is one of the important outcomes of a nursing program, there is a lot of literature discussing NCLEX-RN structure, NCLEX-RN predictors, ATI testing, and remediation. Key predictors included: Verbal score on the SAT, composite score on the NET, cumulative score in the SAT, older age on admission, cumulative GPA, HESI Exit Exam, and performance in pathophysiology, adult health nursing, mental health nursing, maternal-newborn nursing, pediatric nursing, and high-acuity nursing. Standardized tests are commonly used in many nursing programs and are popular subjects to study in order to identify effectiveness as a predictor of outcomes on the NCLEX-RN. Most standardized tests were identified as effective predictors of NCLEX-RN success; however, there was a controversy about whether standardized tests were effective to predict failure on the NCLEX-RN. Many researchers have recommended studying more variables of the NCLEX-RN predictor in longitudinal studies.

CHAPTER 3

METHODOLOGY

Introduction

In order to contribute to resolving the problem of the nursing shortage and preventing problems caused by NCLEX-RN failures, nursing programs have tried to identify students who are at risk of NCLEX-RN failure and to support them for NCLEX-RN success on the first-attempt by providing remediation. For that, finding NCLEX-RN predictors is necessary; therefore, many nursing education researchers have studied various effective predictors of NCLEX-RN outcomes and remediation as discussed in the literature review. Most studies have focused on standardized comprehensive exams as predictors. However, those tests have usually been conducted at the end of nursing programs, and there are needs for predictors that can be used for earlier remediation. This study focused on the standardized tests that are used throughout the nursing program in order to contribute to the implementation of early remediation. The purpose of this study was to investigate predictors of NCLEX-RN success on the first-attempt among standardized tests; adult medical-surgical, fundamentals, pharmacology, maternal-newborn, nursing care of children, mental health, community health, and leadership and management. In this chapter, this study's research questions, research design, participants, inclusion criteria, exclusion criteria, data collection procedures, protection of human subjects, validity and reliability of instruments, and data analysis methods are presented.

Research Questions

1. Are there significant differences in the individual adjusted scores of the standardized tests (adult medical-surgical, fundamentals, pharmacology, maternal-newborn, nursing care of children, mental health, community health, and leadership and management) between the two groups of students with NCLEX-RN success and failure on the first-attempt?
2. Can the NCLEX-RN outcome (success or failure) on the first-attempt be correctly predicted from the standardized tests?
3. If the NCLEX-RN outcome on the first-attempt can be predicted correctly, which variables are central in the prediction of the NCLEX-RN outcome on the first-attempt?
4. How many of the NCLEX-RN successes on the first-attempt are classified correctly? How many of the NCLEX-RN failures on the first-attempt are classified correctly?

Research Design

A quantitative research approach was used in this study. A list of individuals who were in the last nursing course of the traditional baccalaureate nursing program in the spring 2010, summer 2010, fall 2010, spring 2011, summer 2011, and fall 2011 was gathered to determine individuals who graduated from the program from May 2010 to December 2011. Among the individuals, only those who took the NCLEX-RN before May 2012 were added to a sample group of this study. Then, their NCLEX-RN outcomes, which were a dependent variable of this study, and individual adjusted scores on the nursing content standardized tests, which were independent variables of this study, were gathered. The ATI Content Mastery Series developed by a vendor of the ATI was utilized in the traditional baccalaureate nursing program, which was a setting used to collect data. Among the subjects of the ATI Content Mastery Series, adult medical-surgical, fundamentals, pharmacology, maternal-newborn, nursing care of children,

mental health, community health, and leadership and management were selected as the independent variables because this study focused on the standardized tests conducted throughout the nursing program. Therefore, there were a total of eight independent variables as predictors of NCLEX-RN outcomes on the first-attempt. The samples' demographic data (age, gender, and ethnicity) were also collected to describe the samples; however, the data were not used as data analyzed in this study. The list of graduates, their NCLEX-RN outcomes, and their individual adjusted scores on the standardized tests were archival data.

The research design of this study was composed of two steps. First, the samples were divided by their NCLEX-RN results so that there were two groups. One was composed of those who succeeded the NCLEX-RN on the first-attempt, and another was composed of those who failed the NCLEX-RN on the first-attempt. This was to compare those two sample groups' individual adjusted scores on the standardized tests and determine if there were significant differences in the adjusted individual scores on the standardized tests between the two groups of students with NCLEX-RN success and failure on the first-attempt. The second step was to find which standardized tests could correctly predict NCLEX-RN outcome on the first-attempt. The participants' individual adjusted scores on the standardized tests, which were the continuous variables, and their NCLEX-RN outcomes on the first-attempt, which were dichotomous variables, were analyzed to determine if the continuous variables correctly predict the dichotomous variables.

Participants

The participants of this study were graduates from the traditional baccalaureate nursing program of a public university located in the Midwest from May 2010 to December 2011. It was expected to have approximately 150 participants that were composed of approximately 120

graduates who passed and 30 graduates who failed the NCLEX-RN on the first-attempt. All of the graduates had physically attended campus classes. Most of the participants began their college experience at the University; however, some of them were transfer students. Also, there were international and returning students with previous degrees. The participants took fundamentals and mental health standardized tests during their sophomore year, maternal newborn, nursing care of children, and pharmacology standardized tests during their junior year, and adult medical-surgical, community health, and leadership and management standardized tests during their senior year. In order to have the largest possible number of participants, a convenience sample of all eligible graduates was used in this study. In 2011, 89.9 percent of candidates with baccalaureate degrees passed the NCLEX-RN on the first-attempt (NCSBN, 2010b). As shown on the national pass rate of the NCLEX-RN in 2011, there were many more graduates who passed the NCLEX-RN on the first-attempt than those who failed. In the traditional baccalaureate nursing program, which was a setting of this study, had the same circumstance. If sample sizes of students who succeeded and failed the NCLEX-RN were matched by the random sampling method, the sample size of this study would be too small. Therefore, a convenience sample of all eligible graduates identified by the inclusion and exclusion criteria was utilized in this study.

