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## The Effect of Test-Taking Strategy Education on Kaplan Integrated Exam Scores

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THE EFFECT OF TEST-TAKING STRATEGY EDUCATION ON KAPLAN INTEGRATED  
EXAM SCORES

An Evidence-based Practice Capstone Project

Submitted to the Faculty of the

Graduate Program in Nursing

In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Nursing

Nancy Frank

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## Abstract

Achieving minimum NCLEX-RN<sup>®</sup> pass rates is problematic for many nursing programs. Much research focuses on determining predictors of NCLEX-RN<sup>®</sup> success and preventing failure. Schools implement standardized content assessments to provide computerized test taking practice and identify at risk students. Using standardized content assessments as predictors allows for early remediation. Although many studies demonstrate a reactionary, multifaceted approach, proactive remediation potentially prevents a problem. However, current research provides poor indication of effective, generalizable techniques. Test-taking strategies typically combined with other interventions, show potential benefit, but limited research is available on effective methods. Cognitive behavioral test taking techniques and Mayfield's Four Questions<sup>®</sup> (M4Q) strategy appear promising. However, stronger evidence on effective test taking strategy education is necessary. This pilot study examined the effect of M4Q<sup>®</sup> test-taking strategy education on Kaplan Medical-Surgical 1 integrated exam results by comparing non-equivocal groups. Students enrolled a junior level Medical-Surgical nursing course during the 2016 spring semester received the opportunity to participate in an educational intervention. The participants' de-identified exam scores were compared to de-identified outcomes from the previous spring semester. Preliminary data analysis demonstrated no potential confounders to consider. An independent samples *t* test revealed no statistically significant difference in the group means for raw scores and percentile ranking. However, anecdotal comments from students indicated potential benefit. Therefore, additional research to evaluate the M4Q<sup>®</sup> and other test-taking strategies is needed. Tests are an integral aspect of nursing education and proactive remediation techniques, such as test-taking strategies, should be evidence-based.

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## Chapter One, Introduction

Nursing program graduates must pass the National Council Licensure Examination-Registered Nurse (NCLEX-RN<sup>®</sup>) as a final requirement to become a registered nurse. This examination measures entry-level nursing competencies of critical thinking, reflection, and problem solving (Roa, Shipman, Hooten, & Carter, 2011). Due to the high stakes nature of this test, it is often used to indicate program quality for recruitment purposes (Pennington & Spurlock, 2010). In addition, State Boards of Nursing and Accreditation organizations mandate schools of nursing maintain certain rates of first time pass success.

However, nationally, in 2014, over 18% of eligible graduates, educated in the United States, did not successfully pass the NCLEX-RN<sup>®</sup> on their first attempt and less than half of repeated attempts were successful (National Council of State Boards of Nursing, NCSBN, 2015). In particular, diverse nursing students, such as men and non-Caucasian ethnicities, have higher failure rates than otherwise expected (Giddens, 2009; Taylor, Loftin, & Reyes, 2013). NCLEX-RN<sup>®</sup> failure can cause financial and psychosocial distress for the graduate, as well as financially affect health care organizations and schools of nursing (Roa et al., 2011). In addition, if set levels of first time pass rates are not met, schools of nursing may be placed on probation by the indicated State Board of Nursing or lose accreditation. Lack of success on the NCLEX-RN<sup>®</sup> prevents potential nurses from practicing and contributes to the increasing nursing shortage (Roa et al., 2011).

Therefore, many schools of nursing attempt to address the problem of NCLEX-RN<sup>®</sup> failure by purchasing standardized testing packages. Testing packages, such as Assessment Technology Institute (ATI), Elsevier's Health Education Systems Incorporated (HESI), and Kaplan, provide entrance exams, specific content assessments, and predictor tests (ATI, 2014;



Elsevier Student Life, 2015; Kaplan Nursing, n.d.). Standardized testing, when used across the curriculum, can identify students at risk for NCLEX-RN® failure, allow for remediation, and provide test-taking practice (Heroff, 2009). Although some schools of nursing use these standardized exam results to determine student admission, progression, and graduation, the primary goal of implementation is to prepare students for successful completion of the NCLEX-RN® (Heroff, 2009; Schroeder, 2013; Spurlock, 2013). The predictive nature of the standardized exams, however, creates a dilemma on how to provide effective remediation for at risk students.

Many schools of nursing enact remediation strategies in response to unacceptable NCLEX-RN® first time pass rates. Since the remediation is reactionary, the tendency is to initiate multiple interventions simultaneously to accelerate improvements in NCLEX-RN® success rates (Hyland, 2012, Pennington & Spurlock, 2010). However, Culleiton (2009) suggested that remediation should be a proactive process used to identify and address a problem before negative outcomes occur. Standardized content exams, in particular, measure competence throughout the program and therefore, provide an opportunity for early identification of struggling students (Emory, 2013). As students are determined to be at risk for NCLEX-RN® failure, anticipatory remediation strategies promote the students' success.

Remediation plans commonly include education on test-taking strategies. Instruction on test-taking skills can help to relieve test anxiety, which is common in nursing students (Gibson, 2014, Salend, 2012). Frequently, students with test anxiety have poor test-taking strategies and respond well to education on test taking (Holzer, Madaus, Bray, & Kehle, 2009). Since appropriate testing technique is necessary for a student to demonstrate knowledge, a student with inadequate testing skills may have poor test performance even if the content has been learned (Dodeen, 2014). Thomas and Baker (2011) stated that students who know the material might

still answer a question incorrectly due to lack of test-taking skills. Therefore, test-taking strategy education is essential for nursing graduates to be successful on the NCLEX-RN®.

### **Statement of the Problem**

Schools of nursing implement standardized test packages and associated remediation as a way to ensure first time NCLEX-RN® success. Studies done by Emory (2013) and Schooley and Kuhn (2013) have evaluated the predicative capabilities of the ATI and HESI standardized content examinations, but no research could be located on using Kaplan integrated exams as predictors. Additionally, evidence regarding appropriate remediation of students determined to be at risk is unclear. Most studies described multiple, inconsistent interventions with limited generalizability to other schools (Hyland, 2012). Although test-taking strategy instruction was often included in the bundle of interventions, little is known about its individual effect (Pennington & Spurlock, 2010). Since tests encompass a significant part of undergraduate nursing curriculum, test-taking skills are imperative for students to progress through the program, graduate, and pass the NCLEX-RN® successfully.

**Standardized content assessments.** Standardized content assessments measure mastery of specific content areas, such as medical-surgical, pediatric, or community health, throughout a nursing program. Although these tests prepare students for NCLEX-RN® style questions and technique, they lead to frustration for students with poor test-taking skills (Heroff, 2009). Instead of improving test-taking skills, these exams may destroy confidence, increase test anxiety, and ultimately decrease performance in later exams.

**Remediation.** Effective remediation programs are an important continuation for at risk students identified through standardized content assessments. Without intervention in place, the cost of standardized testing packages cannot be justified merely to identify students at risk for

NCLEX-RN® failure (Lavandera et al., 2011). However, identifying at-risk students and beginning remediation by the midpoint of the nursing program can improve the potential for those students to be successful (Corrigan-Magaldi, Colalillo, & Molloy, 2014).

Unfortunately, little evidence exists to support which educational interventions are effective for remediation. Without a solid research base, schools of nursing can gain a false sense of confidence from remediation attempts (Pennington & Spurlock, 2010). Faculty believe the remediation efforts are successful due to the typical NCLEX-RN® first time pass increase that results from any combination of interventions (Hyland, 2012). However, multiple confounders can affect the remediation effects due to lack of experimental or quasi-experimental studies (Pennington & Spurlock, 2010). The current research does not provide clear evidence to determine which interventions are most effective, leading faculty to guess at the best remediation methods.

**Test-taking strategies.** Nurse educators frequently include instruction on test-taking strategies as part of a remediation combination. However, little current research exists on which test-taking strategies are effective for nursing students and what effect those skills have on a student's ability to pass an exam successfully (Mayfield, 2010). Yet, nursing students suffer from high levels of test anxiety and graduates perceive that poor test-taking skills contribute to NCLEX-RN® failure (Gibson, 2014; Mc Farquhar, 2014). Though schools of nursing integrate testing throughout all aspects of a program and graduates must pass a final test to become a registered nurse, the evidence regarding successful nursing test-taking strategies is insufficient.

Although schools of nursing have attempted to help graduates successfully pass the NCLEX-RN® by purchasing standardized testing packages, remediation must be in place to receive full benefit of the exams. However, the evidence is limited on which remediation

strategies are most effective to help nursing students be successful. Even though test-taking strategy education is often included in a multifaceted remediation attempt, little current research is available to indicate which strategies are most effective for nursing students.

### **Background and Need**

After graduating from a school of nursing, passing the NCLEX-RN® is the final prerequisite to become a registered nurse. Every three years, the National Council of State Boards of Nursing (NCSBN) evaluates whether the passing standard will ensure that new registered nurses will meet the minimum competency standards and adjusts the standard accordingly (Lavin & Rosario-Sim, 2013). When the passing standard was last increased in 2013, the NCLEX-RN® pass rate decreased from 90% in 2012 to 81.78% in 2014 (NCSBN, 2013; NCSBN, 2014; NCSBN, 2015). In 2014, 25% of Pennsylvania nursing baccalaureate programs did not meet the mandatory 80% first time pass rate, which results in probationary status for those schools of nursing (Pennsylvania State Board of Nursing, 2014). Inadequate numbers of graduates with first time NCLEX-RN® pass success influences the school's ability to maintain accreditation, as well as attract and retain students (Roa et al., 2011). Therefore, schools of nursing are motivated to ensure their students' successful completion of this last hurdle.

**Standardized content assessments.** Many schools of nursing have purchased standardized testing packages, which include content specific tests, to prepare students for the NCLEX-RN®. Although strongly discouraged by the National League of Nursing (2012), some programs use these standardized exams to determine student progression and graduation eligibility. Current research focuses on using standardized content assessments as predictors of NCLEX-RN® success. Emory (2013) and Yeom (2013) focused on the potential of the ATI

Content Mastery exams to predict which students would successfully pass the NCLEX-RN® on the first attempt. Schooley and Kuhn (2013) studied the HESI specialty exams for NCLEX-RN® predictive value as well. Although each of these studies demonstrated a potential predictive capability of the standardized content assessments, limited generalizability and selection bias were present. Additionally, no studies on the Kaplan integrated exams and NCLEX-RN® first time success are available (K. Haidemenos, personal communication, December 1, 2014). Therefore, the research evidence remains unclear as to the predictive value and potential association of standardized content assessment and NCLEX-RN® first time pass success.

