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A Flipped Classroom in Nursing: The Effects of Peer-Led Simulation on Cognitive Learning and Critical Thinking

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A Flipped Classroom in Nursing:
The Effects of Peer-Led Simulation on Cognitive Learning and Critical Thinking

by

Shannon A. Matthews

A capstone project submitted to the faculty of
Gardner-Webb University Hunt School of Nursing
in partial fulfillment of the requirements for the degree of
Doctor of Nursing Practice

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2016

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Abstract

This aim of this project was to implement a flipped classroom model of instruction using a peer-led in-class simulation in a nursing course. The student-centered learning environment fosters self-paced class preparation and provides interactive application of concepts in the classroom to improve critical thinking and cognitive learning in first level nursing students. The faculty introduced new content by using video lectures and online material assigned as homework with a peer-led simulation used during class to apply the concepts in a hands-on, interactive, learning experience. The effect the flipped classroom using a peer-led simulation had on cognitive learning, critical thinking, and overall effectiveness was evaluated using multiple measures. Improvement was evident in both critical thinking and cognitive post-test scores. Student evaluations of the flipped classroom using a peer-led simulation were favorable.

Keywords: Flipped classroom, peer-led simulation, critical thinking

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A Flipped Classroom in Nursing: The Effects of Peer-Led Simulation on Critical Thinking

Introduction and Background

Pre-Licensure nursing graduates must demonstrate the ability to recognize and respond to rapidly changing patient conditions in highly technical health care environments. Scientific advancements in medicine and technology make it essential for the nurse to apply previously learned knowledge in new and unique ways. Faculty are challenged to develop teaching strategies that facilitate critical thinking and empower the learner to examine complex issues (Billings & Halstead, 2012). The focus of nursing curricula has shifted from traditional teacher-centered methods to hands-on, engaging strategies to foster independent learning and transformation of information that can be applied in varied situations (Billings & Halstead, 2012). New nursing graduates must be prepared to quickly assess a complex situation, decide the most effective interventions, and promptly take action. Conceptual information and psychomotor skills learned in the classroom and laboratory must be applied in critical, real-life settings. The learner must be encouraged to reflect upon concepts and experiences to internalize the knowledge (Lisko & O'Dell, 2010).

The flipped classroom model promotes self-directed learning by assigning video-lecture, reading, and assignments as homework and utilizing class time for interactive discussion and engaging class activities (Enfield, 2013; Gaughan, 2014; Schwartz, 2014; Wilson, 2013). The use of simulation in nursing education programs has also been recognized as an effective strategy to improve critical thinking and create meaningful learning experiences for students (Jeffries, Bambini, Hensel, Moorman, & Washburn,

2009; Kaddoura, 2010; Poore, Cullen, & Schaar, 2014; Shinnick & Woo, 2012).

Utilization of a peer-led simulation class activity will provide an interactive learning opportunity for the student. The students will prepare the content, apply theoretical concepts and psychomotor skills, and reflect on the learning experience to enhance critical thinking.

Problem Statement

Nursing students often lack critical thinking skills and the ability to independently seek and understand new concepts (Myers et al., 2010). Nursing faculty report that students often come to class having only read portions of assignments and are unprepared for in-depth discussion or application of concepts (S. Barry, C. Berringer, & S. Malpass, personal communication, May 4, 2015). Group composite critical thinking scores from Assessment Technologies Institute (ATI) Critical Thinking Assessment: Entrance were 71.2% and 73.5% for the past two cohorts of pre-licensure baccalaureate degree nursing students at the project institute. These scores ranked the groups in the 69th and 84th national percentiles respectively. Studies indicated critical thinking ability had a significantly positive correlation to nursing competence and performance in nursing programs (Chang, Chang, Kuo, Yang, & Chou, 2011; Pitt, Powis, Levette-Jones, & Hunter, 2015). Members of the project institution's nursing advisory board echoed need for nursing graduates to possess critical reasoning skills, the independence and willingness to jump in where needed, and the desire for life-long learning (J. Miller, K. Steere, & E. Goolsby, personal communication, January 17, 2014).

