



## Predicting Success for Associate Degree Nursing Students in a Concept-Based Curriculum



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### ABSTRACT

The study objective was to assess critical thinking scores, National Council Licensure Examination for Registered Nurses (NCLEX-RN) prediction scores, and NCLEX-RN pass rates for associate degree nursing (ADN) students educated with a concept-based curriculum. Results suggested that a concept-based curriculum can assist in developing critical thinking among ADN students, and critical thinking and probability of pass scores may be used as predictors for first-time NCLEX-RN passage for ADN students in a concept-based curriculum.

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### Introduction

Traditional lecture-focused curricular designs are failing to produce new graduates who can make the transition to safe and competent nurses. Although contemporary practice requirements are increasing, many novice nurses struggle with the ability to effectively critically think when making clinical decisions (Perez et al., 2015; Victor-Chmil, 2013). Today's nurse is responsible for managing an escalating census composed of patients with multifaceted health care problems, all while navigating convoluted technology platforms in a hurried and outcome-driven environment (Benner, Sutphen, Leonard, & Day, 2010; Fero, Witsberger, Wesmiller, Zullo, & Hoffman, 2009; Missen, McKenna, & Beauchamp, 2015).

Considering the intricacies associated with today's health care arena, less than desirable traits of novice nurses, and demands of the nursing workforce, a revamp of nursing education is in high demand (Accreditation Commission for Education in Nursing [ACEN], 2013; Benner et al., 2010; Institute of Medicine [IOM], 2011; National League for Nursing [NLN], 2008). Utilizing innovative nursing curricula designs, whereby students are engaged in the learning process through methods that challenge their ability to process complex clinical scenarios, is more likely to prepare them for the challenges inherent in a 21st century health care setting (Benner et al.,

2010). One curricular model possessing these qualities is a concept-based curriculum.

According to Erickson and Lanning (2014), a concept-based curriculum consolidates information by focusing on key exemplars. An essential component to a concept-based curriculum is the use of active teaching–learning strategies (Giddens, Caputi, & Rodgers, 2015), such as case studies, concept maps, problem-based learning, and simulation. Through the use of active teaching–learning strategies, students can formulate connections with information, leading to learning comprehension, critical thinking development, and the ability to decipher similar material when faced with a new experience (Erickson & Lanning, 2014). For example, a nurse educator in a beginning course may develop a case study regarding the concept of oxygenation when teaching students about the exemplar, pneumonia. As students progress through the nursing program, another nurse educator could reinforce the concept of oxygenation by assigning students to care for a simulated patient diagnosed with the exemplar, respiratory failure. Although different exemplars, both are supported by the concept of oxygenation and require similar nursing care.

A conceptual approach to teaching has been applied to prelicensure nursing education for almost a decade and continues to expand in use. However, there remains a dearth of literature analyzing outcomes related to a concept-based curriculum. This study was developed in an attempt to address this gap in the literature and support research priorities created by the IOM (2011) and NLN (2013) regarding the evaluation of innovative nursing curricular designs. The purpose of this study was to evaluate critical thinking skills

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and National Council Licensure Examination for Registered Nurses (NCLEX-RN) pass rates among associate degree nursing (ADN) students completing a concept-based curriculum. Also assessed in this study were the pass rate prediction test scores for the NCLEX-RN. The following research questions were addressed:

1. What is the difference between critical thinking program entry score and critical thinking program exit score for ADN students in a concept-based curriculum?
2. What is the relationship between critical thinking program exit score and first-time NCLEX-RN pass rates for ADN students in a concept-based curriculum?
3. What is the relationship between probability of pass score and first-time NCLEX-RN pass rates for ADN students in a concept-based curriculum?
4. What is the mean probability of pass score for first-time NCLEX-RN passage among ADN students in a concept-based curriculum?