Inclusion Criteria

The inclusion criteria of the sample included all graduates from the nursing program from May 2010 to December 2011 who took the NCLEX-RN, which was revised in April 2010 by the time of data collection. Transfer, international, and returning students were also included in the sample group if they met the same requirements. In each nursing class, students who did not achieve individual adjusted scores at or above the benchmark score on the first-attempt were

allowed to retake the standardized test one more time. They did not have identical tests on the second attempt. In this study, the individual adjusted scores of each nursing subject standardized test only on the first-attempt were eligible to be utilized in this study in order to collect data from the same tests.

Exclusion Criteria

As stated above, the students were allowed to retake each standardized test one more time if they did not achieve an individual adjusted score at or above the benchmark score on the first-attempt. Any individual adjusted scores on each standardized test achieved on the second-attempt were not eligible for use in the study in order to maintain the same conditions and collect data from the same tests. Also, the students were allowed to retake a nursing course if they did not achieve the course grade above C. Any other individual adjusted scores achieved while retaking nursing courses were excluded from this study. Moreover, any students who took any standardized tests in different sequences from other students and any students with missing data were excluded.

Data Collection Procedures

The list of graduates from May 2010 to December 2011, their NCLEX-RN outcomes, and their individual adjusted scores on the standardized tests were archival records. Following approval from the IRB of the University, the list of graduates from May 2010 to December 2011 was gathered from the student affairs office of the nursing program. Among the graduates, those eligible were determined by using the inclusion and exclusion criteria. Once the samples were identified, their NCLEX-RN outcomes and individual adjusted scores on the standardized tests were collected. The NCLEX-RN outcomes were gathered from the dean's office, and the scores were available online with an instructor access code since all students' scores of the assessments

developed by the ATI was maintained online. If any students took any standardized tests more than once, only scores achieved on the first-attempt were collected in order to maintain the same conditions and collect data from the same tests since test items on the first-attempt and second-attempt were not identical. All of the students' names were deleted and coded to prevent identification of particular students.

Protection of Human Subjects

In order to protect the participants' human rights, this study was reviewed by the university Institutional Review Board (IRB), and the data collection procedure was initiated after obtaining approval from the IRB. The data were accessible without the participants' consents to this study since they agreed to the use of their personal assessments and aggregate data for program assessment or research purposes by signing the Student Outcome Assessment Memorandum of Understanding Baccalaureate Nursing Program (see Appendix A). Any particular participant could not be identified since all participants' names were deleted and coded to maintain confidentiality. All data have been kept in a locked cabinet, in which all academic and immunization records of students in the traditional baccalaureate nursing program are kept. The cabinet is located in the student affairs office of the nursing program.

Validity and Reliability of Instruments

For content validity of the ATI Content Mastery Series, each test item was reviewed and evaluated by experts of nursing education and clinical practice. They determined the content of each test item's appropriateness and relevance. Samples of nursing schools were selected for field tests in order to examine validation of the content. Based on the analysis, test items were revised as needed (ATI, 2004).

Each of the ATI Content Mastery Series assessments' reliability data were provided by

ATI. Cronbach's alpha reliability coefficient was used to calculate each assessment's reliability, which is consistency over time (ATI, 2004). A value of Cronbach's alpha reliability coefficient is normally between 0 to 1, and when the value is smaller than 0.5, it is considered unacceptable reliability (George & Mallery, 2003). All of the ATI Content Master Series assessments' Cronbach's alpha reliability coefficients were greater than 0.526, which was the lowest alpha value on the leadership assessment. The highest alpha value was 0.688 on the adult medical surgical assessment on their own data (ATI, 2008).

Data Analysis Methods

Since this study used a quantitative research approach, all non-quantitative data, except the participants' demographic data, were converted into quantitative data and analyzed by using the Statistical Package for the Social Sciences (SPSS) 20.0. The participants' NCLEX RN outcomes on the first- attempt took the value of one (1) with success and value of zero (0) with failure as dichotomous variables for statistical analysis for NCLEX-RN success. On the contrary, NCLEX-RN success took the value of zero (0), and NCLEX-RN failure took the value of one (1) for statistical analysis for NCLEX-RN failure. The participants' individual adjusted scores on the standardized tests were used as continuous variables without any conversion for analyzing because the scores were provided in the form of quantitative data.

Descriptive statistics were conducted to analyze and summarize the participants' demographic data. A *t*-test of the statistical methods was conducted by using the SPSS 20.0 in order to determine if there were significant differences in the adjusted individual scores of the standardized tests between the two groups of participants with NCLEX-RN success and failure on the first-attempt. The individual adjusted scores on the standardized tests of the two groups were compared separately by the *t*-test, and an alpha level of .05 was used as the level of

significance for data analysis. It helped to provide ideas of possible predictors of NCLEX-RN outcomes among the standardized tests although this analysis method could not be used to conclude if the tests predict NCLEX-RN outcomes.

The logistic regression, which “tests the ability of a model or group of variables to predict group membership as defined by some categorical dependent variables” (Mertler & Vannatta, 2010, p. 304), was used to find if the NCLEX-RN outcomes could be correctly predicted from the standardized tests conducted throughout the nursing program. If the NCLEX-RN outcome on the first attempt could be predicted correctly, then which standardized tests were central in the prediction of the NCLEX-RN outcome and how many of the NCLEX-RN successes and failures were classified correctly were found by logistic regression. The logistic regression was conducted by using the SPSS 20.0. An alpha level of .05 was used as the level of significance for data analysis using the logistic regression. Through analyzing the data by a *t*-test and logistic regression, all research questions of this study were answered.

Limitations of Study

There were several possible limitations of this study. All of the data were collected from only one nursing program, and only the ATI Content Mastery Series was used as the standardized test variables. Each nursing program has a different curriculum, student support programs, faculty performances, other aspects that affect students’ outcomes on standardized tests and the NCELX-RN. Also, many different kinds of standardized tests are supplied by various vendors, and nursing programs choose and use different products as standardized tests. Therefore, it was expected that there was a limitation to generalize the results of this study to other populations and products of the standardized tests.

Another expected limitation was that participants who passed the NCLEX-RN were

much larger than those who failed in the sample group of this study. Unequal group sizes were difficult to compare statistically.

The number of questions on the standardized tests was not same. The participants had ninety questions on the adult medical-surgical test, fifty questions on the community health test, and sixty questions on the fundamentals, the pharmacology, the maternal-newborn, the nursing care of children, mental health, and leadership and management standardized tests. In this study, the participants' individual adjusted scores, which were calculated by the number of questions answered correctly divided by the number of scored questions on each test with adjustment for the differences in the difficulty of the form taken (ATI. LLC, n.d.), were used. Although this adjustment was used for the score, the different numbers of the questions on each test limited the ability to have the same conditions for comparisons between each other.