As life-long learners, nursing students must develop the ability to independently gather information, critically evaluate recommendations, and demonstrate clinical

decision making based on their findings (Stanley & Dougherty, 2010). It is essential for nursing education to foster critical thinking skills and the ability for self-directed learning and problem-solving. Traditional lecture-style of instruction fosters learners as passive recipients of knowledge with little engagement or preparation required (Billings & Halstead, 2012; Stanley & Dougherty, 2010). The focus in nursing education must shift to student learning where the students becoming seekers of knowledge in a learning environment that promotes critical thinking, independent exploration of ideas, and expression of thoughts and opinions (Billings & Halstead, 2012).

Needs Assessment

Population

The project institution is a small liberal arts university in southeastern North Carolina offering traditional Bachelors of Science in Nursing (BSN) and Registered Nurse to BSN degrees. Undergraduate enrollment for the university is approximately 2,300 students with nearly nine percent (190 students) designated as pre-nursing and nursing majors. The university offers more than 80 undergraduate degrees and five graduate level degrees. The student body includes persons of diverse ages and nationalities, representing 41 states and 53 foreign countries. The nursing program is fully accredited by the Commission on Collegiate Nursing Education (CCNE) and approved to enroll up to 60 pre-licensure students by the North Carolina Board of Nursing. The nursing program serves the local community through service projects and clinical site placement. Local health care facilities used for clinical and employment for the nursing program include, a tertiary care medical center, an Army Medical Center,

Veteran's Affairs Medical Center, rural community hospital, long-term acute care center, various community agencies such as the health department, home health, and hospice.

Stakeholders

Faculty and clinical affiliates convey the need for graduates of nursing programs to have the opportunity to develop critical thinking skills prior to entry into the workplace. The university's Nursing Advisory Board is comprised of 12 nurse managers and representatives from clinical affiliates serving the community, nursing faculty, and university administrators. The Board meets biannually to discuss any clinical needs or concerns and any issues that need to be addressed to prepare nursing graduates as they enter the workforce. At a round table discussion, representatives from various clinical sites were asked "What are you looking for in a future nurse and a graduate from the University's nursing program?" Responses included the need for new graduates to display critical reasoning, the ability to work well independently and in teams, and have the desire for life-long learning (Nursing Advisory Board, personal communication, October, 2014). They need to be able to critically appraise a situation and decide on an appropriate course of action. Healthcare is fast-paced, highly-technical, and ever-changing environment. Students need to be able to quickly seek information and be able to apply concepts in new and unique ways.

Organizational Assessment (SWOT)

The nursing program currently has six courses with a clinical component. Of these, three courses routinely use simulation as part of the clinical experience. None of the courses utilize simulation as part of the classroom didactic. Most of the courses are taught using a variety of instructional methods such as lecture, videos, guest-speakers,

case studies, and student presentations. The majority of the content is still being presented in the PowerPoint guided lecture format with question and answer discussion inserted during the lecture.

Strengths. The faculty and administration have verbalized strong support on integration of technology and learning and the implementation of simulation into the nursing curriculum. The current simulation and audiovisual equipment are well suited for utilization in the classroom and laboratory setting. The simulation hospital designed with the look and feel of a real hospital with high-fidelity patient simulators assigned to a designated “patient” room with fully functional hospital beds, head-wall fixtures with simulated oxygen and suction, and touchscreen bedside patient monitors. The simulation lab staff is adequate with the simulation director having five years of simulation education experience. Additional staff includes one part-time adjunct faculty, and two pre-nursing student workers assigned to assist in the simulation laboratory. The university has upgraded the current learning management system to support audio and video (A/V) recording of lecture content with the ability to make available to enrolled users. The university is providing training sessions for use of this new A/V technology and participants will be provided with video equipment for use in their course. The nursing program is developing a RN to BSN hybrid online and face to face curriculum. Many of the current faculty will be involved with the move to online coursework using much of the same methodology as a flipped classroom model.