Kolb's Experiential Learning Theory served as the underpinnings for this research study. According to Kolb (1984), students formulate knowledge through experience and by being actively engaged in the learning process. Students are able to build learning through repeated exposure to similar experiences, which improves their critical thinking skill set (Kolb, 1984). It was anticipated that, as participants in this study advanced through a concept-based curriculum, the experiential learning theory guided their knowledge acquisition and critical thinking ability. Moreover, this theory provided support in assessing and measuring the study variables. The independent variables in this study were critical thinking program exit score and probability of pass score. The outcome variable was first-time pass success on the NCLEX-RN.

## Background and Literature Review

Cumulative Index to Nursing and Allied Health Literature, Education Resources Information Center, ProQuest, and PubMed were used to search for relevant literature by applying the following subject terms: *critical thinking*, *NCLEX-RN*, *NCLEX-RN predictors*, *concept-based curriculum*, *nursing education*, and *education, nursing, associate*. To streamline the results, subject terms were combined, which yielded approximately 500 articles. A review of the titles and abstracts of these articles determined their inclusion based on relevance to the study purpose and research questions.

### Critical Thinking

Effective critical thinking skills are inextricably associated with improved patient outcomes (Robert & Petersen, 2013). However, literature overwhelmingly suggests that novice nurses are not able to exercise this crucial thought process (Benner et al., 2010; del Bueno, 2005; Fero et al., 2009; Missen et al., 2015; Perez et al., 2015). New nurses tend to design care around the completion of tasks instead of tackling patient problems with sound clinical decisions (Benner et al., 2010; Missen et al., 2015).

In a landmark study conducted by del Bueno (2005), only 35% of the sample of nearly 11,000 novice nurses were able to use critical thinking skills when managing the clinical care of simulated patients. In a similar study, Fero et al. (2009) reported that, when exposed to clinical case studies, novice nurses had statistically significant lower critical thinking scores as compared with nurses with more than 1 year of experience. In particular, marked deficits were discovered in their ability to recognize health care problems and implement prioritized nursing interventions to solve these problems (Fero et al., 2009).

Saintsing, Gibson, and Pennington (2011) attributed critical thinking deficits to the health care errors committed by novice nurses

in their study. Mishaps in medication administration were identified as the most common type of error (Saintsing et al., 2011). Comparable findings were reported by Ebright, Urden, Patterson, and Chalko (2004), with 88% of the novice nurses in their study being involved in a medication error and nearly a third of these errors related to critical thinking inadequacies. Following an integrative review of literature related to the clinical performance of nurses, Missen et al. (2015) and Perez et al. (2015) concluded that critical thinking deficits were rampant among new graduates.

Novice nurses have expressed their own concern regarding the ability to critically think. Nearly 7,500 nurses in a study conducted by Li and Kenward (2006) blamed poor critical thinking skills as the leading cause for their practice deficits. Participants in another study admitted to feeling unskilled as beginning practitioners and faulted inadequate critical thinking development exercises during nursing school as the primary reason (Etheridge, 2007). Moreover, in a study conducted by Wangenstein, Johansson, Björkström, and Nordström (2010), the use of traditional teaching methods were identified as the likely culprit for novice nurses' low critical thinking scores.

An assessment of literature regarding the critical thinking development of nursing students yielded contradictory findings. Jones and Morris (2007) examined the critical thinking ability of ADN students with the Assessment Technologies Institute (ATI) Critical Thinking Assessment (CTA). A comparison of the students' critical thinking scores at program entry and program exit did not indicate a statistically significant change. The lack of a statistically significant increase in critical thinking scores following completion of a concept-based curriculum was also suggested by the findings in two other studies, leading the researchers to advocate for the use of teaching strategies aimed at developing nursing students' critical thinking skill sets (Giddens & Gloeckner, 2005; Stewart & Dempsey, 2005).