**Remediation.** Unfortunately, the existing research on remediation primarily is a single school's reaction to an unacceptable NCLEX-RN® pass rate. The common response to low first time pass rates is to bundle a variety of potentially effective interventions, such as education on test-taking strategies, curricular changes, and faculty mentorship, and enact them simultaneously in an attempt to reverse the problem quickly (Hyland, 2012; Pennington & Spurlock, 2010). Although NCLEX-RN® pass rates typically improve with the multi-faceted remediation approach, the resulting descriptive research remains unclear as to which interventions are actually effective. Additional research could determine effective proactive remedial interventions that are generalizable across a variety of nursing programs.

**Test-taking strategies.** Commonly, test-taking strategies are included with other remediation attempts to increase NCLEX-RN® success rates. Since tests evaluate the nursing curriculum, appropriate test-taking strategies are essential to determine successful achievement of the curricular objectives. However, research on successful test-taking strategies, in general, is limited. Nursing students typically learn test-taking strategies based in tradition, not research evidence (Mayfield, 2010). Since effective test-taking strategies decrease test anxiety and allow

students to demonstrate their academic abilities accurately, a need for more research exists (Bicak, 2013). Testing specific test-taking strategies with nursing students replicated at various locations would help to solidify the evidence about which strategies are most effective to improve test scores.

***Mayfield's four questions.*** Mayfield (2010) created the Mayfield's Four Questions<sup>®</sup> (M4Q) test-taking strategy to assist nursing students who had difficulty on exams even though they had learned the material. The method teaches students to think critically about each exam question using the following four questions:

1. What is this question really asking me?
2. What is it trying to determine that I know?
3. What level of learning is needed to answer correctly?
4. What do I think is the correct answer? (Mayfield, 2010, p. 77)

After the student has processed each of the questions, the student locates the correct answer among the options. Mayfield (2010) suggested that this method would help students to avoid distractors and improve test scores.

Use of the M4Q<sup>®</sup> test taking strategy as part of a remediation program for nursing students on provisional status indicated that students who learned the M4Q<sup>®</sup> strategy were successful in the nursing program and those students who chose not to learn the M4Q<sup>®</sup> strategy were not successful in the program. Mayfield (2010) performed independent samples *t*-tests on stratified randomized sample group means of multiple-choice tests taken throughout the semester to provide additional evidence of M4Q's effectiveness. Although course exam grade means ( $t(31) = -.821, p = .418$ ) were not statistically different between the groups, the intervention group had higher exam mean grades by 3.31% on 11 of the 18 exams. On the HESI 2 exam and

combined HESI exams, the intervention group had a statistically significant better mean exam grades than the control group ( $t(31) = 2.714, p = .011$ ;  $t(31) = 2.663, p = .012$ ). Therefore, the M4Q<sup>®</sup> test strategy method showed potential for improving nursing student outcomes.

### **Conceptual Framework**

A conceptual framework regarding the nature and purpose of remediation in nursing education is an important foundation. A typical view of remediation is that of a reactionary action to solve a problem. For example, when a school of nursing fails to meet the State Board of Nursing first time pass rate level, the faculty tend to react rapidly with a bundle of interventions designed to make a quick improvement. However, the preemptive remediation provides a stronger foundation for effective nursing education. Culleiton (2009) defined proactive remediation as one that identifies and addresses a potential issue before it becomes a problem. Proactive remediation includes a comprehensive assessment, identification of students at risk, strategies to intervene, and evaluation (Culleiton, 2009). In nursing education, standardized content examinations provide a comprehensive assessment and identify students at risk for NCLEX-RN<sup>®</sup> failure. Consequently, nurse educators can implement strategies to increase the potential for students' success. Finally, an evaluation of the intervention used will determine if that technique was effective for the students. By proactively addressing a potential problem using evidence-based remediation, nurse educators prevent deficiencies in a curriculum. Therefore, remediation is not something that only occurs when a problem exists; it is part of continual quality improvement in a nursing program.

### **Purpose Statement**

The purpose of this project is to determine the effect of M4Q<sup>®</sup> test-taking strategy education on Messiah College junior nursing students' scores using the Kaplan Medical-Surgical

1 integrated exam. Schools of nursing use standardized content assessments already to identify students at risk for NCLEX-RN<sup>®</sup> failure (Schroeder, 2013; Spurlock, 2013). Kaplan integrated exams are administered throughout the Messiah College curriculum to provide additional test-taking practice. However, effective remediation has not been determined for low scoring students. Test-taking skills are essential for students to accurately demonstrate knowledge and help to reduce test anxiety (Dodeen, 2014). Therefore, teaching of test-taking strategies is a proactive measure to improve student outcomes, but insufficient evidence exists to determine which test-taking strategies are most effective.

In order to determine the effect of the test-taking strategy education, Kaplan Medical-Surgical 1 integrated exam scores were compared between pre-intervention and post-intervention groups. The pre-intervention group includes de-identified Kaplan Medical-Surgical 1 exam scores from the cohort receiving that exam in the first rotation of spring 2015. The post-intervention group includes students taking the Kaplan Medical-Surgical 1 exam in spring of 2016 who provided informed consent and attended the intervention session. For the intervention, the researcher presented an educational classroom session on the M4Q<sup>®</sup> test-taking strategy, which uses a series of four questions to determine exactly what the test question is asking and determining the answer before reviewing potential distractors in a multiple choice exam (Mayfield, 2010). Students practiced the method using a series of NCLEX-RN<sup>®</sup> style questions in class and received a handout (Appendix E) and access to online test questions for additional practice on their own. Students took the Kaplan Medical-Surgical 1 exam as scheduled within several weeks of the educational session. Using Statistical Package for the Social Sciences (SPSS), version 22, data were analyzed using descriptive statistics and an independent samples *t*-test for potential effect of the educational intervention.



As a result of the education on the M4Q<sup>®</sup> test-taking strategy, the researcher anticipated a statistically significant difference in the Kaplan Medical-Surgical 1 integrated exam scores between the pre-intervention and post-intervention groups. The hypothesis is that the post-intervention group exam scores will be higher compared to the pre-intervention exam scores, demonstrating that the M4Q education intervention affected the exam scores.

### **Research Question**

What is the effect of the M4Q<sup>®</sup> test taking strategy education on the scores of the Kaplan Medical-Surgical 1 integrated exam in a cohort of junior level nursing students compared to a previous cohort of junior level nursing students who did not receive the M4Q<sup>®</sup> test taking strategy education?

### **Significance of the Problem**

Exams are a primary method of evaluating a nursing education curriculum. Tests ascertain if students have learned the content in a particular course and provide a final determination of readiness to practice. Due to the current emphasis and difficulties with NCLEX-RN<sup>®</sup> first time success, many schools of nursing have purchased standardized assessment packages to help students prepare (Giddens, 2009). Although these standardized test scores are highly correlated with NCLEX-RN<sup>®</sup> outcomes, the test practice provided is not sufficient for all students' success (Spurlock, 2013). Many nursing programs use testing packages, but only 81.8% of candidates educated in the United States passed the NCLEX-RN<sup>®</sup> in 2014 (NCSBN, 2015). Therefore, effective remediation, in addition to test-taking practice, is needed.

A student who demonstrates poor test-taking ability may find it challenging to pass the NCLEX-RN<sup>®</sup> successfully. Mayfield (2010) suggested that a graduate nurse's NCLEX-RN<sup>®</sup>

failure reflects a lack of test-taking skills. Appropriate strategies used to approach test questions are just as important as the knowledge required to answer the question (Dodeen, 2014). Test-taking skills allow an accurate demonstration of learning and reduce anxiety (Holzer et al., 2009). Therefore, a proactive approach of educating students how to take tests effectively has the potential to improve NCLEX-RN® first time pass rates.

### **Definition of Terms**

- *At risk student:* A nursing student who is likely to fail the NCLEX-RN® as identified by standardized assessments.
- *Remediation:* An education intervention implemented proactively to prevent a potential problem from occurring.
- *Standardized tests or assessments:* Exams created by testing company, such as ATI, Elsevier, or Kaplan, designed to evaluate student nursing academic ability and provide a standardized scale for national comparison.
- *Standardized content assessments:* A specific type of standardized assessment that measures nursing student ability in a particular specialty area, such as pharmacology or mental health.
- *Test-taking strategies or skills:* The cognitive approach and skills necessary for a student to demonstrate knowledge of the content appropriately on an exam.

## Chapter Two, Review of Literature

NCLEX-RN<sup>®</sup> first time pass rates provide a comparative indicator of program quality used by prospective students, State Boards of Nursing, and accreditation organizations. Therefore, when increasing numbers of students are unsuccessful, schools of nursing quickly implement multifaceted program changes. One strategy used is standardized content assessments. These exams, which focus on specific content areas, provide early identification of students at risk for NCLEX-RN<sup>®</sup> failure. Subsequently, those at risk students participate in remediation designed to prepare them for NCLEX-RN<sup>®</sup> success. A common remediation technique is education on test-taking strategies, typically in combination with other remediation efforts. Due to the importance of testing in a nursing curriculum, at risk students need early identification. Then, appropriate remediation on test-taking strategies can begin and increase chances of NCLEX-RN<sup>®</sup> first time pass success.

The literature review will synthesize the current nursing evidence on the use of standardized content assessments, implementation of remediation interventions, and education on test-taking strategies. A comprehensive search of the CINAHL, Medline, ERIC, Education Source, and Cochrane Library databases from 2009 – 2015 located current research, using terms such as standardized testing, NCLEX-RN<sup>®</sup>, remediation, and test-taking strategies. Reviewing cited research in the studies revealed additional research articles not found in the original searches.

### Standardized Content Assessments

In order to increase students' NCLEX-RN<sup>®</sup> success, many schools of nursing have purchased standardized testing packages. Companies, such as ATI, Elsevier, and Kaplan, promote the predictive and remediation capabilities of their admission, content, and NCLEX-

RN<sup>®</sup> predictor exams (ATI, 2014; Elsevier Student Life, 2015; Kaplan Nursing, n.d.). Although the predictor tests indicate a student's readiness for taking the NCLEX-RN<sup>®</sup>, the time of administration in relationship to graduation offers little opportunity for remediation (Schooley & Kuhn, 2013). Therefore, standardized content assessments, which occur throughout the program, provide a better opportunity to predict and assist struggling students (Yeom, 2013). By early identification followed by remediation, students receive the tools they need for NCLEX-RN<sup>®</sup> success.