Each participant had individual differences that could not be accounted for by test result differences. Such differences could not be controlled. If a student achieved lower individual adjusted scores than the benchmark score, the student might have remediation or be nervous about failure on the NCLEX-RN. It might make the student have quality support or work harder, and the student might pass the NCLEX-RN on the first-attempt. Also, faculty performance was one of the important factors affecting the participants' scores on the standardized tests. The participants did not have the same faculty in some nursing courses, and they might have a different quality of faculty performance.

Summary

This study was conducted by using a quantitative research approach. The samples were identified by the inclusion and exclusion criteria among graduates from a traditional baccalaureate program from May 2010 to December 2011. After identifying samples, their

NCLEX-RN outcomes on the first-attempt and individual adjusted scores of the adult medical surgical, fundamentals, pharmacology, maternal-newborn, nursing care of children, mental health, community health, and leadership and management standardized tests were collected from archival data. In this study, the ATI Content Mastery Series was used as the standardized tests since it was used in the traditional baccalaureate nursing program that was a setting used to collect data. The participants' identities were protected by coding their names, obtaining the approval from the IRB, and keeping all of the data in a locked cabinet in the student affairs area of the nursing program. The participants' demographic data were summarized by using descriptive statistics. *T*-tests were used to determine significant differences in the adjusted individual scores of each of the standardized tests of the eight subjects between the two groups of participants with NCLEX-RN success and failure on the first-attempt. Also, the samples' NCLEX-RN outcomes and the individual adjusted scores on the standardized tests were analyzed by conducting logistic regression to determine if the NCLEX-RN outcome could be correctly predicted from the standardized tests. Which subjects of the standardized tests were central in the prediction, and how many of the NCLEX-RN successes and failures were classified correctly were also determined by logistic regression. In addition, there were limitations of this study such as collecting data from only one nursing program, unequal sizes of the samples with NCLEX- RN success and failure, different numbers of questions on the standardized tests, and differences in the samples.

CHAPTER 4

RESULTS AND DATA ANALYSIS

Introduction

The purpose of the study was to investigate effective predictors of NCLEX-RN outcomes on the first-attempt among standardized tests: adult medical-surgical, fundamentals, pharmacology, maternal-newborn, nursing care of children, mental health, community health, and leadership and management. The participants took fundamentals and mental health standardized tests during their sophomore year, maternal newborn, nursing care of children, and pharmacology standardized tests during their junior year, and adult medical-surgical, community health, and leadership and management standardized tests during their senior year.

This investigation started with comparing the participants' individual adjusted scores on the standardized tests between the groups of students with NCLEX-RN success and failure on the first attempt. It was determined if there were significant differences in the adjusted individual scores of the standardized tests between the two groups of students with NCLEX-RN success and failure on the first-attempt. This helped to provide ideas of possible predictors of NCLEX-RN outcome among the standardized tests, although it was not possible to conclude by this comparison if the tests predicted NCLEX-RN outcomes. In order to investigate if the standardized tests correctly predicted the probability of NCLEX-RN outcomes, the participants' NCLEX-RN outcomes and individual adjusted scores on standardized tests were analyzed by

logistic regression.

The followings research questions guided the investigation of this study: (1) Are there significant differences in the individual adjusted scores of the standardized tests (adult medical-surgical, fundamentals, pharmacology, maternal-newborn, nursing care of children, mental health, community health, and leadership and management) between the two groups of students with NCLEX-RN success and failure on the first-attempt? (2) Can the NCLEX-RN outcome (success or failure) on the first-attempt be correctly predicted from the standardized tests? (3) If the NCLEX-RN outcome on the first-attempt can be predicted correctly, which variables are central in the prediction of the NCLEX-RN outcome on the first-attempt? and (4) How many the NCLEX-RN successes on the first-attempt are classified correctly? How many the NCLEX-RN failures on the first-attempt are classified correctly? In this chapter, the results of the study are presented in four sections. The first section explains how data were collected and the participants are describing. In the second section, the results of the comparison of the individual adjusted scores on the standardized tests between the two groups of students with NCLEX-RN success and failure on the first-attempt are presented. The first research question is answered in this section. Finally, the results of determining if the standardized tests can predict the NCLEX-RN outcome and identifying which variables are central in the prediction of the NCLEX-RN outcome on the first-attempt are presented in the third section. The percentage of NCLEX-RN success and failure cases correctly classified with the generated model by logistic regression is also addressed. Therefore, answers of the research question 2, 3, and 4 are presented in the third section.

Description of Participants

There were 49 graduates in May 2010, 19 graduates in August 2010, 21 graduates in

December 2010, 46 graduates in May 2011, 13 graduates in August 2011, and 19 graduates in December 2011; therefore, a total of 167 graduates during the time period. After gathering a list of the graduates from May 2010 to December 2011, the graduates' NCLEX-RN outcomes on the first-attempt were collected. Only outcomes on the first-attempt were used in this study. Among the 167 graduates, 11 graduates' NCLEX-RN outcomes were not found; therefore, the number of eligible graduates was reduced to 156. It was assumed that the graduates had not taken the NCLEX-RN by the time of data collection. Among the 156 graduates, 5 graduates were excluded because their individual adjusted scores on one or more the standardized tests were missing. After applying inclusion and exclusion sample criteria, a total of 151 participants were eligible, and their first-attempt NCLEX-RN outcomes and scores on the standardized tests were included and analyzed in this study. A random number between 1 and 200 was assigned to each participant for confidentiality.

There were 151 participants in this study. They were composed of 118 (78.1 percent) graduates who passed the NCLEX-RN on the first-attempt and 33 (21.9 percent) graduates who failed the NCLEX-RN on the first-attempt. Their demographic information was not analyzed in this study. The participants' mean age, gender, and ethnicity self-reported to the university are presented in Table 5 only for descriptive purposes. As shown in Table 5, females and Caucasians were in a majority of the participants. The mean age of the NCLEX-RN success group was slightly older than the NCLEX-RN failure group.