### NCLEX-RN Predictors

The NCLEX-RN is designed to assess nursing graduates' basic competency for entry into practice (National Council of State Boards of Nursing, 2013). Each year, approximately 3,000 graduates are unsuccessful on the NCLEX-RN, which can cause emotional and financial upset for the examinees and impair the standing of the programs from which they graduated (Simon, McGinniss, & Krauss, 2013). Consequently, many schools of nursing have incorporated end-of-program standardized testing in an attempt to identify students deemed high risk of failing the NCLEX-RN (Emory, 2013; Simon et al., 2013). Because critical thinking and NCLEX-RN predictor examinations can be administered to assess a student's likelihood of passing the NCLEX-RN, literature regarding these tools was sought.

Review of the literature yielded contradictory findings when critical thinking skills were used to predict first-time pass success on the NCLEX-RN. Ukpabi (2008) reported a positive correlation between nursing students' critical thinking scores obtained by the ATI CTA and their success on the NCLEX-RN ( $p = .008$ ). Similar findings were reported by Giddens and Gloeckner (2005). Although different instruments were used in the study, a statistically significant relationship between high critical thinking scores and increased NCLEX-RN pass success ( $p = .010$ ) was noted (Giddens & Gloeckner, 2005). On the other hand, studies conducted by Stewart and Dempsey (2005) and Shirrell (2008) found no correlation between critical thinking skills and first-time pass success on the NCLEX-RN.

Although there are numerous tools designed to predict student success on the NCLEX-RN, the focus of this literature review was on the ATI registered nurse (RN) Comprehensive Predictor. In one study involving nursing students enrolled in baccalaureate and master's programs, findings indicated a statistically significant relationship ( $p \leq .001$ ) between scores on the ATI RN Comprehensive

Predictor and NCLEX-RN pass success (Alameida et al., 2011). Likewise, Penprase, Harris, and Qu (2013) and Brodersen and Mills (2014) reported similar results from their studies. It should be noted that none of these studies involved ADN students and that all were conducted at single research sites, in which traditional nursing curricula models were implemented.

### Concept-Based Curriculum

It has been postulated that nursing students educated with a concept-based curriculum are able to demonstrate the higher order thinking needed to safely practice as novice nurses (Giddens et al., 2015). Nonetheless, a review of the literature produced a paucity of research evaluating the outcomes related to this curricular design. Even further lacking was empirical evidence assessing a correlation between predictive variables and first-time NCLEX-RN pass success for students completing a concept-based curriculum. In a study conducted by Giddens and Morton (2010), findings suggested a moderate positive correlation ( $r = .458$ ) between the mean score of an NCLEX-RN predictor examination and NCLEX-RN pass success for students in a concept-based curriculum. However, when comparing a concept-based curriculum with a traditional curriculum, findings were inconclusive regarding improved NCLEX-RN pass success (Giddens & Morton, 2010). In a similar study, minimal differences were noted in the rates of NCLEX-RN pass success and critical thinking scores for nursing students in a traditional nursing program when compared with those in a concept-based curriculum (Duncan & Schulz, 2015). Lewis (2014) reported a small improvement in NCLEX-RN pass success among students exposed to a concept-based curriculum when compared with those who were not, although statistical significance was lacking ( $p = .9019$ ) in the study results. The quantity of retrieved studies evaluating the effectiveness of a concept-based curriculum was limited, and of those obtained, none included ADN students as study participants even though ADN students comprise the greatest number of students enrolled in prelicensure nursing programs (Kaufman, 2013) and those taking the NCLEX-RN (Trofino, 2013). Another theme noted in the literature was a comparison of a traditional curriculum to a concept-based curriculum, instead of solely focusing on the latter.