Weakness. There were faculty-related weaknesses such as time for preparation, technical challenges, variations in teaching styles, and seamless integration of simulation into the curriculum to consider prior to the implementation of the project. The

development of the pre-class assignment and/or video lecture requires pre-planning by the faculty. Faculty typically return from summer break three to five days prior to first day of class with course materials, syllabi, and assessments revised and ready to be implemented. Some faculty may have difficulty transitioning lecture materials to a video-lecture format initially. The development of pre-and post-tests for the flipped classroom sessions will also add to faculty course preparation time. Some faculty may be hesitant to prepare the video lecture due to technical challenges or discomfort with being videotaped. The flipped classroom model also requires the faculty to be flexible during the class time to redirect student learning as needed. Faculty who are not comfortable with a more informal and interactive classroom may be hesitant to convert to a flipped classroom teaching model. Simulation is currently used as a supplement to the clinical component of the curriculum and has not been utilized in classroom time. Some courses such as Mental Health Nursing and Community Health Nursing do not currently utilize simulation as teaching strategy.

The lack of comparative data for evaluation was another area of concern. Comparison data for student critical thinking scores was limited to two graduating cohorts at present. Previous groups used ATI critical thinking tests however, based on student and faculty feedback, the nursing program will no longer utilize the ATI resources. Students were dissatisfied with the discrepancies found in some of the nursing information found in ATI and their textbooks such as lab values and specific medication side effects. Faculty were dissatisfied with the inflexibility of the ATI assessments and difficulty blending ATI content and resources into existing courses. After evaluating several other comparable assessments and learning resources, the faculty voted to utilize

a different company for future classes. There has also been low number of respondents to employer satisfaction reports for the first cohort of graduates. There have been inconsistencies in the response rate for student course evaluations since they were moved to an online format in 2013. These issues are being addressed, however it is difficult to make strong comparative analysis with low response rates and product changes.

Finally, student issues posed another concern for the implementation of the project. The population for the project selected was first year nursing students who lack experience with use of simulation. These students may find it difficult to develop and lead a simulation with such limited experience with the simulation equipment and format. The first year students may experience anxiety when expected to lead class discussion and perform in a simulation scenario in front of peers. First year nursing students may also find it difficult to coordinate with classmates to schedule out-of-class time to prepare the simulation scenario. Students who are familiar with traditional lecture-style format for class may be resistant or hesitant to embrace the flipped classroom format.

Opportunities. The flipped classroom model provides an interactive classroom with the opportunity for development of faculty-student relationships and mutual learning. From the student perspective, the in-class simulation will provide a hands-on learning opportunity that was designed and led by peers that will be beneficial for independent and self-directed learning in clinical practice. The practice of having online coursework to be done independently may serve as a template for the transition to hybrid or online curricula. The online video lectures allow student unlimited access to review content at their convenience. Other programs of study at the institution may implement

the flipped classroom model and develop active learning strategies that foster critical thinking.

Threats. External threats such as Internet outages and technical difficulties may hinder the ability of students to complete the on-line homework and cause problems with the in-class simulation activity. Currently, the budget supports the maintenance of the equipment in the simulation laboratory; however, future budget restraints may adversely affect equipment and staff resources. As health science programs continue to grow at the university, access and scheduling simulation laboratory resources may become more challenging.

Resources

The nursing department includes a simulation hospital equipped with wireless audiovisual recording system. Each patient care room has two video cameras with audio recording. The video system allows students in the lecture hall classroom to view the simulation as it occurs as well as review a video recorded playback. Students sign a confidentiality statement prior to the use of video recording and student video files are deleted upon completion of the program. The simulation hospital is equipped with three high-fidelity adult manikins, one high-fidelity infant, one high-fidelity child, and one high-fidelity birthing simulator. Each simulator is assigned to a designated room configured with electric beds, head-wall fixtures with simulated oxygen and suction, and touchscreen bedside patient monitors. Students receive an orientation to the equipment and faculty are available during scheduled and open laboratory hours to assist with technical issues. There is one full-time faculty, one part-time adjunct faculty, and two pre-nursing student workers assigned to assist in the simulation laboratory. The university

has recently contracted for an upgraded learning management system that will accommodate the video-lecture integration of content into the courses. Prior to the fall semester, the university's Director of Instructional Technology provided faculty-training courses and participants were given headset microphones to for any audio/video recording in their courses.