Table 5

Demographic Information

	Mean age	Gender		Ethnicity			
		Male	Female	African American	Caucasian	Asian/Pacific Islander	Hispanic
NCLEX-RN Success	27.02	9	109	3	29	2	1
NCLEX-RN Failure	26.78	3	30	3	112	1	0
The participants	26.97	12	139	6	141	3	1

Note: $n=151$

Comparison of the Scores on the Standardized Tests

The first research question was “Are there significant differences in the individual adjusted scores of the standardized tests (adult medical-surgical, fundamentals, pharmacology, maternal-newborn, nursing care of children, mental health, community health, and leadership and management) between the two groups of students with NCLEX-RN success and failure on the first-attempt?” In order to find answers to this question, the participants were divided by their NCLEX-RN results. One was composed of those who succeeded on the NCLEX-RN on the first-attempt, and the other was composed of those who failed the NCLEX-RN on the first-attempt. Then, the participants’ individual adjusted scores on each standardized test and their NCLEX-RN outcomes were analyzed by a *t*-test.

Table 6 shows the two groups’ mean and standard deviation of each standardized test (adult medical-surgical, fundamentals, pharmacology, maternal-newborn, nursing care of children, mental health, community health, and leadership and management), *t* statistic, and *p* value (2-tailed).

Table 6

The Standardized Tests Scores of the Groups of NCLEX-RN Success and Failure

	Mean		Standard Deviation		<i>t</i> -value	Sig. (2-tailed)
	Success	Failure	Success	Failure		
Adult Medical-Surgical	61.40	52.79	8.03	6.18	-5.697	.000
Fundamentals for Nursing	74.05	70.70	8.90	9.51	-1.880	.062
Pharmacology	64.79	56.02	9.27	7.93	-4.944	.000
Maternal-Newborn	76.21	71.87	7.18	7.30	-3.060	.003
Nursing Care of Children	70.62	70.04	8.70	12.09	-0.308	.759
Mental Health	72.82	67.73	8.41	7.49	-3.143	.002
Community Health	78.45	74.24	6.21	5.01	-3.582	.000
Leadership & Management	72.14	68.27	5.86	6.19	-3.311	.001

Note: $n=151$

It was found that there were significant statistical differences between the two groups with NCLEX-RN success and failure in the individual adjusted scores on almost all of the standardized tests. There were no significant statistical differences between the two groups only in individual adjusted scores on the fundamental ($p=.62$) and nursing care of children ($p=.759$) standardized tests. Answers of the research question 1 were found as follows:

- There was a statistically significant difference in the individual adjusted score of the adult medical-surgical standardized test between the participants who succeeded ($M=61.40$, $SD=8.03$) and those who failed ($M=52.79$, $SD=6.18$) on the NCLEX-RN on the first-attempt, $t(149)=-5.697$, $p=.000$ ($r^2=.179$).
- There was not a statistically significant difference in the individual adjusted score of the

fundamentals standardized test between the participants who succeeded ($M=74.05$, $SD=8.90$) and those who failed ($M=70.70$, $SD=9.15$) on the NCLEX-RN on the first-attempt, $t(149)=-1.880$, $p=.062$.

- There was a statistically significant difference in the individual adjusted score of the pharmacology standardized test between the participants who succeeded ($M=64.79$, $SD=9.27$) and those who failed ($M=56.02$, $SD=7.93$) on the NCLEX-RN on the first-attempt, $t(149)=-4.944$, $p=.000$ ($r^2=.14$).
- There was a statistically significant difference in the individual adjusted score of the maternal-newborn standardized test between the participants who succeeded ($M=76.21$, $SD=7.18$) and those who failed ($M=71.87$, $SD=7.30$) on the NCLEX-RN on the first-attempt, $t(149)=-3.060$, $p=.003$ ($r^2=.059$).
- There was not a statistically significant difference in the individual adjusted score of the nursing care of children standardized test between the participants who succeeded ($M=70.62$, $SD=8.70$) and those who failed ($M=70.04$, $SD=12.09$) on the NCLEX-RN on the first-attempt, $t(149)=-0.308$, $p=.759$.
- There was a statistically significant difference in the individual adjusted score of the mental health standardized test between the participants who succeeded ($M=72.82$, $SD=8.41$) and those who failed ($M=67.73$, $SD=7.49$) on the NCLEX-RN on the first-attempt, $t(149)=-3.143$, $p=.002$ ($r^2=.062$).
- There was a statistically significant difference in the individual adjusted score of the community health standardized test between the participants who succeeded ($M=78.45$, $SD=6.21$) and those who failed ($M=74.24$, $SD=5.01$) on the NCLEX-RN on the first-attempt, $t(149)=-3.582$, $p=.000$ ($r^2=.079$).

- There was a statistically significant difference in the individual adjusted score of the leadership and management standardized test between the participants who succeeded ($M=72.14$, $SD=5.86$) and those who failed ($M=68.27$, $SD=6.19$) on the NCLEX-RN on the first-attempt, $t(149)=-3.311$, $p=.001$ ($r^2=.069$).

The participants with NCLEX-RN success had higher mean scores than those with NCLEX-RN failure on all of the standardized tests. However, the p values for fundamentals and nursing care of children were greater than .05, and these were the only results indicating that there were no statistically significant differences in the individual adjusted scores between the participants who succeeded and failed on the NCLEX-RN on the first-attempt. Except these two standardized tests (fundamentals and nursing care of children), the participants who succeeded and failed on the NCLEX-RN on the first-attempt had statistically significant differences in their scores on the other six standardized tests (adult medical-surgical, pharmacology, maternal-newborn, mental health, community health, and leadership and management).

Predicting the Probabilities of NCLEX-RN Outcome

The research question 2 was “Can the NCLEX-RN outcome (success or failure) on the first-attempt be correctly predicted from the standardized tests?”, and the research question 3 was “If the NCLEX-RN outcome on the first-attempt can be predicted correctly, which variables are central in the prediction of the NCLEX-RN outcome on the first-attempt?” In order to find answers to these questions, the participants’ individual adjusted scores on the standardized tests and their NCLEX-RN outcomes on the first-attempt were analyzed by logistic regression. Logistic regression “...predicts the probability of membership occurring, which varies from zero to one, and a good-fitting model typically have: fairly low values for -2 Log Likelihood, significant model chi-square, and variables with odds ratios greater than 1” (Mertler & Vannatta,

2010, p. 304).