### Methods

A retrospective, descriptive, correlational design was utilized to evaluate critical thinking scores, pass rate prediction scores, and NCLEX-RN pass rates in ADN students who were educated with a concept-based curriculum. To avoid repeating similar study designs, the decision was made to merely concentrate on outcomes of the revised curriculum instead of comparing the traditional curriculum to the revised curriculum. Before conducting this study, permission was secured from the president and academic dean of the study college, the institutional review board from the study site, and the institutional review board from the University of Missouri–Kansas City. The study participants were a convenience sample of ADN students whose academic records and demographic data were analyzed as secondary data. The setting for this study was a private, nonprofit college in a midwestern state. The ADN program at this college has been in existence since 2001. The program is accredited by the Higher Learning Commission and the ACEN. In the face of declining NCLEX-RN scores, faculty and administrators at the college consulted with a curriculum expert, who suggested a major curriculum revision. In 2010, the college adopted a concept-based curriculum. The first graduating class from the revised curriculum was in 2012.

Students who completed the senior nursing clinical course on the first attempt, took all nursing courses at the study site, sat for the NCLEX-RN within 6 months from graduation, and graduated from

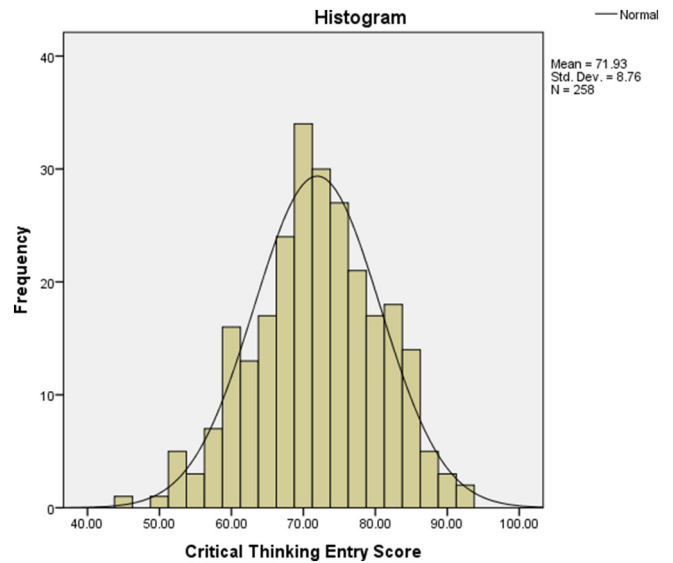


Fig. 1. CTA program entry scores.

the ADN program during 2012 through 2014 were included in the study. Those students who repeated the senior nursing clinical course, transferred from another nursing program, or took the NCLEX-RN 6 months or longer from the date of graduation were excluded. Power analysis was established via post hoc statistical techniques with an estimated 240 data sets. Results of the study were regarded as dichotomous (pass/not pass). An assumption was that these data reflected 80% of the potential population. With an alpha preset at .05, this afforded a power of 0.8 with a beta of 0.2 and produced a moderate effect size.

Two of the instruments utilized for data collection were copyrighted by ATI, for which permission for use was granted. These instruments were the CTA and RN Comprehensive Predictor. The other instrument was the NCLEX-RN, for which copyrights are maintained by the National Council of State Boards of Nursing. Participants' critical thinking skills were calculated via the CTA, which is a 40-item test that was created in 2000 by a panel of expert nurse

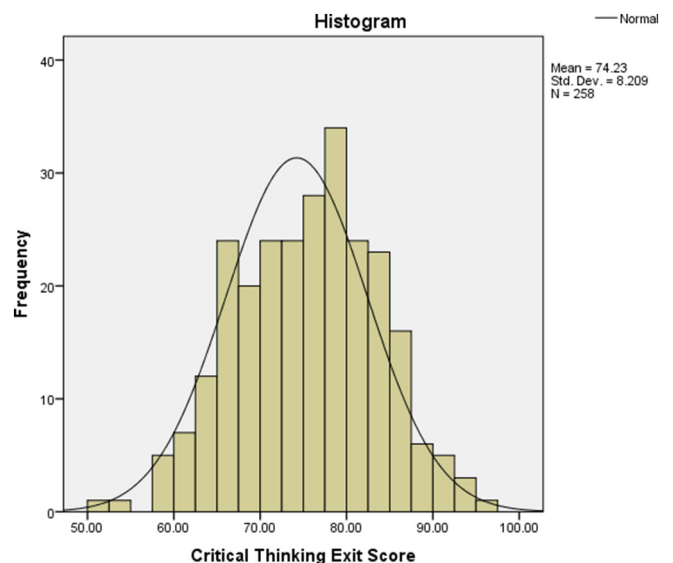


Fig. 2. CTA program exit scores.

