Evaluation of Concept Map Use on Nursing Students'

Critical Thinking and Clinical Judgment

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(Principal Investigator)

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Abstract

Aim: The purpose of the study is to evaluate whether students' critical thinking (CT) and clinical judgment (CJ) skills improve after using concept mapping (CM), a new teaching strategy implemented at the School of Nursing for all clinical courses before the COVID-19 pandemic.

Background: CT and CJ in nursing are critical attributes when providing safe patient care. The development of CT/CJ among nursing students through the use of active learning strategies, such as concept mapping (CM), in both classroom and clinical settings is a major thrust in nursing education. Beginning April 2023, the revised National Council Licensure Examination-Registered Nurses (NCLEX-RN) test plan, the required exam for nursing licensure, will highlight the use and measurement of CJ. The revision in the NCLEX-RN test plan significantly impacts nursing education as teaching and assessment strategies must strengthen the development and measurement of student's CT/CJ skills.

Methods: Using a retrospective comparative research design, we plan to conduct a secondary data analysis of student Assessment Technologies Institute (ATI) CT/CJ scores at multiple test points during the nursing program to evaluate whether CM improved students' CT/CJ scores. ATI data of nursing graduates from Spring 2017 to Spring 2021 will be analyzed. Independent *t*-tests will be used to determine differences in CT/CJ scores among students who used and did not use CM. Analysis of variance will be used to investigate the differences in CT/CJ mean scores at multiple points in the nursing program.

Budget

SoTL Budget Request Page
January 15, 2022 to June 30, 2023

BUDGET: *Request by budget category.*

Lead Principal Investigator: _____James Montegrico_____

Principal Investigator 800#: _____801039571_____

Title of Project: _Evaluation of Concept Map Use on Nursing Students' Critical Thinking and Clinical Judgment _____ _____

Allocate operating budget to Department of: _____School of Nursing_____

Fiscal Year One (January 15, 2022 to June 30, 2022)		
Faculty Stipend	Paid directly from Academic Affairs fund on May 15, 2022	
911250	Graduate Student Salaries	
911300	Special Pay to Faculty other than Grantee	
915000	Student (Undergraduate or Graduate) Temporary Wages	
915900	Non-student Temporary Wages	
920000	Honorarium (Individual(s) not with UNCC)	
921160	Subject Incentive Fee	
925000	Domestic Travel	
926000	Foreign Travel	
928000	Communication and/or Printing	
930000	Supplies	
942000	Computing Equipment	
944000	Educational Equipment	
951000	Other Contracted Services	
	Year One Subtotal	$ 0

Fiscal Year Two (July 1, 2022 to May 30, 2023)		
Faculty Stipend	Paid directly from Academic Affairs fund on May 15, 2023	$ 3,850
911250	Graduate Student Salaries	
911300	Special Pay to Faculty other than Grantee	
915000	Student (Undergraduate or Graduate) Temporary Wages	
915900	Non-student Temporary Wages	
920000	Honorarium (Individual(s) not with UNCC)	
921160	Subject Incentive Fee	
925000	Domestic Travel	$2,104
926000	Foreign Travel	
928000	Communication and/or Printing	
930000	Supplies	
942000	Computing Equipment	
944000	Educational Equipment	
951000	Other Contracted Services	
Year Two Subtotal		$ 5,954
TOTAL FUNDS REQUESTED (Year One + Year Two)		$ 5,954

Budget Narrative

A total budget of $5,954 is requested for the completion of the study and dissemination of results. This proposed study is a one-year project that involves extensive data collection in Spring 2023, data analysis in Summer 2023, and research dissemination in Fall 2023.

Faculty Stipend ($3,850)

A faculty stipend of $3,850 is requested for Dr. Montegrico in May of Fiscal Year Two. As the principal investigator, Dr. Montegrico will be actively involved throughout the research, particularly on the extensive data collection phase, data analyses, manuscript preparation, and research dissemination in conferences. Dr. Lynch is a 12-month administrative employee.