One of the strengths of standardized content assessments is the potential to identify at risk students. A recent research focus is identifying which specific content exams are predictive of NCLEX-RN<sup>®</sup> success. Many of the ATI Content Mastery exam scores correlate to NCLEX-RN<sup>®</sup> results and may predict NCLEX-RN<sup>®</sup> success (Emory, 2013; McCarthy, 2014; Yeom, 2013). Schooley & Kuhn (2013) found the Fundamentals HESI specialty exam to be predictive of NCLEX-RN<sup>®</sup> results as well. Although research was not available, Kaplan suggested successful students would attain the 50<sup>th</sup> percentile or greater on the integrated assessments (K. Haidemenos, personal communication, December 1, 2014). Therefore, standardized content assessments potentially identify which students are at risk for NCLEX-RN<sup>®</sup> failure and allow for early remediation on test-taking strategies.

Several studies have investigated the relationship between ATI Content Mastery exams and NCLEX-RN<sup>®</sup> results. Emory (2013) performed a quantitative retrospective case study to determine if a relationship existed between ATI Content Mastery exam scores and NCLEX-RN<sup>®</sup> pass or failure. Data from 167 baccalaureate nursing graduates from a central United States public university between fall 2008 and spring 2010 were evaluated for inclusion in the study. One hundred nineteen files had complete data that contained the 2007 ATI content specific

mastery assessments as well as recorded NCLEX-RN<sup>®</sup> results of the first attempt. Only complete data files were retained and stripped of identifying information. The sample was comprised of 90% women with an average age of 23.6 years. Only seven graduates in the sample failed the NCLEX-RN<sup>®</sup>. Independent 2-sample *t* tests compared the mean ATI content mastery scores in pharmacology, fundamentals, and mental health between groups of those who passed the NCLEX-RN<sup>®</sup> and those who failed on the first attempt. Statistically significant different scores between groups on the pharmacology and fundamentals assessments existed. The mental health exam scores were not statistically significantly different between groups. Using a stepwise logistic regression, the pharmacology assessment projected NCLEX-RN<sup>®</sup> results with 73.7% accuracy, but the fundamentals and mental health exams did not influence the model. Therefore, lower ATI pharmacology exam scores potentially identify students at risk for NCLEX-RN<sup>®</sup> failure. Since this exam generally takes place early in a curriculum, prompt remediation increases the possibility of NCLEX-RN<sup>®</sup> success.

The strength of Emory's (2013) well-researched and thoroughly explained study was reduced by selection bias and limited generalizability. The retrospective, convenience sample design allows for description, but cannot control for potential confounders. Additionally, the study attrition due to incomplete data encompassed over 28% of potential participants and the group that included NCLEX-RN<sup>®</sup> first time failure was small. Although many schools use ATI assessments, the timing of exams and presentation of the curriculum may vary, leading to decreased generalizability. Therefore, the evidence is not clear that the ATI assessment score differences account for the NCLEX-RN<sup>®</sup> results or are generalizable to other programs.

A second study using ATI content mastery exams focused on their potential to predict NCLEX-RN<sup>®</sup> exam failure. Yeom (2013) evaluated whether the ATI adult medical-surgical,

fundamentals, pharmacology, maternal-newborn, pediatric, mental health, community health, and leadership and management exams could predict NCLEX-RN<sup>®</sup> outcomes. A convenience sample of baccalaureate nursing graduates between May 2010 and December 2011 from a Midwestern United States public university allowed for 151 participants. This sample included 118 successful first time NCLEX-RN<sup>®</sup> passes and 33 first time failures. Although demographic data were not included in the calculations, the sample was primarily female and Caucasian. A *t*-test showed statistically significant differences between the group of those graduates who passed the NCLEX-RN<sup>®</sup> and those who failed in the scores of almost all of the standardized tests. The fundamentals and pediatrics exams did not show a significant difference. Using a logistic regression, adult medical-surgical, pharmacology, and community health assessments predicted NCLEX-RN<sup>®</sup> success. However, those variables could only predict NCLEX-RN<sup>®</sup> failure accurately one third of the time. This study added to the knowledge of using ATI standardized content assessments as NCLEX-RN<sup>®</sup> predictors.

Unfortunately, many of the same flaws exist in Yeom's (2013) research as were present in the study by Emory (2013). Once again, a retrospective convenience sample and limited generalizability reduce the clarity of evidence. Additional students in the NCLEX-RN<sup>®</sup> failure group, although unfortunate, helps to increase the statistical conclusion validity, but power analysis was absent. Although Emory (2013) and Yeom (2013) both used the ATI Content Mastery exams, only the pharmacology exam was consistently predictive of NCLEX-RN<sup>®</sup> outcomes. Potential confounders and limited generalizability limit the strength of this evidence.

Another study by Schooley and Kuhn (2013) examined whether HESI specialty exams correlate with course grades and predict NCLEX-RN<sup>®</sup> outcomes. The sample included 306 graduates between spring 2007 and fall 2010 from an associate degree program at a Midwestern

public university. Sixteen different logistical models using forward selection calculated which HESI test scores were most predictive of NCLEX-RN<sup>®</sup> results. The fundamentals HESI exam was a significant predictor in the eight models that included first time NCLEX-RN<sup>®</sup> outcomes. Since the HESI fundamentals exam is typically the first content exam administered to students, low scores indicate at risk students. This early identification allows proactive remediation to begin promptly.

Again, the research concerns include selection bias and limited generalizability. In addition, Schooley and Kuhn (2013) had threats to internal validity not addressed in the article. Some of the data, such as 12 NCLEX-RN<sup>®</sup> outcomes and 43 HESI exam scores, were mentioned as missing by the authors. However, Schooley and Kuhn (2013) did not address how the missing data were handled and if those omissions could have affected the results. Additionally, the NCLEX-RN<sup>®</sup> passing standard changed during collection of the study data, which most likely affected NCLEX-RN<sup>®</sup> outcomes. These threats to internal validity make it difficult to determine if HESI specialty exam scores or potential cofounders are responsible for NCLEX-RN<sup>®</sup> outcomes.

Therefore, although current research shows a correlation between standardized content assessment scores and NCLEX-RN<sup>®</sup> results, many gaps exist in the evidence. No research was available in peer-reviewed journals, dissertation databases, or from the Kaplan Nursing representative regarding an association between the integrated exams and NCLEX-RN<sup>®</sup> results (K. Haidemenos, personal communication, December 1, 2014). The suggested goal for students to score above the 50<sup>th</sup> percentile on the Kaplan tests seems arbitrary based on the lack of research. Additionally, the studies done using ATI content mastery exams and HESI specialty exams have common threats to internal and external validity. In order to solidify the evidence,

future research should implement control for potential confounders, improve sampling technique, and use multiple schools of nursing. Standardized content assessments may provide early identification of at risk students, but the evidence is unclear.

### **Remediation**

Schools of nursing implement various remediation strategies to ensure graduates' success on the NCLEX-RN<sup>®</sup>. In some cases, standardized assessment purchase results directly from a NCLEX-RN<sup>®</sup> failure remediation plan. Educators believe that computerized test-taking practice will increase test-taking skills (Homard, 2013). However, that opinion has little evidence to substantiate it. Current remediation research is primarily descriptive evaluations of program changes in response to NCLEX-RN<sup>®</sup> failure rates (Pennington & Spurlock, 2010). Schools of nursing often use multifaceted, reactionary interventions, making it difficult to know which remediation strategies are effective.

Typically, remediation activity occurs during the final semester of a nursing program, which does not allow enough time for improvement (Hyland, 2012). Many students who fail the standardized predictor tests are required to engage in prescribed remediation in order to graduate. The stigma associated with such remediation potentially interferes with a student's learning ability (Moore, 2013). Students required to remediate tend to view the remediation negatively, even though it is designed to be helpful (Heroff, 2009). However, at risk students often wait too long to seek assistance, making early identification and provision of remediation essential (Corrigan-Magaldi et al., 2014). Therefore, although schools recognize the importance of remediation, little evidence exists about what actually works.

Typical of remediation research, Carr (2011) described the response by a New York state baccalaureate private university nursing program when NCLEX-RN<sup>®</sup> first time pass rates of 70%



in 2002-2003 jeopardized State Board approval as well as accreditation. The school had in place a non-credit review course, which focused on test practice using standardized assessments. However, as NCLEX-RN® first time pass rates continued to decline to 63%, the school increased passing test scores, made curricular changes, and implemented a remedial course for students who attained a failing standardized exam score. The remedial course met weekly and emphasized test-taking strategies and individual study plans, in addition to standardized test practice. Two years after implementation of the course, NCLEX-RN® first time pass rates increased to 92 to 93%. Standardized exam scores determine which students are referred for the remediation course. Carr (2011) stated that remediation on all levels had become essential for the program's success.

Although Carr's (2011) description of remediation explains the process used to increase NCLEX-RN® success, no conclusions can be drawn about the effectiveness of the remediation methods. The multiple remediation strategies used have limited generalizability and cannot be replicated due to the lack of specific details. Additionally, potential confounders may have influenced the NCLEX-RN® pass rate increase. Therefore, the remediation description provided by Carr (2011), only reveals what worked for that particular school and does not provide clear evidence how or if the interventions will work for other schools of nursing.

Another descriptive study depicted remediation for students failing a standardized exit examination. Reinhardt, Keller, Summers, and Schultz (2012) explained the response of a baccalaureate nursing program in southwestern United States to unsatisfactory NCLEX-RN® pass rates in 2003 and 2004. In addition to increasing admission and progression requirements, implementing a new curriculum, and adding standardized admission and exit examinations, the school began a remediation course. The remediation course met weekly and addressed test-

taking strategies and test anxiety, identified content weaknesses, and provided faculty mentorship. Thirteen students initially took the course as required to graduate due to low exit exam scores and all but one passed the NCLEX-RN<sup>®</sup> on the first attempt. After the first semester, the remediation course was implemented into the curriculum as a required course for students identified at risk through nursing course failure, standardized exam failure, or extended absence from the nursing program. The program experienced low attrition rates and a consistent NCLEX-RN<sup>®</sup> first time pass rate of 94-96% since beginning the remediation course.

The description of a successful remediation course can be helpful for other schools attempting to implement such a course. However, few specific details are given, which limits study replication. In addition, multiple changes happened simultaneously, making it difficult to determine which intervention made the difference in results. Reinhardt et al. (2012) provided a strong rationale for remediation and description of crisis management model for change, but evidence on effective remediation continues to be unclear.