**Table 1**  
Logistic regression analysis: Omnibus test of model coefficients

	$\chi^2$	df	Sig.
Model	14.432	2	<.001

educators to determine examinees' critical thinking attributes (ATI, 2001). Reliability of the CTA was determined with Cronbach's alpha and a Guttman split-half coefficient comparison (ATI, 2001). For those initially taking the CTA, the instrument had a global alpha of .694 for each item, and the standardized item alpha was .7012 (ATI, 2001). Each participant in the study took the CTA before entering the nursing program and during Week 8 of the 16-week final senior nursing clinical course as part of a program requirement.

The participants' probability of pass scores were measured via the RN Comprehensive Predictor, which provides a score correlating the likelihood of passing the NCLEX-RN based on responses to 180 multiple-choice questions (ATI, 2012, 2014). During the study period, four versions of the RN Comprehensive Predictor were administered. The test plan for three of the forms was the same, but one form was revised in response to the increase in passing standard on the NCLEX-RN during that year (ATI, 2014). All forms of the RN Comprehensive Predictor were equated so that content and level of difficulty were the same (ATI, 2012, 2014). According to ATI (2012), content and face validity of the RN Comprehensive Predictor was determined by experts who assessed each item for proper content representation and difficulty via the Mantel-Haenszel chi-square procedure in over 3,000 examinees. Similarity in topics from the RN Comprehensive Predictor and curriculum at the study site helped to support face validity of the instrument. All participants took the RN Comprehensive Predictor during Week 13 of the 16-week senior nursing clinical course as part of a program requirement. After reviewing similar programs, a benchmark score of 72% was established, for which students were granted three attempts to achieve before graduating. Only first-time scores were included as study data.

The NCLEX-RN provided the participants' NCLEX-RN pass rates. The NCLEX-RN examination determines RN competency for entry into practice. A decision consistency statistic is used to measure the reliability of the NCLEX-RN because the results are reported dichotomously as pass/fail (National Council of State Boards of Nursing, 2015b). All items on the NCLEX-RN are written and reviewed by nurse experts with varied educational and practice backgrounds in an attempt to ensure content validity (National Council of State Boards of Nursing, 2015b). To provide sampling validity, every examinee is presented with items from each content area on the testing blueprint, and expert item writers review imitation and true questions for representation of current nursing practice to support face validity of the instrument (National Council of State Boards of Nursing, 2015b). In addition, every 3 years, a group of experts review the passing standards of the examination to make sure the questions reflect contemporary nursing practice and the examination possesses pass/fail decision validity (National Council of State Boards of Nursing, 2015a, 2015b). Study participants were granted permission to take the NCLEX-RN after completing all graduation requirements and meeting state licensing board eligibility requirements. Only first attempt scores and scores from participants who took the NCLEX-RN within 6 months from graduation were included as study data.

**Table 2**  
Logistic regression analysis: Variables in the equation

	Sig.	Exp (B)
CTA program exit score	0.009	1.09
Probability of pass score	0.012	1.12

**Table 3**  
Correlation

	NCLEX-RN pass success	Sig. (two tailed)
CTA program exit Pearson correlation	.195	.002
Probability of pass Pearson correlation	.188	.002

Two versions of the NCLEX-RN were included in the study because the passing standard of the examination was revised during the time of the study.