Theoretical Underpinnings

Learning theories are used often used to guide nursing curricula and exemplify the process in which knowledge is gained. Kolb (1984) described learning as a cycle in which the learner participates in a concrete experience, reflects upon the experience, derives meaning through abstract conceptualization and explores how the experience can be applied in new situations using active experimentation. Kolb (1984) also identified four learning styles that corresponded with a learner's preferential way of transforming knowledge. Nursing education that encourages the student to move through this cycle of learning and provides varied learning experiences will result in deeper and more meaningful learning outcomes and improve critical thinking (Lisko & O'Dell, 2010). Simulation in nursing education is an effective method to provide students with a concrete experience to apply didactic concepts in a hand-on, risk-free environment (Jeffries et al., 2009). Students can critically evaluate their performance and identify concepts that can be applied in future patient encounters. Using simulation as the concrete experience in Kolb's Experiential Learning Theory (ELT) provides a controlled experience that mimics real life situation, but can be replicated and repeated for multiple groups of students (Jeffries, 2012).

Origin of Theory and Major Concepts

Kolb's Experiential Learning Theory (ELT) is based on the premise that learning is "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience" (Kolb, 1984, p. 41). Kolb's ELT identifies four distinct phases of learning: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). For optimal learning to occur, students must experience each phase (Poore et al., 2014). The learning cycle is based on the premise that learning is ongoing. New experiences add to the cognitive framework of the individual and affect how the person reacts and responds in new circumstances (Poore et al., 2014). The learner continues to develop and learn with each new experience building on the previous.

Integration of a peer-led simulation in a nursing course will allow the learner to participate in a concrete experience with reflective thought which "leads to the discovery of new knowledge with the intent of applying this knowledge in future situations" (Jeffries, 2012, p. 75). For example, participation in resuscitation efforts for a cardiac arrest in the clinical setting is often limited to non-existent for the nursing student. A simulation that integrates the principles of cardiopulmonary resuscitation and defibrillation will provide a hands-on learning experience for students to apply in future practice. During the debrief session, reflective observation will identify key concepts and skills that were used in the experience. The students can "cognitively and purposefully think about the experience so that those abstract principles learned in the classroom can become concrete as a result of their application" (Howard, Englert, Kameg, & Perrozi,

2011, p. e3). Abstract conceptualization occurs when the learner makes logical connections to understand the problem and the simulation may be repeated to allow active exploration with potential variables to the situation (Billings & Halstead, 2012). These “what if’s” encourage the learner to explore the concept from various perspectives and identify how it can be applied in the future (see Appendix A).

Review of Literature

A review of the literature was conducted using the key words simulation, nursing education and critical thinking through Cumulative Index to Nursing and Allied Health (CINAHL) Plus with Full Text. Limitations included full text, journal publications, and date from 2007 to present to ensure current articles were reviewed. When combined search keywords simulation, nursing education, and critical thinking, a total of 355 articles were identified. A search for articles on flipped classroom in nursing education led to only three results using the same limitations previously stated. The search was broadened to flipped classroom limited by academic journals, full text, and date of publication since 2007. A total of 128 articles on flipped classroom were retrieved using this search. The subject matter taught using the flipped classroom model varied.

Flipped Classroom

The flipped classroom as a pedagogical model has been effective in providing meaningful learning opportunities in the classroom with much of the “content” covered outside of class time (Critz & Knight, 2013). The student is expected to come to class having prepared by completing assigned readings, study guides, and/or recorded lecture material. Classroom activities create engaging discussion or application of concepts while the instructor acts as a facilitator of learning by guiding the discussion and

redirecting any misconceptions (Critz & Knight, 2013; Enfield, 2013; Gaughan, 2014; Schwartz, 2014; Wilson, 2013). The flipped classroom model requires the student to take responsibility for their learning and develop confidence in their ability to independently explore new learning opportunities.