A quasi-experimental study by Horton, Polek, and Hardie (2012) examined the relationship between enhanced remediation and NCLEX-RN<sup>®</sup> success. After a decline in NCLEX-RN<sup>®</sup> pass rate to 82%, the mid-Atlantic United States associate degree nursing program implemented remediation requirements. The study evaluated the differences between graduates before and after the intervention. Both groups of graduates used the ATI testing package for remediation and tutorials. However, the earlier graduates were not required to use the remediation available and examination results did not count towards a course grade. The intervention group had required self-study tutorials and individualized remediation based on the ATI predictor results. Additionally, the intervention group had a minimal grade assigned to the remediation to encourage completion. An independent samples *t*-test compared the group

demographics and independent variables. Although the group differences were statistically significant, the groups were determined to be comparable based on educational practice. The graduates who had received the additional remediation had a 13.1% increased pass rate over the graduates who had the previous level of test remediation. Horton et al. (2012) admitted that confounders may be present, but remained convinced that the enhanced remediation is responsible for the improved NCLEX-RN® first time pass rate.

Horton et al. (2012) provided specific details regarding the use of particular ATI self-study tutorials for remediation, which would allow for replication of the study. Additionally, the quasi-experimental nature of the research provides a practical method to maintain some control of extraneous variables. However, remediation using the ATI self-study tutorials requires additional research evidence to demonstrate effectiveness.

To make a difference in student outcomes, remediation should be started early in a nursing program and be supported by the evidence. Since most current research on remediation is reactionary to poor NCLEX-RN® outcomes and describes multiple simultaneous interventions, additional research is needed (Pennington & Spurlock, 2010). Research on specific individual interventions, ideally as part of quasi-experimental or experimental design, would help to establish which remediation strategies work best for nursing students. In addition, current remediation studies are difficult to generalize to other nursing programs. Collaboration between schools to research which remediation strategies are effective and establish some level of control would increase the generalizability of the evidence (Hyland, 2012). Since NCLEX-RN® success is essential for nursing programs, students, and the healthcare system, remediation for at risk students needs basis in evidence, not conjecture.

### **Test-taking Strategies**

Remediation efforts often include instruction on test-taking strategies. However, little is known regarding its individual effect and which techniques are most beneficial for nursing students. Holzer, Madaus, Bray, and Kehle (2009) suggested that high performing college students use different test-taking strategies than lower performing students. Without effective test-taking skills, students cannot appropriately demonstrate their knowledge (Dodeen, 2014). Teaching students how to take a test effectively can decrease anxiety and increase confidence, which will ultimately improve the results (Bicak, 2013). Since exams are an integral part of nursing curriculum, nursing students need to be taught evidence based test-taking strategies.

Most research on test-taking strategy education focuses on students disadvantaged by ethnicity or learning disabilities. As the nursing profession necessarily continues to diversify, more underrepresented and learning-disabled students attempt the NCLEX-RN® (Giddens, 2009). Dollinger and Clark (2012) discovered that African-American and younger college students had lower exam grades specifically due to poor testing technique. Students diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) have deficits in test-taking skills (Lewandowski, Gathje, Lovett, & Gordon, 2013). Appropriate test-taking skills of effective use of time, priority setting, accuracy, and communication transfer into practical skills needed by a registered nurse (Dodeen, 2014). Therefore, instruction on effective test-taking strategies has become essential for nursing programs to help all students succeed.

Research on test-taking strategies specific to nursing students is limited. Poorman, Mastorovich, Liberto, and Gerwick (2010) described a testing technique course implemented for seniors identified at risk for NCLEX-RN® failure. Students who scored below the 30<sup>th</sup> percentile on the ATI predictor exam were required to take the course, offered as an elective for other

nursing students. The course focused on cognitive behavioral test-taking techniques of restructuring, thought stopping, visual imagery, and metacognitive questioning. Poorman et al. (2010) suggested that students struggling with exams have multiple test-taking difficulties and that the cognitive behavioral approach improves student success. Percentages of NCLEX-RN® first time pass success for students participating in this course ranged from 92-100% and exceeded the overall school rate in 2007 and 2008. Since many nursing students experience test anxiety and lack effective test-taking skills, this course offered necessary strategies to improve their potential for success.

However, the descriptive study by Poorman et al. (2010) demonstrates common remediation research weaknesses. Generalizability is limited due to the implementation at one school. Replication of the course at other schools using the techniques described thoroughly in the article would help to establish the effectiveness of the intervention. Again, multiple interventions, although focused on test taking, are implemented. Poorman et al. (2010) justified the multifaceted approach stating that there are multiple variables responsible for NCLEX-RN® failure and more than one remediation strategy is appropriate. Unfortunately, bundling remediation strategies presents challenges in determining which ones work best. Another concern is that the course, offered the final semester, takes place too late in the program. These cognitive behavioral techniques show promise in providing effective test-taking strategy education. Future research should focus on replicating the study with quasi-experimental or experimental control and testing the strategies at earlier levels in a nursing curriculum.

Another test-taking strategy study used a critical thinking process to address each question. The Mayfield's Four Questions® (M4Q) strategy leads students through sequential questions about the test item before viewing the answer options to assist development of a

complete understanding of the question and avoidance of choosing a distractor (Mayfield, 2010). In order to determine whether the education and implementation of the M4Q<sup>®</sup> test-taking strategy improved nursing exam scores, Mayfield (2010) performed a quantitative research study in a small, private, Midwestern United States associate degree program. A stratified random sampling design allowed for increased control of the intervention. Although 51 students originally agreed to participate, only 33 completed the study. After sorting into strata of first year and second year students, the participants were selected randomly to be part of the control group or intervention group. The intervention group received individualized or group teaching on the test-taking strategy with guided practice using the strategy during weekly 30-minute meetings. Each student in the intervention group received a laminated card to remind them of the test-taking strategy and was encouraged to use the card during course exams.

Mayfield (2010) performed independent samples *t*-tests on the group means of multiple-choice tests taken throughout the semester. Although course exam grade means were not statistically different between the groups, the intervention group had higher exam mean grades. On the HESI 2 exam and combined HESI exams, the intervention group had a statistically significant better mean exam grades than the control group. Therefore, the M4Q test strategy method showed potential for improving nursing student outcomes.

Mayfield (2010) suggested that the method worked well because it helped those students who knew the material to choose the correct answer and avoid distractors. Since the study was part of a dissertation, it included a substantial amount of research on the use of test-taking strategies in education overall. Although Mayfield (2010) attempted to control for selection bias by using stratified random sampling technique, significant attrition corrupted the sample and caused a threat to internal validity in the form of mortality. Therefore, the sample became too

small and potentially could have resulted in a Type II error by concluding the intervention did not influence the course exams, when, in fact, it did. Another concern is that the Hawthorne effect affected exam grades and posed a threat to external validity. Students receiving the M4Q<sup>®</sup> education received extra attention and faculty mentorship has been associated with positive student outcomes (Mayfield, 2010). Even with these concerns, the M4Q<sup>®</sup> method shows promise and replicating the study with a larger sample size may verify its effectiveness.

No other current research studies on education specific to nursing test-taking strategies could be located. Although nursing education relies on successful test taking, many nursing students suffer extreme test anxiety and lack of test-taking skills (Gibson, 2014). Test-taking skills are just as important as content knowledge for successful test-taking (Dodeen, 2014). However, little evidence exists on the effectiveness of test-taking strategy education. Future research should further evaluate education on test-taking strategies specific to nursing students using quasi-experimental and experimental designs to build a strong base of evidence.

### **Summary**

The current literature on standardized content assessments focuses on their value for predicting NCLEX-RN<sup>®</sup> success. Both ATI and HESI content exams have limited research evidence for use as predictors, but Kaplan integrated exams have not been studied. Unfortunately, all research studies are specific to individual nursing programs and have limited generalizability. Additionally, all studies have selection bias, which limits internal validity. The advantage of using standardized content assessments as predictors lies in implementation of early remediation. Therefore, more research on the predictive capabilities of standardized content assessments is needed using larger samples with random selection and from multiple schools.

Research on Kaplan integrated exams and statistical predictive values is necessary. As nurse educators have more evidence on prediction, early identification of at risk students is possible.

Remediation research is primarily descriptions of multifaceted reactions by nursing schools to NCLEX-RN® failure rate increases. Little evidence exists about which interventions work and how to prevent NCLEX-RN® failure. Remediation needs to be a proactive part of program quality improvement rather than reactionary. However, in order to implement effective remediation, more research is needed to determine which methods the evidence supports. Evaluating remediation interventions, individually or grouped logically, using quasi-experimental or experimental studies will increase the strength of the evidence. When multiple interventions simultaneously occur, the evidence becomes unclear as to which ones are effective. Future nursing research needs to focus on remediation so that nurse educator can base strategies on solid evidence.

Test-taking strategy education has potential to influence nursing students' success significantly on the many curricular exams as well as the NCLEX-RN®. Providing effective test-taking skills would help reduce nursing students' test anxiety and allow students to demonstrate their knowledge appropriately. However, only two current studies (Mayfield, 2010; Poorman et al., 2010) on teaching test-taking strategies to nursing students could be located and those studies did not use the same method. Replicating both methods using larger, randomized samples will provide additional evidence of effectiveness. Additionally, research of other traditional test-taking strategies for accuracy in nursing education is important. Much of the current nursing research focuses on predicting which students will pass the NCLEX-RN®. Instead, more research emphasis should be placed on effective remediation, such as test-taking strategies. Perhaps, then, first time NCLEX-RN® pass rates would increase as desired.



### Chapter Three, Methods

Schools of nursing consistently struggle to ensure their graduates are prepared for first time successful completion of the NCLEX-RN<sup>®</sup>. In order to prepare nursing students for this high stakes exam, many programs purchase standardized testing packages, including standardized content assessments. Current research focuses on the predictive value for first time NCLEX-RN<sup>®</sup> success by these standardized content assessments, which provide an indicator of successful mastery of a specific content area. However, current predictive evidence is unclear and the problem of insufficient first time NCLEX-RN<sup>®</sup> pass rates continues. Schools of nursing typically attempt to remediate students determined to be at risk for NCLEX-RN<sup>®</sup> through a variety of reactive responses, which may include curricular changes, remedial instruction, and faculty mentorship (Hyland, 2012; Pennington & Spurlock, 2010). Because these interventions occur simultaneously in order to rectify a crisis, it is challenging to determine which are most effective. Test-taking strategies are included frequently as a reactive remediation intervention. However, limited research exists about which test-taking strategies are most effective, in particular for nursing students. Since effective test-taking strategies are essential not only to complete a nursing program, but also to pass the NCLEX-RN<sup>®</sup> successfully, more research needs to take place on specific test-taking strategies.

The purpose of this study is to determine the effect of the Mayfield's Four Questions<sup>®</sup> (M4Q) test-taking strategy education on the Kaplan Medical-Surgical 1 test scores in a cohort of junior level nursing students. Scores on the Kaplan Medical-Surgical 1 integrated exam were compared between nonequivalent groups. The junior cohort in the spring 2015 semester took the exam with no test-taking strategy education and the study participants in the spring 2016 junior cohort received an educational session on the M4Q test-taking strategy. The nonequivalent

control group pretest/posttest study design demonstrated whether the test-taking strategy educational intervention was effective by analyzing scores for differences between the two groups.