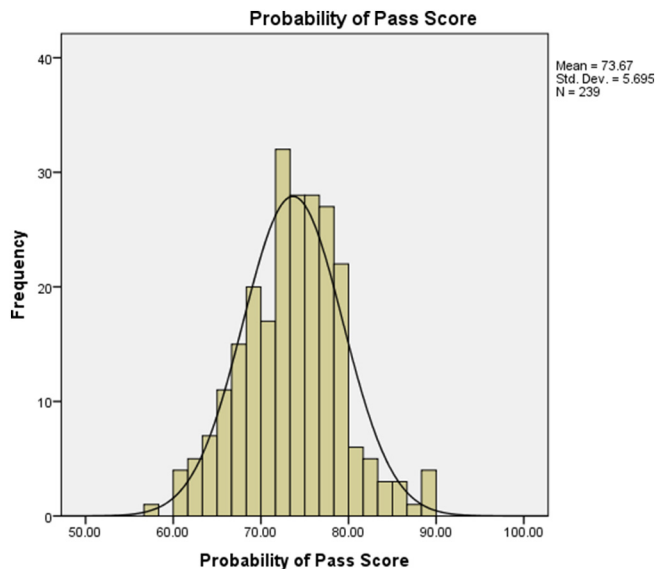
**Data Analysis and Results**

Statistical Package for Social Sciences was used for data management and analysis. All data were inspected and edited for coding and transfer errors. There was a risk for loss of confidentiality by participating in the study, which is inherent when manipulating any research data. Therefore, after matching scores to each student's name, the names were removed, and a code number was assigned. Descriptive and inferential statistical methods were used to analyze the research data.

Initially, 272 potential students were identified. Fourteen students were excluded following application of the inclusion criteria, resulting in 258 study participants. Descriptive statistics were used to characterize the participants. With regard to gender, the sample ( $N = 258$ ) consisted of 90% female ( $n = 231$ ) and 10% male ( $n = 27$ ). A breakdown of ethnicity was as follows: 94% Caucasian ( $n = 242$ ), 4% African American ( $n = 10$ ), 1% Asian ( $n = 3$ ), 0.4% Hispanic ( $n = 1$ ), 0.4% Indian ( $n = 1$ ), and 0.4% biracial ( $n = 1$ ).

The paired  $t$  test was performed to assess if critical thinking program exit score was significantly higher than critical thinking program entry score. The mean score on the CTA program entry examination was 71.9 ( $SD = 8.76$ ; Fig. 1), and the mean score on the CTA program exit examination was 74.2 ( $SD = 8.21$ ; Fig. 2). A significant increase from critical thinking program entry to critical thinking program exit was found,  $t(257) = -5.134, p < .001$ .

Logistic regression and point biserial correlation statistics assessed whether the two predictor variables predicted whether a



**Fig. 3.** RN comprehensive predictor scores.

student passed the NCLEX-RN on the first attempt. The Omnibus Test of Model Coefficients suggested that the overall model was significant when both independent variables were considered together ( $\chi^2 = 16.432$ ,  $df = 2$ ,  $p < .001$ ; Table 1). The Cox and Snell R Square and the Nagelkerke R Square in the model summary indicated that between 6.2% and 15.1% of the variance in first-time NCLEX-RN pass success was accounted for by critical thinking program exit and probability of pass scores. According to the variables in the equation, both predictor variables, critical thinking program exit score ( $p = .009$ ), and probability of pass score ( $p = .012$ ) were significant in predicting if a student passed the NCLEX-RN on the first attempt (Table 2). Data analysis from the classification table indicated that, when critical thinking program exit scores and probability of pass scores were used as predictors, 93% of the participants were correctly predicted in their ability to pass the NCLEX-RN on the first attempt. Correlation of each independent variable and the dependent variable was also computed (Table 3).