Predicting NCLEX-RN Success

The results of logistic regression conducted to determine which standardized tests were predictors of NCLEX-RN success is shown in Table 7. The overall model was statistically reliable in distinguishing those who succeed on the NCLEX-RN on the first-attempt (-2 Log likelihood=111.713, $X^2(2)=46.854$, and $p=.000$). The model correctly classified 93.2 percent (110 out of 118) of the NCLEX-RN success cases. Regression coefficients are presented in Table 7.

Table 7

Regression Coefficients for Predicting NCLEX-RN Success

	<i>B</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	Odds Ratio
Adult Medical-Surgical	.115	6.550	1	.010	1.122
Fundamentals	-.010	.127	1	.721	.990
Pharmacology	.084	6.554	1	.010	1.087
Maternal-Newborn	.041	1.471	1	.225	1.042
Nursing Care of Children	-.011	.218	1	.641	.989
Mental Health	-.015	.145	1	.703	.985
Community Health	.096	4.899	1	.027	1.101
Leadership and Management	.050	1.261	1	.261	1.052

Wald statistics indicated that the adult medical-surgical, pharmacology, and community health standardized tests significantly predicted NCLEX-RN success on the first-attempt. The participants achieving higher scores on these standardized tests were more likely to succeed on

the NCLEX-RN on the first-attempt. Although the adult medical-surgical standardized test has the highest odds ratio, there are not significant differences between odds ratios of adult medical-surgical, pharmacology, and community health standardized tests. The odds ratios for the adult medical-surgical, pharmacology, and community health standardized tests revealed little increase in the likelihood of NCLEX-RN success when the predictors increase by 1.

Predicting NCLEX-RN Failure

Logistic regression was executed to identify which standardized tests were predictors of NCLEX-RN failure. The overall model was statistically significant in distinguishing those who failed the NCLEX-RN on the first-attempt ($-2 \text{ Log likelihood}=111.713$, $X^2(2)=46.854$, and $p=.000$). However, the model correctly classified only 33.3 percent (11 out of 33) of the NCLEX-RN failure cases. Regression coefficients for predicting NCLEX-RN failure are presented in Table 8.

Table 8

Regression Coefficients for Predicting NCLEX-RN Failure

	<i>B</i>	<i>Wald</i>	<i>df</i>	<i>p</i>	Odds Ratio
Adult Medical-Surgical	-.115	6.550	1	.010	.891
Fundamentals	.010	.127	1	.721	1.010
Pharmacology	-.084	6.554	1	.010	.920
Maternal-Newborn	-.041	1.471	1	.225	.960
Nursing Care of Children	.011	.218	1	.641	1.011
Mental Health	.015	.145	1	.703	1.015
Community Health	-.096	4.899	1	.027	.908
Leadership and Management	-.050	1.261	1	.261	.951

Wald statistics indicated that the adult medical-surgical, pharmacology, and community health standardized tests significantly predicted NCLEX-RN failure. However, the odds ratios for the adult medical-surgical, pharmacology, and community health standardized tests indicated little change in the likelihood of NCLEX-RN failure.

Summary

The investigation found that there were significant statistical differences between the two groups with NCLEX-RN success and failure in the individual adjusted scores on the adult medical-surgical, pharmacology, maternal-newborn, mental health, community health, and leadership and management standardized tests. Only in individual adjusted scores on the fundamental and nursing care of children standardized tests, there were no significant statistical differences between the two groups. Also, the result of logistic regression indicated the overall regression models were significant in predicting both NCLEX-RN success and failure; however, the model classified much lower percentage of NCLEX-RN failure than success. The adult medical-surgical, pharmacology, and community health standardized tests were central in the prediction of both NCLEX-RN success and failure, and their odds ratios indicated little changes in the likelihood of both NCLEX-RN success and failure.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Early studies regarding NCLEX-RN predictors focused on admission criteria and performances in cognate and nursing courses. As standardized tests have been available by commercial vendors, the standardized tests' effectiveness as NCLEX-RN predictors have been studied by many researchers in current literature. However, comprehensive standardized tests, which are usually performed at the end of the nursing programs, have been mostly studied, and there is a rising need to study nursing content standardized tests, which are utilized throughout the nursing program, in order to detect students at risk and provide remediation early. This study was to investigate effective predictors of NCLEX-RN outcomes on the first-attempt among standardized tests conducted throughout the nursing program. In this chapter, significance and conclusions, guiding framework, limitations, and recommendations of this study are discussed.

Significance and Conclusions

Success on the NCLEX-RN has significant importance to nursing students, nursing programs, and society. Nursing students have to pass the NCLEX-RN to become RNs, and the NCLEX-RN is one of the important evaluation factors of a quality of education provided by nursing programs. Since the nursing shortage is a critical issue in the U.S., more RNs are needed to meet increased demands for nursing care. In addition, NCLEX-RN failure causes many negative effects on graduates, nursing programs, consumers, and society. If graduates fail the

NCLEX-RN, they may experience emotional distress and financial difficulties. Nursing programs performing a low NCLEX-RN pass rate are in a risk of losing accreditation and decreasing enrollments, and graduates' failure on the NCLEX-RN aggravates the problem of the nursing shortage. It is possible to foster more qualified RNs by supporting graduates to succeed on the NCLEX-RN, which is developed to assess competencies required to provide quality nursing care.

In order to improve a NCLEX-RN pass rate, supporting students who are at risk of failure on the NCLEX-RN is indispensable. Researchers and nursing programs have tried to find effective remediation, and various remediation methods have been developed and implemented to improve students' NCLEX-RN outcomes. Since identification of the students at risk should be preceded in order to provide remediation to them, many studies have investigated effective NCLEX-RN predictors; however, common variables of the studies are limited to admission criteria, comprehensive standardized tests, and performances in courses with controversies over the results of the studies. In this study, nursing content standardized tests (adult medical-surgical, fundamentals, pharmacology, maternal-newborn, nursing care of children, mental health, community health, and leadership and management) conducted throughout the nursing program, were investigated to determine their effectiveness as NCLEX-RN predictors.

One of the findings in this study indicated that there were significant statistical differences between the two groups with NCLEX-RN success and failure in the individual adjusted scores of the adult medical-surgical, pharmacology, maternal-newborn, mental health, community health, and leadership and management standardized tests. The NCLEX-RN success group's mean scores in those standardized tests were higher than the NCLEX-RN failure group.