The research question addressed by this study is:

What is the effect of the M4Q<sup>®</sup> test taking strategy education on the scores of the Kaplan Medical-Surgical 1 integrated exam in a cohort of junior level nursing students compared to a previous cohort of junior level nursing students who did not receive the M4Q<sup>®</sup> test taking strategy education?

A de-identified data set available from the Messiah College department of nursing chairperson provided the Kaplan Medical-Surgical 1 integrated exam scores from the junior cohort in the first half of the spring semester of 2015. Junior level nursing students enrolled in the second medical-surgical nursing course during the first half of the spring 2016 semester had the opportunity to participate in a pilot study of the effectiveness of the M4Q<sup>®</sup> test-taking strategy. As part of this course, these students take the Kaplan Medical-Surgical 1 integrated exam. Study participants received education on the M4Q<sup>®</sup> test-taking strategy. Then, the students took the Kaplan Medical-Surgical 1 integrated exam as scheduled. Using Statistical Packages for the Social Sciences (SPSS), version 22, the researcher analyzed descriptive statistics as well as performed an independent samples *t*-test on the raw scores and percentile ranking to determine effectiveness of the educational intervention by comparing the two groups.

### **Setting**

The study took place at a private, faith-based college located in suburban, central Pennsylvania with 3,234 undergraduate and graduate students (Messiah College, 2015). The full-time undergraduate students are 61% female and 85% Caucasian (Messiah College, 2014).

Students from underrepresented ethnic populations comprise 11% of the undergraduate student body (Messiah College, 2015).

The Department of Nursing is one of the largest departments on campus and has approximately 205 undergraduate and 30 graduate enrolled nursing students. Baccalaureate degree nursing students begin clinical nursing courses in the spring of the sophomore year following successful completion of prerequisites courses in the sciences, social sciences, and nursing theory. Many of the undergraduate clinical nursing courses proceed over a half-semester with student groups rotating clinical nursing courses at the completion of the first half-semester course.

The Pennsylvania State Board of Nursing issued a provisional status designation on this school of nursing in 2012 based on a first time NCLEX-RN<sup>®</sup> pass rate of less than 80%. As part of a multifaceted response, the school of nursing implemented Kaplan standardized assessments throughout the curriculum in the fall semester of 2013. This goal of this intervention was to help undergraduate nursing students prepare for the NCLEX-RN<sup>®</sup> and increase first time pass rates. The majority of undergraduate nursing courses contain one Kaplan integrated exam, allocated to 10% of the overall course grade. Students prepare for the Kaplan integrated exams by completing a Kaplan focused review test and remediation at least three days prior to the integrated exam. Additional remediation activities occur following completion of the Kaplan integrated exam.

### **Participants**

The sampling process was a convenience sampling of junior level nursing students at Messiah College. The comparison group included scores from students who received the Kaplan Medical-Surgical 1 integrated exam in the first part of the spring 2015 semester as contained in a

de-identified database. All junior level nursing students enrolled in the first section of NURS 312, Nursing Care of Adults and Older Adults II, during the spring 2016 semester received an email invitation and classroom announcement detailing participation in this research study (see Appendix C for invitation). Attendance at the educational intervention and completion of the informed consent form (see Appendix B for informed consent form) indicated willingness to participate in the study.

The participating students comprised a largely homogenous sample. The potential participants were primarily female and Caucasian. The first section of this course included 18 students with one male student and one Hispanic student in the current enrollment. Students ranged from 20 to 22 years of age. The junior cohort in the spring 2015 semester is largely homogeneous as well, containing 22 students with one male student and three non-Caucasian students in the first section. Of the potential participants, 50% (N=9 students) attended the educational intervention and gave informed consent to participate in the research study.

### **Intervention**

Education on the M4Q<sup>®</sup> test-taking strategy is the independent variable for this study. The M4Q<sup>®</sup> test-taking strategy involves a critical thinking approach to test questions designed to prevent students from choosing the incorrect, but appealing distractors (Mayfield, 2010). Students learn to evaluate the test question to determine the actual question, what they should know, the level of learning, and the correct answer (Mayfield, 2010). After students thoroughly process the question, they skim the options to determine which matches their correct answer. The test-taking strategy encourages students to be confident in their knowledge and avoids confusion by distractors.

The dependent variable is the students' Kaplan Medical-Surgical 1 integrated exam scores as measured by the percentage correct and national percentile ranking provided by Kaplan. Although the percentile ranking is the primary indicator of students' grades and NCLEX-RN<sup>®</sup> predictive value, the raw scores provide valuable data for measuring effect of the educational intervention as well.

### **Materials**

The primary material used for the educational classroom session was the Mayfield's Four Questions<sup>®</sup> handout (see Appendix E). The researcher received permission from Dr. Linda Riggs Mayfield to use her intellectual property for further research (see Appendix D for permission letter). Based on this handout and additional information provided by Dr. Mayfield, the researcher developed a power point presentation to instruct students on the M4Q<sup>®</sup> test-taking strategy.

In addition, students practiced the M4Q<sup>®</sup> method on NCLEX-RN<sup>®</sup> style test questions selected from a variety of NCLEX-RN<sup>®</sup> test preparation books (Colgrove & Hargrove-Huttel, 2011; Nugent & Vitale, 2016; Poorman, Mastorovich, Molcan, & Liberto, 2011). These textbooks provide practice questions with rationales allowing for a wide variety of medical-surgical topics to be covered. As students practiced using the M4Q<sup>®</sup> test-taking strategy, their understanding of and comfort with the method improved. The goal was for students to become competent applying the M4Q<sup>®</sup> method so that the method itself becomes natural.

The researcher presented the power point instruction on the M4Q<sup>®</sup> test-taking strategy during the first half hour of the educational session. The students actively participated in group discussion as they worked through two NCLEX-RN<sup>®</sup> style questions to learn the M4Q<sup>®</sup> process. Then the students worked in small groups of two-three students to attempt six additional exam

questions. Each group completed one question at a time and the M4Q<sup>®</sup> process was reviewed as a large group before choosing the appropriate answer and providing rationale. Students were encouraged to write down their answers as they moved through the M4Q<sup>®</sup> process in order to aid their learning. All students acknowledged that they understood the M4Q<sup>®</sup> strategy and how to use it by the end of the educational session.

Students were provided the option of completing 10 additional NCLEX-RN<sup>®</sup> style questions online at the conclusion of the class. Using a Medical-Surgical focused NCLEX-RN<sup>®</sup> preparation book (Colgrove & Hargrove-Huttel, 2011), the researcher created a password controlled quiz on the learning management system for student practice. The test questions offered the steps of the M4Q<sup>®</sup> process and answer rationale after the student attempted the question. Only two students participated in this additional learning opportunity.

### **Measurement Instruments**

The effect of the educational intervention on the M4Q<sup>®</sup> test-taking strategy was measured by the Kaplan integrated exam raw scores and national percentile rankings. These standardized assessments receive rigorous statistical analysis using the Rasch measurement protocol (Kaplan, 2014). In this model of item analysis, probability of a student correctly answering a question centers in the test item difficulty and test taker ability, expressed as logits (Kaplan, 2014). Reliability and validity are essential for the appropriate test performance as a NCLEX-RN<sup>®</sup> preparation and predictor tool.

**Kaplan Medical-Surgical 1 integrated exam.** With a focus on the musculoskeletal, endocrine, immune, integumentary, gastrointestinal, and genitourinary systems, the first Kaplan medical-surgical integrated exam assesses students' ability to answer questions related to the nursing process, diagnostic and therapeutic procedures, meeting clients' physical and

psychosocial needs, health promotion, communication, and critical thinking (Kaplan, 2014). The majority, 60%, of the questions are at the knowledge or comprehension level of Bloom's taxonomy with the remaining 40% at the application and evaluation levels (Kaplan, 2014). This 90-question exam has high reliability with a Cronbach's alpha of 0.89 (Kaplan, 2014). However, validity cannot be determined since no studies have evaluated the relationship between the Kaplan integrated exams and NCLEX-RN® results (K. Haidemenos, personal communication, December 1, 2014).

### **Procedure**

Junior nursing students enrolled in NURS 312, Nursing Care of Adults and Older Adults II, participated in classroom and clinical experiences as usual. Several weeks prior to the Kaplan Medical-Surgical 1 exam, students received an emailed and in person invitation to participate in the intervention, an educational session on the M4Q® test-taking strategy (see Appendix C for invitation). The Kaplan Medical-Surgical 1 integrated exam took place as typically scheduled with assigned Kaplan focused review completion and remediation prior to the exam.

**Intervention.** Participants attended a one hour interactive classroom session to learn the M4Q® test-taking strategy using the Mayfield's Four Questions® handout (see Appendix E for handout) and power point presentation developed by the researcher. As part of that classroom session, students formed small groups to practice NCLEX-RN® style questions compiled from a variety of NCLEX-RN® test preparation textbooks (Colgrove & Hargrove-Huttel, 2011; Nugent & Vitale, 2016; Poorman, et al., 2011). The researcher circulated between groups to assist students as they used the M4Q® test-taking strategy. For additional practice, students were provided the password for an online practice 10-question test.

**Data collection.** The chairperson of the department of nursing provided the Kaplan Medical-Surgical 1 integrated exam scores for the cohorts of the first section of NURS 312 in the spring semester in 2015 and 2016 in a de-identified database. The data storage occurred on a password protected computer drive accessible only by the researcher.

**Protection of Human Subjects.** Prior to beginning the study, the researcher obtained Institutional Review Board (IRB) approval and informed consent (see Appendix A for IRB approval and Appendix B for informed consent document). Participation in this study was voluntary and a student could withdraw consent at any time during the process, without any penalty related to course grade. No identifying information was available to the researcher in the de-identified database.

### **Data Analysis**

Using SPSS, version 22, the researcher analyzed descriptive statistics and an independent samples *t*-test. Descriptive statistics indicated potential confounders, such as number of “C” grades in the sciences and prerequisite courses as well as science courses transferred from other institutions. Groups were compared for statistically significant differences related to the confounders. Additionally, the descriptive statistics reported the range, average, standard deviation, and distribution of the Kaplan Medical-Surgical 1 integrated exam outcomes, including raw score and percentile ranking, for the students participating in the study.

After establishing normality, the independent samples *t*-test compared the pre-intervention and post-intervention group mean raw scores and percentile ranking from the Kaplan Medical-Surgical 1 integrated exam. This statistical value demonstrated whether the differences in test scores following the intervention were statistically significant and could provide an effect size.