A total of 19 participants did not pass the NCLEX-RN on the first attempt. This resulted in a decrease in the sample size to 239 when assessing the mean probability of pass score. Descriptive statistics were utilized, and the mean probability of pass score was determined to be 73.7% (Fig. 3).

## Discussion

Overall, the study participants were characterized as being in their late 20s to early 30s in age, female gender, and Caucasian ethnicity. An analysis of the results provided support for the use of a concept-based curriculum in enhancing the critical thinking development of ADN students and predicting their success on the NCLEX-RN. Hypothesis testing found significant results for all hypotheses.

There was a statistically significant increase in the critical thinking development of the study participants after they completed a concept-based curriculum ( $p < .001$ ). This rejected the null hypothesis. The alternative hypothesis was supported, which stated “Critical thinking program exit score will be higher than critical thinking program entry score for ADN students in a concept-based curriculum.”

Statistically significant results were found in the ability of the dependent variable, first-time pass success on the NCLEX-RN, to be predicted by both independent variables, critical thinking program exit score ( $p = .009$ ), and probability of pass score ( $p = .012$ ). With the use of model building via logistic regression, it was suggested that the model was a good fit. Specifically, this indicated that the model was able to predict values that were not significantly different from what was observed. Although a weak relationship was suggested between critical thinking program exit score and first-time pass success on the NCLEX-RN ( $rpb = 0.195$ ) and probability of pass score and first-time pass success on the NCLEX-RN ( $rpb = 0.188$ ), it was indicated that, as critical thinking score and probability of pass score increased, a student’s ability to pass the NCLEX-RN on the first attempt also increased. In particular, the odds of passing the NCLEX-RN on the first attempt was suggested to be 1.09 times higher with a 1% increase in critical thinking program exit score and 1.12 times higher with a 1% increase in the probability of pass score. As a result, the second and third null hypotheses were rejected, and the alternative hypotheses were supported, which stated, “A higher critical thinking program exit score will result in a higher first time NCLEX-RN pass success for ADN students in a concept-based curriculum” and “A higher probability of pass score will result in a higher first time NCLEX-RN pass success for ADN students in a concept-based curriculum.”

The mean probability of pass score for first-time NCLEX-RN passage was 73.7%. This was higher than the program’s benchmark probability of pass score of 72%. Thus, the fourth null hypothesis was also rejected, thereby supporting the alternative hypothesis, which stated,

“The mean probability of pass score for first time NCLEX-RN passage among ADN students in a concept-based curriculum will be greater than the program’s benchmark score of 72%.”

There were several study limitations, such as a single research site, no inclusion of a control group, lack of randomization, secondary data, four formats of the RN Comprehensive Predictor, two versions of the NCLEX-RN, and the use of correlation procedures to analyze the data. The ramifications of these limitations were taken into consideration when analyzing the study results. Moreover, these limitations may hinder the generalizability of the study’s findings.

## Conclusions

In an attempt to address concerns regarding the preparedness of novice nurses, several prominent organizations have recommended a transformation of nursing education (ACEN, 2013; Benner et al., 2010; IOM, 2011; NLN, 2008). One suggestion is the use of innovative curricular models that can stimulate nursing students’ critical thinking skills. While a concept-based curriculum is gaining popularity in nursing education, little empirical data exist evaluating the outcomes associated with this leading-edge curricular model. Thus, this study was created to deliver evidence regarding the outcomes of a concept-based curriculum.

Nurse educators have a duty to do all they can to adequately prepare students for first-time pass success on the NCLEX-RN. Results of this study can assist nurse educators in identifying students who are at risk for failing the NCLEX-RN on the first attempt. Findings from this study also provide hope that nursing students’ critical thinking skills can be enhanced following exposure to a concept-based curriculum. Due to the substantial gap between nursing education and contemporary nursing practice, it is essential that nurse educators take swift action to better equip novice nurses in meeting the demands of today’s health care arena. A passive approach to undertaking an educational redesign in nursing education may lead to grave patient outcomes.

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