Domestic Travel ($2,104)

The 7th Nursing World Congress, scheduled on October 16-18, 2023 in Boston, MA, is the target conference for knowledge dissemination. The requested budget will cover conference registration fee ($839), hotel accommodation ($500), round trip plane ticket ($395), meals ($150), ground transportation ($100), and airport fees ($120 - parking and luggages). Dr. Montegrico presented a poster at the 6th Nursing World Congress last October 2022. An oral presentation is planned for the 2023 conference.

Letter of Support

UNIVERSITY OF NORTH CAROLINA
CHARLOTTE

MEMORANDUM

To: SoTL Grants Committee, Center of Teaching and Learning

From: Catrine Tudor-Locke, Dean, College of Health and Human Services

CC: Dr. James Montegrico, Dr. Susan Lynch

Date: November 16, 2022

Subject: Letter of Support for Drs. Montegrico & Lynch's SoTL Grant Application

It gives me great pleasure to write this letter in support of the SoTL grant application presented by Drs. James Montegrico and Susan Lynch, both of the School of Nursing. Their proposed study supports the University's strategic goal of providing students with a competitive career advantage and the School of Nursing's strategic objective of delivering high-quality educational programs that prepare graduates as clinicians.

Critical thinking and clinical judgment are essential to providing safe and effective patient care. The School of Nursing implemented concept mapping before the pandemic with the aim of enhancing these specific skills in our nursing students. However, the impact of this teaching strategy has not been evaluated on a program level. If found effective, the results of the study can be used to ensure student success defined by performance, both academically and on licensure examinations.

<center>**Project Narrative**</center>

<center>**Specific Aim**</center>

Research Aim

The purpose of the study is to evaluate whether students' critical thinking (CT) and clinical judgment (CJ) skills improve after using concept mapping (CM), a new active teaching strategy implemented at the School of Nursing for all clinical courses before and during the pandemic. The study will involve collecting student data on Assessment Technologies Institute (ATI) CT/CJ indicators at multiple test points throughout the nursing program to evaluate whether CM improved student CT/CJ scores. This project aims to address the suggested focus area of measuring the impact of active learning on student success.

Research Questions

To address the research aim, the proposed study will answer the following research questions:

1) Is there a difference in CT/CJ scores for students who used CM (cohorts Fall 2018 to Spring 2021) compared to students who did not use CM (cohorts Fall 2017 and Spring 2018)?

2) Is there a difference in the ATI Registered Nurse Comprehensive Predictor (RN-CP) scores for students who used CM (cohorts Fall 2018 to Spring 2021) compared to students who did not use CM (cohorts Fall 2017 and Spring 2018)?

3) Is there a difference in student CT/CJ scores over time as students (cohorts Fall 2018 to Spring 2021) progress in the nursing curriculum as they used CM over time?

4) Is there a difference in CT/CJ scores for those students with altered clinical schedule and increased use of CM during the pandemic (cohorts Spring 2020 to Spring 2021)?

Impact

       The proposed study has a potential positive impact at both individual and institutional levels. Determining the influence of CM on CT/CJ of nursing students may provide important information to assist faculty in improving students' cognitive skills, academic performance, and equip students with CT/CJ skills needed to successfully pass the National Council Licensure Examination-Registered Nurses (NCLEX-RN) (Alfayoumi, 2019; Fawaz & Kavuran, 2021; Jaafarpour et al., 2016; Jeffreys, 2015; Machado & Carvalho, 2020; Yue et al, 2017). Concept mapping as an instructional strategy that enhances CT/CJ academic performance, may also increase student's satisfaction with learning, application of content to clinical practice thus increasing student success evidenced by retention, time to graduation, and nurse licensure examination first-time pass rates. The introduction of the Clinical Judgment Measurement Model in the NCLEX-RN by April 2023 requires nursing educators to focus using effective teaching strategies on development and assessment of students' CT/CJ skills (National Council on State Boards of Nursing [NCSBN], 2022). Thus, CM may be an important teaching strategy for the enhancement of CT/CJ and as such, increase student success at licensure exam to enter the nursing workforce alleviating the nursing shortage.