These findings can be linked to the finding of Uyehara, Magnussen, Itano, and Zhang (2007)'s study, which indicated that there was correlation between performance in adult health nursing, mental health nursing, maternal-newborn nursing courses and NCLEX-RN success, although their study did not include scores on standardized tests. However, while Uyehara, Magnussen, Itano, and Zhang (2007) found that there was correlation between performance in pediatric nursing course and NCLEX-RN success, this study's finding indicated that there were no significant statistical differences between the NCLEX-RN success and failure groups in the individual adjusted scores on the fundamentals and nursing care of children standardized tests.

Moreover, in this study, logistic regression models showed that adult-medical surgical, pharmacology, and community health standardized tests were effective to predict NCLEX-RN success, and the regression model including these tests was accurate to classify 93.2 percent of the NCLEX-RN cases. This finding is consistent with Vandenhouten (2008)'s study indicating that medical-surgical, community health, and pharmacology standardized tests significantly predicted NCLEX-RN success. However, Vandenhouten (2008)'s study also included leadership and maternal-newborn standardized tests as NCELEX-RN success predictors while this study's finding indicated that those two tests did not predict NCLEX-RN success. In addition, the finding of this study is associated with Seldomridge and Dibartolo (2004)'s study finding that performance in a medical-surgical nursing course could predict NCLEX-RN success, and Vandenhouten (2008)'s study indicating that grades in pharmacology, adult medical-surgical nursing, and community health nursing courses were able to predict NCLEX-RN success.

The result of logistic regression in this study showed adult medical-surgical, pharmacology, and community health standardized tests were able to predict NCLEX-RN failure; however, much less percentage (33.3 percent) of NCLEX-RN failure cases than cases of

NCLEX-RN success could be classified by the generated model. It can be concluded that the standardized tests are less effective to predict NCLEX-RN failure than NCLEX-RN success since the standardized tests were less accurate to classify NCLEX-RN failure. This finding is consistent with Sledomridge and Dibartolo (2004) and Vandenhouthen (2008)'s studies concluding that variables were not accurate in predicting students who are likely to fail on the NCLEX-RN as much as in predicting those who are likely to pass the NCLEX-RN.

In order to provide early remediation to students at risk, it is required to utilize effective predictors earlier in the nursing curriculum. This study's results indicated that adult medical-surgical, pharmacology, and community health nursing were powerful NCLEX-RN success predictors. Through using these predictors, students at risk can be identified before comprehensive standardized tests usually conducted in the last semester of nursing programs, and early remediation can be provided. After early remediation is implemented, and the comprehensive standardized test may be used as a mid-point indicator of the remediation's effectiveness before taking the NCLEX-RN.

Guiding Framework

Constructivism, Knowles' Adult Learning Theory, and Bloom's Revised Taxonomy served as a theoretical framework in this study. The theories explained ways of gaining nursing knowledge and skills that result in achieving higher scores on standardized tests and success on the NCLEX-RN. Nursing students are required not only to acquire knowledge but also to develop critical thinking in order to be successful on NCLEX-RN and provide quality nursing care after graduation. Constructivism provided a foundation to understand what cognitive model nursing students bring to nursing programs in this study. Also, Constructivism provided a conceptual framework describing essentially the approach on how nursing students learn through

explaining the complex cognitive process based on their own knowledge (Brandon & All, 2010). Developing critical thinking skills, which are required to meet cognitive domains evaluated on standardized tests and NCLEX-RN, were also explained by Constructivism since they present cognitive development built through interactions with the environment.

Adult Learning Theory, developed by Knowles, emphasizes that adults are different from children in learning, and it guides important components of adult learning (Dumchin, 2010). Six principles of adult learning are presented in the Adult Learning Theory, and those are the need to know, self-concept, the learner's experiences, readiness to learn, life-centered orientation, and motivation. In this study, Adult Learning Theory practically explained how nursing students are motivated and promoted to achieve better scores on standardized tests and succeed on NCLEX-RN as well as how they learn. Also, the six principles provided practical frameworks to promote nursing students to utilize gained knowledge and skills on standardized tests and NCLEX-RN.

In addition, Bloom's Revised Taxonomy identifies six cognitive categories that can be used to classify cognitive learning objectives (Su & Osisek, 2011). Knowledge, comprehension, application, analysis, synthesis, and evaluation are six cognitive categories, which compose the taxonomy. In this study, intended learning outcomes, which nursing students are evaluated on the standardized tests and NCLEX-RN, were conceptualized by Bloom's Revised Taxonomy, since it is used for the cognitive level classification of the standardized tests and NCLEX-RN examination. Nursing Students have to accomplish all of the outcomes ordered from simple to complex and concrete to abstract in the Taxonomy to achieve higher scores on standardized tests and succeed on the NCLEX-RN. Figure 1 shows how Constructivism, Knowles' Adult Learning

Theory, and Bloom's Revised Taxonomy were blended and served together as a theoretical framework of this study.

Limitations

One of the limitations of this study was unequal sizes of groups of students who succeeded and failed on the NCLEX-RN on the first-attempt. Since the majority of candidates pass NCLEX-RN as shown in the national NCLEX-RN pass rate, this limitation has been persisted in most studies regarding NCLEX-RN predictors. In this study, there were 118 participants in the NCLEX-RN success group, and 33 participants in the NCLEX-RN failure group. These unequal sizes might negatively affect the accuracy of statistical results of this study, particularly predicting NCLEX-RN failure.

Another limitation is that all of this study's data was collected in one traditional baccalaureate nursing program of a public university located in the Midwest. A diversity of different curriculums, student support programs, remediation, student populations, and other aspects, which are unique to each nursing program, is not captured in this study. As shown in Table 5, a majority of the participants was female Caucasians. Also, various products of standardized tests offered by vendors are available besides the ATI Content Series. However, only the ATI Content Series was used as variables of the standardized tests in this study. These can limit generalizability of this study's findings to other nursing programs and standardized tests products.