**Conclusion**

Since current nurse educators have limited evidence on effective test-taking strategies to teach, this pilot study expands the available research on the subject. Although the convenience sample and limited generalizability restrict the study implications, all additional knowledge is valuable to add evidence to nursing educational practice. This study is a starting point for additional research into specific efforts that will use faculty time and school of nursing resources effectively to increase the ability of at risk students to pass the NCLEX-RN<sup>®</sup> successfully on the first attempt.

### **Chapter Four, Results**

Since exams are embedded throughout nursing education curricula and licensure depends on successful completion of the NCLEX-RN<sup>®</sup>, many schools of nursing purchase standardized testing packages to prepare their students appropriately. However, adequate first time pass rates of the NCLEX-RN<sup>®</sup> continue to be challenging even after standardized testing package integration. Schools use a variety of remediation strategies, which include mentoring, curricular modifications, and test-taking strategies education, to promote student success (Hyland, 2012; Pennington & Spurlock, 2010). Although the remediation attempts typically raise the NCLEX-RN<sup>®</sup> first time pass rate, the simultaneous implementation of strategies makes it challenging to determine which efforts are most effective (Hyland, 2012). Therefore, additional research on specific remediation efforts is important.

Test-taking strategies are a little explored area of nursing education. Only two current studies (Mayfield, 2010; Poorman et al., 2010) measure the effect of test-taking education specific to nursing students. Although many nursing students struggle with high levels of test anxiety and exams are integral to nursing education, no sufficient data exist to base test-taking strategy education on evidence (Gibson, 2014; Mayfield, 2010). Therefore, this study evaluated whether education on the M4Q<sup>®</sup> test-taking strategy increased a junior cohort's Kaplan Medical-Surgical 1 integrated exam scores as compared to the previous junior cohort's scores with no test-taking education.

After receiving IRB approval (see Appendix A for IRB approval), junior students enrolled in the first section of NURS 312, Nursing Care of Adults and Older Adults II, during the spring 2016 semester received an emailed invitation and in class announcement inviting participation in the study. Students who desired to participate in the study attended one of two

educational sessions. Following procurement of informed consent (see Appendix B for informed consent form), nine students actively participated in an educational intervention designed to teach the M4Q<sup>®</sup> test-taking strategy. The class consisted of instruction on the strategy as well as large group and small group application of the M4Q<sup>®</sup> strategy to NCLEX-RN<sup>®</sup> style questions. The students had access to an online test specifically designed for additional practice following the class session. The Kaplan Medical-Surgical 1 integrated exam was taken as scheduled by the course instructors. The department of nursing chairperson provided a de-identified database, which included scores from the first rotation of junior students enrolled in NURS 312 during spring 2015 (n=22) as well as the scores from the study participants (n=9). The data were analyzed using descriptive statistics and independent samples *t*-tests to determine if the groups had statistically significant differences in potential confounders, observed parameters of normality, and showed a statistically significant difference in mean exam scores.

### **Potential Confounders**

In order to determine if the M4Q<sup>®</sup> test-taking strategy educational intervention affected the Kaplan Medical-Surgical 1 integrated exam results, the two groups were analyzed for statistically significant differences. Each group contained primarily females, with one male in each group. The control group included 86.4% Caucasian students which was similar to the intervention group's composition of 89% Caucasian students. Since the groups were homogeneous in gender and ethnicity, those factors were not considered as potential confounders.

Research supports the premise that grades in prerequisite courses can be predictive of nursing program completion and first time NCLEX-RN<sup>®</sup> success (Breckenridge, Wolf, & Roszkowski, 2012; Grossbach & Kuncel, 2011). In particular, a "C" grade or lower in the

required science courses indicates an at-risk student (Newton & Moore, 2009). Additionally, faculty have stated anecdotally that students transferring science courses from other educational institutions, typically community colleges, lack the necessary foundation for nursing courses. Therefore, data were analyzed for group differences in number of “C’s” or lower grades in prerequisite science courses, number of “C’s” in any prerequisite course, and number of science courses transferred from another college.

Although the mean number of science courses with a grade of “C” or lower, prerequisite courses with grade of “C” or lower, and number of transferred science courses varied between the groups, an independent samples *t* test demonstrated no statistical significance difference between the control and intervention groups in relationship to the potential confounders (see Table 1). Consequently, extraneous variables would not account for any differences in the Kaplan Medical-Surgical 1 integrated exam scores. Since the control and intervention groups were similar, the effect of the M4Q<sup>®</sup> test-taking strategy educational intervention could be analyzed without controlling for confounders.

Table 1

*Group Comparison for Differences in Potential Extraneous Variables*

<b>Potential Confounder</b>	<b>Group</b>	<b>Mean</b>	<b>SD</b>	<b><i>t</i></b>	<b>Sig. (2-tailed)</b>
Number of <=/C in prereq. sciences	Control	.27	.550	.817	.421
	Intervention	.11	.333		
Any C grade in prerequisite	Control	.55	.912	.310	.759
	Intervention	.44	.527		
Number of sciences courses transferred	Control	.55	.739	-1.797	.083
	Intervention	1.11	.928		

### **Score Distribution**

The Kaplan Medical-Surgical 1 integrated exam results are interpreted using criterion and normed referenced scores. The raw score includes the percentage of the 90 test questions that the student answered correctly and ranges from 0-100% correct (Kaplan, 2014). More importantly, a percentile ranking indicates how a student performed in comparison to other nursing students across the nation who have taken the same exam (Kaplan, 2014). The possible range for percentile rankings ranges from 0 – 100%<sup>ile</sup>. Although the percentile ranking calculation determines a component of each student's grade for the nursing course, both values provide indication of student outcomes. Therefore, the researcher evaluated both raw scores and percentile ranking in data analysis.

The exam results revealed widespread variability of outcomes. Raw scores ranged from 45.6 to 70 (M=59.58, SD 6.08) among the total sample size, which included the control and intervention group. Percentile ranking ranged from 35 to 95 (M=71.16, SD=17.55). In order to determine if the data met parametric assumptions of normality, skewness and kurtosis were assessed. Normal distribution is assumed if the data measures of both skewness and kurtosis fall between the range of -1 to +1 (Kim & Mallory, 2014). Since the measures of the total sample, control group, and intervention group each demonstrated normal distribution, no violations of normality existed for the outcome scores (see Table 2).

Table 2

*Indicators of Normality in Score Distributions*

<b>Group</b>	<b>Outcome</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>SD</b>	<b>Skewness</b>	<b>Kurtosis</b>
Total Sample (N=31)	Raw score	45.6	70.0	59.58	6.08	-.65	.30
	Percentile	35.0	95.0	71.16	17.55	-.80	-.15
Control group (n=22)	Raw score	45.6	70.0	59.51	5.89	-.69	1.04
	Percentile	35.0	93.0	70.96	16.35	-.75	.15
Intervention group (n=9)	Raw score	48.9	68.9	59.76	6.91	-.72	-.29
	Percentile	37.0	95.0	71.67	21.27	-1.00	-.18

**Intervention Effect**

In order to determine whether the M4Q<sup>®</sup> test-taking strategy education intervention affected the Kaplan Medical-Surgical 1 integrated exam results, an independent samples *t* test was performed. The independent samples *t* test compares two distinct group means for variability to determine if differences can be explained by the intervention or merely occur through chance (Kim & Mallory, 2014). The independent samples *t* test assumes the data are distributed normally, measured at the interval level, have minimal confounders, and result from unique subjects (Kim & Mallory, 2014). Since the data from this study met those parametric assumptions, the group means were analyzed for differences using the independent samples *t* test. No statistically significant difference in either the Kaplan Medical-Surgical 1 integrated exam raw scores or percentile ranking existed between the control and intervention group means (See Table 3).

Table 3

*Comparison of Group Means for Differences*

<b>Outcome</b>	<b>Group</b>	<b>Mean (SD)</b>	<b><i>t</i></b>	<b>df</b>	<b>Sig. (2-tailed)</b>
Kaplan MS raw score	Control	59.51 (5.89)	-.103	29	.919
	Intervention	59.76 (6.91)			
Kaplan MS percentile	Control	70.96 (16.35)	-.101	29	.920
	Intervention	71.67 (21.27)			

**Summary**

Although the intervention group received additional education on the M4Q<sup>®</sup> test-taking strategy, the mean raw score and percentile ranking closely approximated the control group mean outcomes. An independent samples *t* test demonstrated that no statistically significant group differences in scores existed; meaning that any score variation could be explained by chance, not the intervention. Groups had no potential confounders to consider for score interpretation. Therefore, the null hypothesis that there is no difference in scores between the control and intervention groups stands.

### Chapter Five, Discussion

Due to the necessity for nursing school graduates to pass the NLCEX-RN<sup>®</sup> successfully on the first attempt, remediation strategies are essential. Many schools of nursing have implemented standardized assessment packages in order to provide test-taking practice, identify students at-risk, and address remediation needs (Heroff, 2009). However, most remediation attempts occur as a reaction to concerning NLCEX-RN<sup>®</sup> first time pass rates and involve multiple interventions implemented at once making it difficult to determine effectiveness of a specific approach (Hyland, 2012; Pennington & Spurlock, 2010). Instead, Culleiton (2009) suggested a preventative remediation design that focuses on discovering and confronting potential risks in an anticipatory fashion. One of the common responses to unsuccessful NLCEX-RN<sup>®</sup> attempts is education on test-taking strategies (Pennington & Spurlock, 2010). Although exams are an integral part of nursing curriculum and licensure, nursing students continue to struggle with taking tests (Gibson, 2014). Insufficient test-taking skills lead to increased anxiety and poor performance (Dodeen, 2014; Holtzer et al., 2009; Salend, 2012; Thomas & Baker, 2011). Yet, current nursing education research does not sufficiently address which test-taking strategies are most effective for nursing students (Mayfield, 2010). In order to address students at risk of NLCEX-RN<sup>®</sup> failure proactively, more research is needed to determine appropriate remediation strategies.

The purpose of this study was to measure effect of the M4Q<sup>®</sup> test-taking strategy education as preemptive remediation for student success as assessed by the Kaplan Medical-Surgical 1 integrated exam. Students enrolled in the first section of NURS 312, Nursing Care of Adults and Older Adults II, during the spring 2016 semester received an invitation to attend a one-hour class instruction on the M4Q<sup>®</sup> test-taking strategy. During this educational



intervention, participants learned about the method and practiced using it with NLCEX-RN<sup>®</sup> style questions. The study participants took the Kaplan Medical-Surgical 1 integrated exam as scheduled with the remainder of the class. In order to determine effect, de-identified raw scores and percentile rankings of the intervention group were compared to de-identified outcomes from the control group, which included the first section of NURS 312 students during the spring 2015 semester.