Areas of Focus

       The proposed study addresses the SoTL's focus on measurement of active learning classrooms on student success, improving learning outcomes, and increasing student retention, progression, and graduation rates. Further, it supports the University's strategic plan on the area of Opportunity on Excellence, Goal A.3 (Prepare students to thrive in a changing world) and Objective A.3.1 (Provide students with a competitive advantage to launch and build careers). Learning activities, such as CM, and research focused on development and measurement of

CT/CJ enable nursing faculty to identify critical areas of strengths and weaknesses at both individual and program levels. Thus, appropriate interventions can be instituted to identify students who are at-risk of failing academically.

Literature Review

Critical Thinking and Clinical Judgment in Nursing Education

Critical thinking (CT) and clinical judgment (CJ) in nursing are critical attributes when providing safe patient care (NCSBN, 2022). The development of CT/CJ among nursing students through the use of active learning strategies, such as concept mapping (CM), in classroom and clinical settings has been a major nursing education goal. Concept maps were first introduced in 1972 as a constructivist approach in education, enabling teachers to act as facilitators in promoting student active learning (Schunk, 2000). CM presents ideas in a structure that enables the learner to identify concepts and describe interrelationship between concepts (Machado & Carvalho, 2020). As a constructivist approach to learning, CM enables the learner to learn a new concept by linking previously learned concepts to the current learning situation (Schunk, 2000). CM is widely used in higher education (Ritchhart et al., 2009) and a common teaching strategy used in nursing education. However, we do not know how CM influences CT/CJ and comparative studies on CM use on multiple in-curriculum data points within the context of the COVID-19 pandemic is lacking. The proposed study addresses these gaps in the literature..

As an instructional method, CM is a motivating teaching strategy that fosters long-term and meaningful learning as it facilitates reflective strategies to link theory to practice (Bressington et al., 2018; Khrais & Saleh, 2017; Machado & Carvalho, 2020). Previous studies show that the use of CM improved cognitive skills, clinical reasoning, and overall academic performance of nursing students (Alfayoumi, 2019; Fawaz & Kavuran, 2021; Jaafarpour et al.,

2016; Machado & Carvalho, 2020; Yue et al, 2017). Further, CM improved CT in core nursing courses such as pharmacology, pathophysiology, (Kaddoura et al., 2016), and maternal-child nursing (Farrag, 2017). However, no one has examined the use of CM over time.

Nursing Education During the COVID-19 Pandemic

The COVID-19 pandemic significantly affected nursing education, with nursing schools altering the delivery of theory, laboratory, and clinical instruction (Powers et al., 2021, 2022). The shift from traditional to online learning reduced students' engagement time, negatively impacted learning, decreased actual patient clinical contact hours, and affected academic performance (Dewart et al., 2020; Fitzgerald & Konrad, 2020; Langegard et al., 2021). To compensate for this shift to virtual learning and reduced clinical hours, nursing faculty resorted to using various virtual instructional strategies to meet learning outcomes. In North Carolina, nursing faculty reported reduced critical thinking skills among nursing students who graduated during the pandemic (Powers et al., 2021, 2022). At UNC Charlotte SON, the use of CM was intensified as students had presumably more time for reading and completing CM. However, the impact of CM use pre- and during pandemic on the nursing students' CT/CJ has not been evaluated. This proposed study addresses a gap in the literature and provides evidence-based information to the SON for curricular decisions regarding CM use.

Critical Thinking/Clinical Judgment and the NCLEX-RN

To practice nursing, graduates must pass the NCLEX-RN, which measures the minimum competency of a nursing graduate to provide safe patient care (NCSBN, 2022). The NCLEX-RN is a computer adaptive test that presents simulated clinical scenarios to measure a candidate's ability to provide safe nursing practice. As an adaptive test, questions that are given are based on how candidates responded to the previous question. As such, questions may become increasingly

complex. Starting April 2023, the Next Generation NCLEX-RN (NGN) test plan will be revised

and will highlight the use and measurement of candidates' clinical judgment (NCSBN, 2022).