In addition, individual differences were not captured in this study. Each participant's NCLEX-RN outcome could be affected by different motivations, maturations, life situations, emotional reactions to NCLEX-RN, and other aspects. Although students did not achieve benchmark scores on the standardized tests, the nursing program might provide remediation to

them, and it might be effective and help the students to succeed on the NCLEX-RN. Also, students who achieved low scores on the standardized tests might be nervous, and it might result in preparing more extensively for the NCLEX-RN. The other consideration is that students might feel comfortable with NCLEX-RN after achieving benchmark scores on the standardized tests, and it might reduce the intensity of preparation for the NCLEX-RN and resulted in failure on the NCLEX-RN. Moreover, the participants had different faculty, textbooks, teaching strategies, and assessment methods in nursing courses, and these might affect the participants' learning, performances on the standardized tests, and outcomes on the NCLEX-RN. These aspects could not be controlled for this study.

Finally, each standardized test had different question numbers. Although individual adjusted scores on each standardized test were used for this study, the different numbers of the questions could limit to compare its effectiveness as a NCLEX-RN predictor between each other. These limitations have to be considered in interpreting this study's results.

Recommendations

There are different kinds of standardized tests, which are offered by various commercial vendors. It is recommended to include various products of standardized tests as variables in the future studies. It will help to investigate effective NCLEX-RN predictors and compare effectiveness of each nursing content standardized test. Also, it is possible to have more powerful evidences showing if the findings of this study are repeated in other studies having variables of different products of the standardized tests.

In addition, it is recommended to study the same topic with this study in more diverse populations and in many different nursing programs. In this study, a majority of the participants were female Caucasians, and one of the limitations was data collection from only one nursing

program. Collecting data from more diverse participants from different nursing programs can increase the generalizability of the findings for future studies.

Also, one of the recommendations is to include a large number of participants who fail on the NCLEX-RN if possible; therefore, it will be available to have equal sizes of participants who succeed and fail on the NCLEX-RN. This will result in having more accurate results of regression models predicting and classifying NCLEX-RN failure.

Finally, there is a need for having longitudinal and repeated similar studies. The NCLEX-RN is revised every three years, and the next revision will be in April, 2013. After the revised version of NCLEX-RN starts to be conducted, commercial vendors will accordingly revise their products of standardized tests based on the revised NCLEX-RN. Therefore, it is recommended to continue studies to investigate the effectiveness of nursing content standardized tests conducted throughout nursing curriculum as NCLEX-RN predictors.

Summary

This study investigated the effectiveness of the nursing content standardized tests as predictors of NCLEX-RN outcome while previous literature focused on admission criteria, performances in cognate and nursing courses, and comprehensive standardized tests. The findings of this study can be used to identify students at risk and provide early remediation since adult medical-surgical, pharmacology and community health nursing standardized tests were conducted before comprehensive standardized tests. However, as shown in the results of this study, those standardized tests were not effective in predicting NCLEX-RN failure, and the result was consistent with other previous studies. It is recommended to include various products of standardized tests as variables, have a large sample size of those who fail the NCLEX-RN, have more diverse participants, and continue longitudinal and similar studies for future research.

REFERENCES

- Alameida, M. D., Prive, A., Davis, H. C., Landry, L., Renwanz-Boyle, A., & Dunham, M. (2011). Predicting NCLEX-RN success in a diverse student population. *Journal of Nursing Education, 50*(5), 261-267.
- American Association of Colleges of Nursing. (2011). *Nursing shortage fact sheet*. Retrieved from <http://www.aacn.nche.edu/media-relations/NrsgShortageFS.pdf>.
- American Association of Colleges of Nursing. (2012). *Nursing fact sheet*. Retrieved from <http://www.aacn.nche.edu/media-relations/fact-sheets/nursing-fact-sheet>.
- Assessment Technologies Institute, LLC. (2012). *Comprehensive assessment and review program (CARP)*. Retrieved from <https://www.atitesting.com/Solutions/DuringNursingSchool/ComprehensiveAssessmentAndReviewProgram.aspx>.
- Assessment Technologies Institute, LLC. (2008). *RN Content Mastery Series 2007 test statistics*. Overland Park, Kansas: Author.
- Assessment Technologies Institute, LLC. (2004). *Validation of the RN Content Mastery Series*. Overland Park, Kansas: Author.
- Assessment Technologies Institue, LLC. (n.d.). *RN Content Mastery Series 2007 national standard setting study: Executive summary*. Overland Park, Kansas: Author.
- Baker, M. J. (2008). Predicting NCLEX-RN success through prerequisite and admission requirements. (Doctoral dissertation). Retrieved from ProQuest. (3348673)

- Brandon, A. F., & All, A. C. (2010). Constructivism theory analysis and application to curricula. *Nursing Education Perspectives, 31*(2), 89-92.
- Carl, L. C. (2007). Assessment Technology Institute Test score, NCLEX-RN pass-fail, nursing program evaluation and catastrophic events in Pennsylvania. (Doctoral dissertation). Retrieved from ProQuest. (3292150)
- Carr, S. M. (2011). NCLEX-RN pass rate peril: One school's journey through curriculum revision, standardized testing, and attitudinal change. *Nursing Education Perspectives, 32*(6), 384-388.
- Crow, C. S., Handley, M., Morrison, R. S., & Shelton, M. M. (2004). Requirements and interventions used by BSN programs to promote and predict NCLEX-RN success: A national study. *Journal of Professional Nursing, 20*(3), 174-186.
- Dumchin, M. (2010). Redefining the future of perioperative nursing education: A conceptual framework. *AORN Journal, 92*(1), 87-100.
- English, J. B., & Gordon, D. K. (2004). Successful student remediation following repeated failure on the HESI exam. *Nurse Educator, 29*(6), 266-268.
- George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference* (4th ed.). Boston, MA: Allyn & Bacon.
- Harding, M. (2010). Predictability associated with exit examinations: Literature review. *Journal of Nursing Education, 49*(9), 493-497.
- Hedderick, V. M. (2009). The utilization of NCLEX predictor assessments and the effect on NCLEX success rates in nursing programs within the state of Pennsylvania. (Doctoral dissertation). Retrieved from ProQuest. (3352422)