### **Interpretation of Results**

Analysis of extraneous variables including number of “C” grades or lower in science courses, presence of a “C” grade or lower in any prerequisite course, and transfer of a science course from another institution, demonstrated similar group composition. No statistically significant difference existed between group means of the control and intervention groups for either raw scores or percentile ranking. The raw score mean indicates the average percentage of correct responses on the 90 question Kaplan Medical-Surgical 1 integrated exam (Kaplan, 2014). The control group’s average raw score ( $M=59.51$ ,  $SD=5.89$ ) was slightly lower than the intervention group’s score ( $M=59.76$ ,  $SD=6.91$ ). However, according to the independent samples  $t$  test results, the minute difference could have occurred by chance ( $t(29)=-.103$ ,  $p=.919$ ). Percentile ranking provides a more significant measure by comparing a student’s raw score to other test takers across the nation (Kaplan, 2014). Similarly, the intervention group’s percentile ranking ( $M=71.67$ ,  $SD=21.27$ ) minimally exceeded the control group’s percentile ranking ( $M=70.96$ ,  $SD=16.35$ ), but did not demonstrate statistical significance in the independent samples  $t$  test ( $t(29)=-.101$ ,  $p=.92$ ).

Even though no statistically significant differences in exam scores existed, students’ anecdotal feedback indicated the M4Q test-taking strategy intervention was helpful. Students

mentioned the test-taking strategy's value to faculty in multiple nursing courses. Additionally, several students revealed to the faculty that they continued using the strategy with success throughout the spring semester. Therefore, limitations in sample size, measurement instrument, intervention dose, or group differences probably influenced the results.

**Sample size.** According to Kim and Mallory (2014), a Type II error, which involves not rejecting a false null hypothesis, occurs more commonly with an inadequate sample size. Due to the time constraints, only nine students participated in this research study. With such a small group of participants, statistical tests are less likely to indicate group differences. The small sample size most likely influenced the lack of statistically significant differences between the groups. A post-hoc power analysis revealed 51% power, substantially lower than the minimum 80% power required to detect a difference. Therefore, this study had too small of a sample size to indicate the true effect of the M4Q<sup>®</sup> test-taking strategy intervention.

**Measurement instrument.** The Kaplan Medical-Surgical 1 integrated exam is a highly reliable standardized test, which students take after completing a focused review test. However, students downplayed the exam's importance due to their perceived inability to prepare for it. Students stated that they typically did not know the material tested on the integrated exams and therefore, guessed. Conversely, students mentioned that they spend hours studying for course exams and answered incorrectly for a variety of reasons, including overthinking and reading extra information into the question. Since the purpose of test-taking strategies is to allow students to demonstrate their true knowledge, not increase their guessing skills, the Kaplan integrated exam may have not been the best outcome measurement of the test-taking strategy intervention (Holzer et al., 2009). Therefore, test-taking strategy education may affect course

exam scores more directly than the effect on the Kaplan Medical-Surgical 1 integrated exam score demonstrated.

**Intervention dose.** This pilot study allowed for only one classroom instruction on the M4Q<sup>®</sup> test-taking strategy. However, Mayfield (2010) discussed the need for continued practice using the method before implementing it during actual test taking. One hour of education and practice with a new test-taking strategy is insufficient to master it adequately. Mayfield (2010) offered 30-minute weekly sessions for students to learn and practice the M4Q<sup>®</sup> test-taking strategy and encouraged gradual incorporation into testing. Therefore, the minimal intervention conceivably limited the potential for effect on the outcome measures.

**Group differences.** Although the control group did not differ from the intervention group statistically, cohort differences exist. The student groups experienced course and faculty changes that occurred as they progressed through the nursing clinical courses. One example of course variation relates to the timing of spring break. The intervention group's spring break occurred immediately prior to the scheduled Kaplan Medical-Surgical 1 integrated exam, while the control group's spring break transpired the week following the scheduled Kaplan Medical-Surgical 1 integrated exam. Additionally, each cohort establishes a unique personality and faculty interactions. Therefore, comparing students from differing cohorts may have influenced the results. A comparison of students within the same cohort with and without the test-taking strategy intervention may identify a difference in group means.

### **Limitations**

Several limitations threatened the internal and external validity of the study. Selection bias and time of intervention in relation to outcome measurement reduced the internal validity. The control and intervention groups, selected by convenience, likely had preexisting,

uncontrolled differences, resulting in a selection threat. Additionally, the intervention took place several weeks prior the Kaplan Medical-Surgical 1 integrated exam. The students in the intervention group took the exam immediately following spring break, during which they would have likely not practiced the M4Q<sup>®</sup> test-taking strategy. Therefore, the timing of the intervention and outcome measures presents a maturation threat. Both of these limitations potentially threatened internal validity, meaning that group differences, if noted, could have been unrelated to the intervention. Furthermore, the homogeneous sample decreased external validity. Since the sample was chosen based on convenience from a Christian, liberal arts college, the small sample was unrepresentative of the population of potential nursing students. Therefore, the results are not generalizable to nursing students as a whole. These limitations challenge the ability to make conclusions from the study's results.

### **Recommendations for Further Research**

In order to determine effective remediation strategies, this pilot study should be replicated on a larger scale with some adjustments to the sample selection, measurement instrument, and intervention dose. Of primary importance is the performance of a power analysis to indicate an appropriate sample size. Sample size is essential in order to avoid a potential type II error and to improve generalizability. A power analysis will ensure an adequate sample size determination in order to make inferences based on the results (Kim & Mallory, 2014). Replicating the study over multiple levels of students or among several nursing programs would allow for a larger sample size and increased diversity to maximize potential for generalizability. Moreover, the sample selection should contain randomization in order to reduce selection bias. The convenience sampling technique challenges the internal and external validity of the study, detracting from the usability of the outcomes.

Another consideration is the measurement instrument. Since students take the Kaplan integrated exams only once or twice per course and dismiss their course importance, an analysis of course exams may provide more evidence of successful test taking. Although course exams do not exhibit the high reliability noted in the Kaplan integrated exams, students prepare for them and progress could be measured over the course of the semester. Alternatively, researchers could administer a Kaplan standardized examination at the beginning of the study, followed by a comparable, but distinct exam after the M4Q<sup>®</sup> test-taking strategy education intervention. These suggestions may reduce some of the concerns related to the measurement instrument.

Finally, the M4Q<sup>®</sup> test-taking strategy education duration should be increased to confirm student confidence and efficacy with using the method. Although students learned the method in the one-hour class, they continued to operate on a novice level with the method. Therefore, without additional reinforcement, it is unlikely they continued using the method effectively. Since the M4Q test-taking strategy requires a systematic interpretation of an exam question, students spent about 3-5 minutes per test item when they were learning the method. During a testing environment, students have approximately 1 minute per question and would be likely to revert to their previous testing techniques. Provision of regular M4Q<sup>®</sup> practice sessions would allow students time to learn how to integrate the strategy into their test taking. Therefore, replication of the study with an adequate, diverse, randomized sample while considering the measurement instrument and intervention duration will allow for improved statistical conclusion validity and expanded generalizability to the nursing student population.

### **Conclusion**

This study confirms the potential benefits of proactive remediation strategies as well as indicates the need for additional research in this area. The students' highly positive response to the M4Q<sup>®</sup>

test-taking strategy intervention demonstrated the need for such education. Although students receive a brief introduction to test-taking strategies during their Foundations class, it seems clear that students do not retain the information. At the beginning of the education session, students revealed that they did not remember learning any test-taking strategies prior to the session and therefore, did not use any methods when taking exams. Nursing students experience test anxiety with high frequency and research has demonstrated reduction in test anxiety merely through learning a test-taking strategy (Gibson, 2014; Holzer et al., 2009). Anecdotally, students expressed gratitude for the opportunity to learn the M4Q<sup>®</sup> test-taking strategy and shared their gained knowledge with their classmates who had not attended the session. Therefore, regular remediation appears to be important to ease student anxiety and promote successful program completion.

Additionally, this study indicates the deficit of sound evidence in the area of effective test-taking strategies. Ineffective test-taking strategies may limit a student's ability to demonstrate his or her knowledge appropriately on an exam (Thomas & Baker, 2011). Furthermore, test-taking skills are essential for nursing students' successful program completion and licensure. Yet, minimal research exists on test-taking strategies in nursing education. Current remediation efforts involve uncoordinated attempts to improve NCLEX-RN<sup>®</sup> outcomes in the short-term, but evidence of which remedial interventions will provide long-term success is unavailable. Test-taking strategies, commonly taught along with other remediation interventions, represent a significantly untapped area of nursing education research (Hyland, 2012; Mayfield, 2010; Pennington & Spurlock, 2010). Therefore, continued research to determine effective test-taking strategies is essential.

As pressure mounts on schools of nursing to produce graduates that successfully pass the NCLEX-RN® on the first attempt, proactive remediation strategies become indispensable. Early identification of at-risk students and provision of necessary education on effective test-taking strategies has potential to increase successful program completion and NCLEX-RN® pass rates. However, current research does not indicate which test-taking strategy methods are effective in nursing education. The M4Q® test-taking strategy is one method used with nursing students that has demonstrated promise with increased course exam and standardized assessment grades in a stratified random experimental study (Mayfield, 2010). This quasi-experimental pilot study examined the effect of the M4Q® test-taking strategy in a different school of nursing, but due to study limitations, did not demonstrate a statistically significant difference between the control and intervention groups. However, anecdotal evidence continues to indicate that test-taking strategies are important for nursing students. Therefore, continued research on test-taking strategies, specifically the M4Q® approach, is necessary to establish sound evidence-based nursing education practice.

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Appendix A

Institutional Review Board (IRB) Approval



Institutional Review Board for Human Investigation

The Messiah College Institutional Review Board has reviewed the proposal and informed consent with respect to:

1. The rights and welfare of the individuals
2. The appropriateness of the methods to be used to secure informed consent
3. The risks and potential benefits of the investigation

Submitted by: Nancy Frank

Entitled: Effect of Test Taking Strategy Education on Kaplan Integrated Exam Scores

The Board considers this project, IRB protocol # 2015-037 :

FULLY ACCEPTABLE, without reservation; approved through 1/18/17.

APPROVED CONTINGENT ON REVISIONS (*See attached*); approved through \_\_\_\_\_.

NOT ACCEPTABLE for reasons noted. (*See attached*).

A WAIVER OR ALTERATION OF CONSENT PROCEDURE OR DOCUMENTATION IS GRANTED.

Type of Review:  FULL (approved by IRB Meeting on \_\_\_\_\_).

EXPEDITED (see reasons checked below) .

This approval requires the use of the IRB-approved informed consent form unless a waiver has been granted. Include the approval date 1/19/16 and the expiration date 1/18/17 on the form.