The revision on the upcoming NCLEX-RN test plan significantly impacts nursing

education as teaching strategies must strengthen the development of student's CT/CJ skills.

Currently, ATI resources and content mastery series (CMS) assessments are extensively

integrated in the nursing curriculum at UNC Charlotte SON. Aside from providing students with

up-to-date active learning resources for specific nursing course requirements, ATI resources also

help our graduates prepare for the NCLEX-RN. Measuring CT/CJ skills using ATI CMS helps in

increasing student's chances of passing the NCLEX-RN and improving our NCLEX-RN first-

time pass rates.

Measurement of Critical Thinking in Nursing Education

There is no gold standard for measurement of CT/CJ in nursing education. In a systematic

review of 13 trials and meta-analysis of 11 trials that measured nursing students' CT/CJ, tools

used to measure include California Critical Thinking Disposition Inventory (CCTDI), California

Critical Thinking Skill Test (CCTST), and Critical Thinking Scale (CTS) (Yue et al., 2017).

Alternatively, most nursing schools use in-curriculum high-stakes standardized testing such as

Assessment Technologies Institute (ATI), Health Education Systems, Incorporated (HESI), and

the National League for Nursing (NLN) (Brodersen & Mills, 2014), where CT/CJ is one of the

outcome measures. The SON integrates ATI assessments throughout the nursing curriculum.

Conceptual Framework

Jeffrey's nursing universal retention and success (NURS) model will be used as the

conceptual framework for this study. The NURS model postulates that academic performance

and outcomes in nursing education are the results of a multiplicity of individual, affective,

academic, environmental, professional, and outside world factors (Jeffreys, 2015). CT and CJ are essential individual and affective characteristics that influence academic success and licensure outcomes. Through this proposed study, we will be able to identify trends in CT/CJ across multiple in-curriculum data points, compare CT/CJ across multiple cohorts, and determine the impact of CM as an instructional strategy on students' CT/CJ.

Critical Thinking/Clinical Judgment at the UNC Charlotte School of Nursing

The UNC Charlotte School of Nursing (SON) implemented ATI as a curriculum-wide instructional aid and high-stakes assessment in Fall 2015 and adopted CM as a major teaching strategy for all nursing clinical courses in Fall 2018. A preliminary study investigated the predictive ability of ATI CMS assessments taken by UNC Charlotte nursing students on their NCLEX-RN passing at first attempt but this study did not measure their CT/CJ scores (Montegrico, 2021). Currently, outcome measures including CT/CJ are left to individual course faculty and ATI CMS reports are reported to the Associate Director for Undergraduate Nursing Programs at the end of every semester. Additionally, the SON Academic Success Coordinator monitors cohort outcome performance every semester. However, these reports do not highlight evaluation of CT/CJ measures. At present, the evaluation of CT/CJ based on student's use of CM in clinical courses utilizes a faculty-developed 5-point Likert scale but does not specifically measure CT/CJ. CM has also been used as an instructional method in nursing theory/didactic courses. Although CT/CJ outcome measures scores are available from the ATI CMS and Registered Nurse Comprehensive Predictor (RN-CP) assessments, there has been no program level evaluation on the use of CM on the CT/CJ of our nursing students. The proposed study addresses this need.

Methods

Research Design

The proposed study will use retrospective comparative research design to evaluate differences in CT/CJ scores. Using secondary data analyses, a comparison of ATI CT/CJ scores pre- and post-implementation of CM will be made. Several comparisons will be made in this study. First, the CT/CJ scores from the ATI CMS and RN-CP from the cohorts of May 2017 to May 2018 graduates (no CM) will be compared to the CT/CJ scores of cohorts from Fall 2018 to Fall 2019 (with CM). Second, the change in CT/CJ scores from ATI CMS will be examined as they progress in the curriculum. Four data points, one for each semester, will be compared to determine changes in CT/CJ scores as they progress in the nursing program. Third, CT/CJ scores of cohorts impacted by the COVID-19 pandemic will be compared. The shift to virtual classes from Spring 2020 to Spring 2021 impacted the use and grading of ATI CMS proctored assessments, thus, data from these cohorts will be used to compare changes in CT/CJ scores among these three cohorts only.