Enfield (2013) evaluated students' perception of the flipped classroom model related to effectiveness for learning content and its impact on self-efficacy in the ability to learn independently. Survey results from students indicated the flipped classroom model was beneficial to learning new content and supported independent learning (Enfield, 2013). The majority of comments in the open-ended questions were positive using phrases such as "engaged by choice", "laid back learning environment", and "learned a lot and had fun" (Enfield, 2013, p. 25). Faculty advantages included a decrease in time required for class preparation, consistency of course content presented, and the availability of the videos for remediation and absences. This study supports the concept that a flipped classroom model is an effective and engaging teaching strategy.

Simulation

The use of simulation in nursing education provides an interactive and responsive experience for students to assess a situation, determine the most effective course of action, and then review and evaluate their performance in a risk-free environment (Jeffries, 2012). The simulation experience allows the learner to apply theoretical concepts and clinical decision making in a life-like setting without the risk of patient harm (Billings & Halstead, 2011; Bultas, Hassler, Ercole, & Rea, 2014; Lisko & O'Dell, 2010). Students are able to internalize the experience, reflect upon it, and then transform the knowledge gained to be used in new and varied ways (Kolb, 1984). The use of

simulation has been effective to develop critical thinking skills and cognitive development (Brannan, White, & Bezanson 2008; Bultas et al., 2014; Gibbs, Trotta, & Overbeck, 2014; Goodstone et al., 2013; Howard, Ross, Mitchell, & Nelson, 2010; Kaddoura, 2010; Lasater, 2007; Lindsey & Jenkins, 2013; Shinnick & Woo, 2010).

The use of simulation in nursing education has been reported to be an effective strategy to improve critical thinking. Goodstone et al. (2013) explored the effect simulation had on critical thinking in first level associate degree nursing students using a two group, quasi-experimental, pre-test and post-test design to measure critical thinking using the Health Studies Reasoning Test (HSRT). Results indicated significant increase in critical thinking scores in both groups (case study and simulation) over time with no statistical significance between the case study and high-fidelity patient simulation (HFPS) (Goodstone et al., 2013). While the study did not indicate that HFPS was a more effective than a pen and paper case study, it does provide empirical data supporting that simulation is an effective strategy to increase critical thinking in nursing students.

Brannan et al. (2008) also evaluated the effects human patient simulators (HPS) had on the development of cognitive skills and confidence levels in nursing students. The researchers compared the effects of traditional classroom instruction to the use of HPS to prepare students to recognize and care for patients with acute myocardial infarction. A quasi-experimental, pre-test and post-test design was used to compare the effect instructional method had on cognitive skill and confidence level. Both groups were pre-tested using the Acute Myocardial Infarction Questionnaire: Cognitive Skills Test (AMIQ), Confidence Level tool (CL), and demographic data. After completion of the instructional method, participants completed the post-test AMIQ and CL. Results

revealed that students receiving HPS instruction scored significantly higher on the AMIQ than student receiving traditional classroom instruction. Confidence levels significantly improved in both groups, however there were no statistically significant differences between traditional instruction and HPS instruction groups (Brannan et al., 2008). These findings suggested that the use of HPS was an effective instructional method to teach complex concepts in nursing education.

Peer-Led Learning

Valler-Jones (2014) conducted a study to analyze the effectiveness of a peer-led simulation in an undergraduate nursing program. Students designed and facilitated a simulation based on the care of a critically-ill child. Evaluation of learning was measured through the use of a clinical competence examination and student perceptions were analyzed (Valler-Jones, 2014). One hundred percent of the participants passed the clinical competence examination and students' reports indicated feelings of satisfaction with learning, a sense of achievement, and improved confidence in their ability to care for a critically ill child in the future (Valler-Jones, 2014). The peer-led simulation utilized the principles of learning by teaching to develop an in-depth understanding of didactic concepts (Valler-Jones, 2014).

Peer-led training and assessment has been successfully implemented in the instruction of basic life support with excellent learning outcomes and participant satisfaction (Harvey, Higenbottam, Owen, & Bion, 2012). Ninety-six percent of the students enjoyed the course and 99% preferred to be taught by their peers rather than clinicians. During the study period, every student passed the course with only a 2.5% re-test rate (Harvey et al., 2012). The peer-led instruction was found to be at least

equivalent to faculty-led teaching with the added benefit of professional development of the student-trainers (Harvey et al., 2012).