NOTE: The IRB should be notified of any changes to the research protocol using Form 400 (Request to Amend).

Reasons for EXPEDITED review as listed under Expedited Review Categories in OHRP document 34 CFR 97 and 45 CFR 46.110 (check all that apply; must be completed if EXPEDITED is checked above as Type of Review):

Meets Minimal Risk (required) AND

- #2 Collection of blood samples by finger stick, heel stick, ear stick, or venipuncture as follows: (a) from healthy, non-pregnant adults who weigh at least 110 pounds. For these subjects, the amounts drawn may not exceed 550 ml in an 8 week period and collection may not occur more frequently than 2 times per week; or (b) from other adults and children<sup>2</sup>; considering the age, weight, and health of the subjects, the collection procedure, the amount of blood to be collected, and the frequency with which it will be collected. For these subjects, the amount drawn may not exceed the lesser of 50 ml or 3 ml per kg in an 8 week period and collection may not occur more frequently than 2 times per week.
- #4 Collection of data through noninvasive procedures . . . (e) moderate exercise, muscular strength testing, body composition assessment, and flexibility testing where appropriate given the age, weight, and health of the individual.
- #7 Research on individual or group characteristics or behavior or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.
- OTHER:

SOURCE OF SUPPORT:  None  Departmental  Outside Funding (*specify*)  
 Agency: \_\_\_\_\_ Agency Number: \_\_\_\_\_

ARE ANY OF THE FOLLOWING INVOLVED?  No  Yes, those checked

Minors  Prisoners  Pregnant Women  Mentally Disabled  Mentally Retarded

Protocols involving children approved under  45 CFR 46.404  45CFR 46.405  45 CFR 46.406

2/3/16  
Date of Approval

Signature of Reviewer

The Messiah College IRB operates under the HHS Multiple Project Assurance of Compliance Number FWA 0000 1871.

## Appendix B

### Informed Consent Form

**Title of Project:** Effect of Test Taking Strategy Education on Kaplan Integrated Exam Scores

**Principal Investigator:** Nancy Frank  
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1. **Purpose of the Study:** The purpose of this study is to learn if the Mayfield Four Question test taking method improves Kaplan scores.
2. **Procedures:** You will attend a 1-hour class. You will learn how to use Mayfield's Four Question test taking method. You will practice answering test questions. Then, you will take the Kaplan Medical-Surgical 1 test as scheduled.
3. **Discomforts and Risks:** The test taking method may not work for you. Your score may affect your course grade.
4. **Benefits:** You will practice test questions. Your Kaplan Medical-Surgical 1 test score may be increased. You will learn a test taking skill that could improve your test scores.
5. **Duration/Time:** The 1-hour class will take place in the evening. You will take the Kaplan tests with the rest of your class.
6. **Statement of Confidentiality:** Your participation in this study is private. I will not see your individual test score. The information will be stored in a computer protected with a password at Messiah College. I will not use your name in papers or presentations. Dr. Louann Zinsmeister, Dr. Nancy Woods, Messiah College's Institutional Review Board for the Protection of Human Subjects, and the Department of Health and Human Services' Office for Human Research Protections may look at the records for this research study.
7. **Right to Ask Questions:** Please contact Nancy Frank at (717) 649-6241 or [njfrank@messiah.edu](mailto:njfrank@messiah.edu) with questions, complaints, or concerns about this research. You can also call this number if you believe this study has harmed you. If you have questions about your rights as a research participant, please call Messiah College's Office of the Provost at (717-766-2511 x5375). You may also call this number if you cannot reach Nancy Frank or wish to talk to someone else.



8. **Voluntary Participation:** You are volunteering to participate in this research. You can stop at any time. You do not have to answer any questions you do not want to answer.

You must be 18 years of age or older to agree to take part in this research study. If you agree to help with this research study and the information explained above, please sign your name and write the date below.

You will be given a copy of this consent form for your records.

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Participant Signature

\_\_\_\_\_  
Date

I have followed the informed consent procedure.

\_\_\_\_\_  
Person Obtaining Consent (Investigator)

\_\_\_\_\_  
Date

## Appendix C

### Participant Email Invitation

Subject: Opportunity to participate in a research study and learn a test taking skill

Attention Junior Students taking NURS 312:

For my master's degree capstone project, I am studying the effect of test taking skills on test scores. You are invited to participate in my research.

On (date) at (time) in (available room in Kline/Jordan), I will be presenting a test taking strategy called Mayfield's Four Questions. This test taking method has been effective for other undergraduate nursing students at other schools. It involves making sure you completely understand the question before you choose your answer during a test.

During this 1-hour interactive class, I will explain the method. Then, we will practice NCLEX style test questions to improve your use of the strategy.

If you choose to participate in this experience, I will analyze your Kaplan Medical-Surgical 1 integrated exam score to determine any association between the scores and education on this test taking strategy. You are under no obligation to use this particular test taking strategy if you believe it does not work for you. Participation is completely voluntary and you can withdraw at any time. Participation in this study is not required for the NURS 312 course. Withdrawing from the study will not affect your NURS 312 grade. If you do not attend the educational session, your test scores will not be used for the study. All identifying information will be removed before I see the test scores and I will not know your individual exam result.

Participation in this study could help improve your test scores through learning a test taking method that has worked for other nursing students. Also, you will gain valuable test question practice, which could increase your exam grades.

Please consider helping me learn more about the connection of test taking strategy and exam scores by participating in this study. If you have questions, please contact Nancy Frank at [njfrank@messiah.edu](mailto:njfrank@messiah.edu). Thank you.

**Appendix D****Permission to Use M4Q Test-taking Strategy****Linda Riggs Mayfield, Ed.D.**

Writing, Research, and Education Consultant

1401 Oak Street, Quincy, IL 62301-2649

[l\\_r\\_mayfield@ymail.com](mailto:l_r_mayfield@ymail.com) 217-228-3042

January 14, 2016

Nancy Frank BSN, RN, CMSRN  
Messiah College  
1 College Ave  
Mechanicsburg, PA 17055

Dear Ms. Frank:

This letter represents my formal permission to utilize the Mayfield's Four Questions (M4Q) multiple-choice test-taking strategy as part of your capstone research project for your master's degree, an educational strategy for which I hold the copyright. As you suggested, full credit for my copyright ownership should be given.

I also grant permission to copy and utilize the student handout for a research study, which was published as Appendix E in my dissertation, and is also protected by copyright and should be shown as such.

I commend you for choosing to seek ways to enhance the success of nursing students as they take high-stakes tests, complete their degrees, and obtain their licensures, and I am pleased that you have chosen to utilize the M4Q strategy in that endeavor.

Sincerely,



Linda Riggs Mayfield

## Appendix E

### Handout for Mayfield's Four Questions<sup>®</sup> (M4Q)

By Dr. Linda Riggs Mayfield, used with permission

This research-based multiple-choice test-taking strategy decreases the power of a distractor to distract the person who knows the correct answer. To maximize this strategy, cover up all the possible answers with a card or paper containing the Mayfield's Four Questions (M4Q), then work through the M4Q questions to find the answer to the test question. Do not look at the options until you have gone through all four M4Q questions about that test question.

**1. What is this question really asking me?**

Identify the important words. If the item is not set up as a question, use all the important words to rephrase it as a question.

**2. What is it trying to determine that I know?**

This is not the same as 1, above. The question might be trying to determine if you know priorities, the meanings of certain terms, universal precautions, therapeutic communication, or basic anatomy, for example.

**3. What level of learning is needed to answer correctly?**

See Bloom's Taxonomy, below. Research conducted on published test banks of nursing questions indicates the vast majority of multiple choice questions are application level or below. Knowing this gives the test-taker confidence, and also helps you not read into the question.

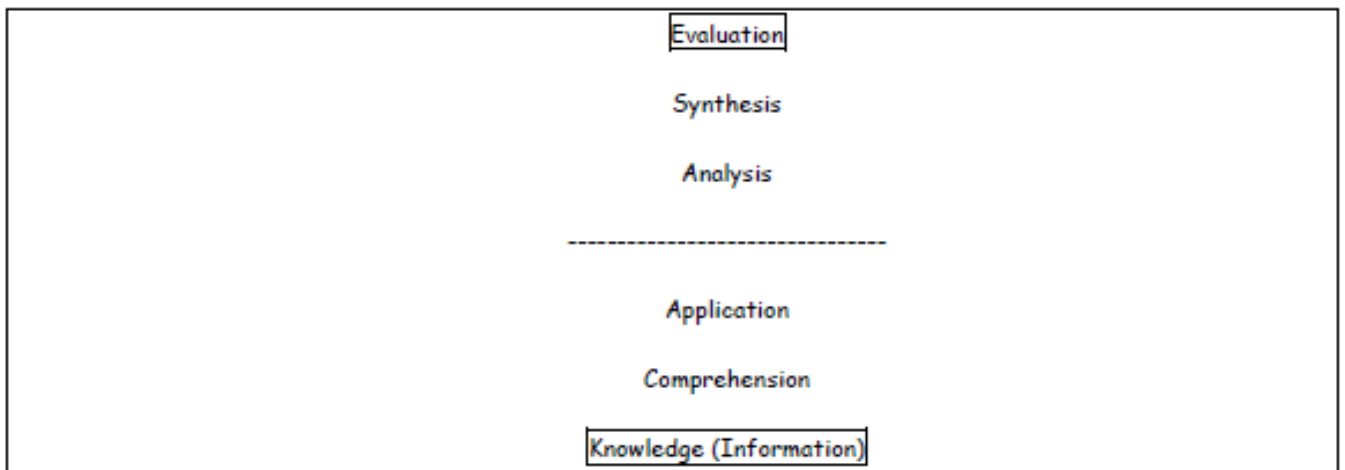
**4. What do I think is the correct answer?**

If you determine what you think is the correct answer before you look at the options, you do not need to carefully read and study all those distractors—careful

reading and study increases the opportunity for them to appear to be correct. Just skim through them, looking for what you decided was the correct answer. Unless there is an umbrella statement\*, go with it.

### The Levels of Learning, Based on Bloom's Taxonomy:

Knowledge is the lowest, most basic, concrete level of learning, followed by comprehension of the knowledge and the ability to apply the knowledge. Multiple choice test question format is good for determining a student's knowledge, comprehension and ability to apply the knowledge they comprehend. The higher levels are usually tested by a different format—discussion, writing, research.



### Umbrella Statements

Umbrella statements are true statements that are broader, or more inclusive, than the distracters. They cover more situations. If you find that more than one of the options is true, look for the one that is broader, or covers more possible situations—an Umbrella Statement.

(Mayfield, 2010, p. 137-138).