Data Collection

As the associate director for undergraduate programs and academic success coordinator, both investigators of this proposed study have director-level access to SON ATI data. Although ATI student data are readily available, permission to use these data for this study will be sought from ATI. The CT/CJ scores from ten assessments (Table 1), which includes nine ATI CMS (Fundamentals of Nursing [practice and proctored]), Pharmacology, Maternal and Newborn Nursing, Care of Infants and Children, Adult Medical-Surgical Nursing, Mental Health Psychiatric Nursing, Community Health Nursing, and Leadership and Management) and one

RN-CP assessments, will be collected from ATI and entered into an Excel spreadsheet. All

student data will be de-identified. Data then will be entered in SPSS version 27 for analyses.

Table 1. Placement of ATI Content Mastery Series assessment tests in the nursing curriculum

Year/Semester	CMS Assessment
Junior year, first semester	Fundamentals of Nursing Practice Exam
Junior year, second semester	Fundamentals of Nursing Proctored Exam Pharmacology Maternal and Newborn Nursing Care of Infants and Children
Senior year, first semester	Adult Medical Surgical Nursing Mental Health Psychiatric Nursing
Senior year, second semester	Community Health Nursing Leadership and Management Registered Nurse Comprehensive Predictor (administered at three points during the semester at weeks 4, 8, and 12)

Sampling

G power analysis requires a minimum sample size of 52 to achieve an effect size of at

least 0.30, power of 0.80, and 0.05 level of significance. We will be collecting data from ATI

records of an estimated 450 nursing graduates from May 2017 to Spring 2021 cohorts.

Evaluation

Data Analysis

Descriptive statistics using frequency, percentage, mean, and standard deviation will

describe the students' CT/CJ scores across cohorts and groups with and without CM. Inferential

statistics for parametric group comparisons using SPSS version 27 will be used to determine CT/CJ mean differences. Specifically, these inferential statistics will include:

RQ 1: Independent *t*-test will be used to determine CMS CT/CJ mean differences between two groups of nursing graduates, those used CM and did not use CM.

RQ 2: Independent *t*-test will be used to investigate RN-CP CT/CJ mean differences of students who used CM and did not use CM.

RQ 3: Analysis of variance (ANOVA) will be used to determine CMS CT/CJ mean differences at four data points within the curriculum (first to fourth semester).

RQ 4. ANOVA will be used to compare the CMS CT/CJ mean differences among three cohorts of nursing students with altered clinical schedules during the pandemic.

Knowledge Dissemination

Findings from this study will be presented at scientific nursing conferences and submitted for publication in nursing journals in 2023. Oral/poster presentations will be submitted to one or more of the following conferences: Annual Sigma Theta Tau Research Forum - Gamma Iota Chapter (locally at UNC Charlotte), Southern Nursing Research Society annual conference (regional), the ATI Nurse Educator Summit conference (national), or the 35th Sigma Theta Tau International Nursing Research Congress or 7th Nursing World Congress (international). Potential journals for manuscript submission include Nurse Education Today, Nursing Education Perspectives, and the Journal of Professional Nursing.

Human Subjects

To ensure the protection of human subjects in this study, UNC Charlotte Institutional Review Board will be sought prior to study implementation. As this is a retrospective review of an educational activity, an exempt determination will be requested.

Extramural Funding

External funding will not be sought for this study. However, these results may be strong

pilot work for future National League for Nursing (NLN) research grants.

Timeline

Time (Semester)	Activity
Spring 2023	
January	IRB Approval
February – May	ATI data collection
Summer 2023	
June – July	Data Analysis
Fall 2023	Dissemination of Results (Conferences and publications)

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