- Heroff, K. (2009). Guidelines for a progression and remediation policy using standardized tests to prepare associate degree nursing students for the NCLEX-RN at a rural community college. *Teaching and Learning in Nursing, 4*(3), 79-86.
- Humphreys, J. A. (2008). Academic and nonacademic predictors of future success on the NCLEX-RN licensure examination for nurses. (Doctoral dissertation). Retrieved from ProQuest. (3315143)
- Jacobs, P., & Koehn, M. (2006). Implementing a standardized testing program: Preparing students for the NCLEX-RN. *Journal of Professional Nursing, 22*(6), 373-379.
- Knowles, M. S., Holton, E. F., & Swanson, R. A. (1998). *The adult learner: The definitive classic in adult education and human resource development*. Houston, TX: Gulf Publishing.
- Krathwohl, D. R. (2002). A revision of Bloom's Taxonomy: An overview. *Theory into Practice, 41*(4), 212-218.
- Lambert, L., & Walker, D. (2005). *The constructivist leader*. New York, NY: Teachers College Press.
- March, K. S., & Ambros, J. M. (2010). Rx for NCLEX-RN success: Reflection on development of an effective preparation process for senior baccalaureate students. *Nursing Education Perspectives, 31*(4), 230-232.
- Mertler, C. A., & Vannatta, R. A. (2010). *Advanced and multivariate statistical methods*. Glendale, CA: Pyrczak Publishing.
- National Council of State Boards of Nursing. (2010). *2010 NCLEX-RN detailed test plan: Item writer, item reviewer, nurse educator version*. Retrieved from https://www.ncsbn.org/2010_NCLEX_RN_Detailed_Test_Plan_Educator.pdf.

National Council of State Boards of Nursing. (2012a). *NCLEX examinations*. Retrieved from <https://www.ncsbn.org/nclex.htm>.

National Council of State Boards of Nursing. (2012b). *2011 Number of candidates taking NCLEX Examination and percent passing*. Retrieved from https://www.ncsbn.org/Table_of_Pass_Rates_2011.pdf.

Norton, C. K., Rele, M. V., Cox, C. W., Farley, J., Lachat, M., & Tucker, M. (2006). Ensuring NCLEX-RN success for first-time test takers. *Journal of Professional Nursing, 22*(5), 322-326.

Pennington, T. D., & Spurlock, D. (2010). A systematic review of the effectiveness of remediation interventions to improve NCLEX-RN pass rate. *Journal of Nursing Education, 49*(9), 485-492.

Piaget, J. (1953). *The origins of intelligence in children*. New York, NY: Basic Books.

Roa, M., Shipman, D., Hooten, J., & Carter, M. (2011). The costs of NCLEX-RN failure. *Nurse Education Today, 31*(4), 373-377.

Stark, M. A., Feikema, B., & Wyngarden, K. (2002). Empowering students for NCLEX success: Self-assessment and planning. *Nurse Educator, 27*(3), 103-105.

Seldomridge, L. A., & Dibartolo, M. C. (2004). Can success and failure be predicted for baccalaureate graduates on the computerized NCLEX-RN. *Journal of Professional Nursing, 20*(6), 361-368.

Sifford, S., & McDaniel, D. M. (2007). Results of a remediation program for students at risk for failure on the NCLEX exam. *Nursing Education Perspectives, 28*(1), 34-36.

Spurlock, D. R., & Hunt, L. A. (2008). A study of the usefulness of the HESI Exit Exam in predicting NCLEX-EN failure. *Journal of Nursing Education, 47*(4), 157-166.

- Su, W. M., & Osisek, P. J. (2011). The revised Bloom's Taxonomy: Implications for educating nurses. *The Journal of Continuing Education in Nursing, 42*(7), 321-327.
- Uyehara, J., Magnussen, L., Itano, J., Zhang, S. (2007). Facilitating program and NCLEX-RN success in a generic BSN program. *Nursing Forum, 42*(1), 31-38.
- Vandenhouten, C. L. (2008). Predictors of success and failure on the NCLEX-RN for baccalaureate graduates. (Doctoral dissertation). Retrieved from ProQuest. (3306523)
- Wittmann-Price R. A. (2009). Facilitating learning. In R. Wittmann-Price & M. Godshall (Eds.), *Certified nurse educator review manual* (pp. 15-66). New York, NY: Springer Publishing.
- Yannacci, J., Roberts, K., & Ganju, V. (2006). *Principles from adult learning theory, evidence-based teaching, and visual marketing: What are implications for toolkit development*. Retrieved from http://ebp.networkofcare.org/uploads/Adult_Learning_Theory_2497281.pdf.

APPENDIX A: STUDENT OUTCOMES ASSESSMENT MEMORANDUM OF
UNDERSTANDING BACCALAUREATE NURSING PROGRAM

Purpose

The purpose of assessment in the Nursing Programs is to measure achievement of student learning and program outcomes. Assessment occurs through a variety of methods such as standardized testing, clinical evaluation of student performance, course assignments and presentations, and surveys. Aggregate information is used for program improvement and is required for continued program accreditation. The aggregate data may also be utilized in educational research.

Benefit to Student

Participation in assessment activities, including standardized testing:

- Help the student to identify strengths and weaknesses in understanding critical nursing content.
- Improve confidence and familiarity with computerized NCLEX-RN style testing.
- Increase probability of student passing the national licensure examination (NCLEX-RN).

Graduating from an accredited program creates a gateway for graduates to:

- Participate in federally funded and state entitlement programs.
- Qualify to attend accredited schools to pursue advanced studies, including Master's and doctoral nursing programs.
- Improve marketability: Employers prefer graduates from nationally accredited institutions.

Standardized Testing

The Baccalaureate Nursing Program is currently using Assessment Technology Institute's (ATI) Comprehensive Program of Assessment and Review (CARP). Among other materials the program includes standardized testing that is used for assessment beginning with pre-admission

to the major and continuing throughout the program, culminating in preparation for the National Council Licensure Examination (NCLEX-RN) in the senior year.

Placement of the various tests in the program of study and cost to the student depend on the student's program track.

Students are required to pass a comprehensive examination in the last semester of the nursing program to assess readiness for NCLEX-RN. Students will be ineligible to apply for licensure and to schedule the NCLEX-RN until the comprehensive examination program requirement has been met.

Memorandum of Understanding

I have read and understand the information provided about outcomes assessment in the Baccalaureate Nursing Program. I understand the purposes for which aggregate (group) data will be utilized and that my personal assessments will be kept confidential. I understand that the ATI assessment package (CARP) is required for the Baccalaureate Nursing Program, and I will purchase what is required for my program track. I understand that I may request a copy of this form for my records.

Printed Name _____ Date _____

Signature _____