Peer assessment has also been effective in nursing education to improve engagement, increased capacity to learn, and development of the ability to reflect and critically think (Casey et al., 2011). Undergraduate nursing students (n=91) were included in a qualitative study examining their perceptions of the use of peer assessment to enhance engagement (Casey et al., 2011). The premise behind peer assessment was for students to develop autonomy and responsibility for their learning and use reflective thinking (Casey et al., 2011). Students were asked to evaluate and provide feedback on two peer's anonymous written assignments for a grade. Focus groups were conducted at two months to explore student experiences. The majority of the students reported the activity was useful for learning and helped them understand what was expected from an assignment (Casey et al., 2011). The use of peer assessment revealed the overarching theme of improved student engagement with the subcategory of enhanced learning identified (Casey et al., 2011).

Mission

The mission of this project was to implement a flipped classroom method of instruction in nursing education utilizing an in-class peer-led simulation to promote critical thinking and cognitive development in nursing students. The flipped classroom model promotes self-directed learning by assigning video-lecture, reading, and assignments as homework and utilizing class time for interactive discussion and engaging class activities. Upon implementation of this instructional method, the faculty will recognize an increase in class preparedness and class participation by nursing students.

Goals

- Implement flipped classroom model using peer-led simulation as class activity in nursing courses with a clinical component.
- Develop learning activity that brings experiential learning and simulation based learning into the classroom.
- Introduce an innovative teaching strategy (peer-led classroom simulation) in nursing curricula using Kolb's Experiential Learning Theory.
- Contribute to the evidence supporting the use of a flipped classroom in nursing education.

Objectives

- Students demonstrate significant increase in critical thinking scores after the implementation of the flipped classroom using a peer-led simulation.
- Students reveal significant improvement in post-test cognitive learning scores.
- Students report flipped classroom as effective learning modality to achieve course objectives.
- Students report flipped classroom and peer-led simulation facilitated independent learning and deeper understanding of concepts.
- Faculty report improvement in student preparedness and class participation.
- Faculty report satisfaction with the implementation of the flipped classroom model using a peer-led simulation.

Project

Nursing education has shifted from the traditional, content-laden, lecture-style of teaching to a learner-focused approach. The instructor is no longer portrayed as the fount of all nursing knowledge but a facilitator of learning and applying complex concepts. The flipped classroom model urges the student to complete preparatory assignments prior to coming to class to allow time in class for application and deeper understanding of the content. Simulation has been shown to be effective at creating an engaging and risk-free learning environment for students to develop critical thinking and apply concepts. By integrating a flipped classroom model using peer-led simulation, learners will develop deeper understanding of concepts and the opportunity to utilize critical thinking skills in the classroom. The practice of assigning a peer-led interactive scenario to be carried out in the classroom will help students link concepts and bring the clinical scenarios to life. The implementation of a flipped classroom model using a peer-led simulation as a class activity to introduce new and complex concepts will encourage nursing students to explore ideas and concepts independently and improve critical thinking.

The goal of this project was to implement a flipped classroom model using peer-led simulation as class activity in fundamentals of nursing course in a pre-licensure baccalaureate nursing program. The aim was to develop a learning activity that brings experiential learning and simulation based learning into the classroom by introducing an innovative teaching strategy (peer-led classroom simulation) using Kolb's Experiential Learning Theory. This project addressed critical thinking in nursing students and lack of student preparedness for class by implementing evidence-based pedagogy using the flipped classroom model and simulation in nursing education. It was anticipated the pre-

and post-test scores for critical thinking would show a significant increase in critical thinking scores after the implementation of the flipped classroom using a peer-led simulation. It was anticipated the cognitive pre-and post-test cognitive ability tests would reveal significant improvement after participation in the peer-led simulation indicating that the students learned the concepts presented in the at-home assignment and classroom simulation. The end of course evaluation questionnaire findings would indicate students felt the flipped classroom was an effective learning modality to achieve course objective and the peer-led simulations stimulated independent learning and deeper understanding of concepts. Outcome evaluation was based on student data related to critical thinking and cognitive learning as well as data derived from student and faculty course evaluations. It was anticipated faculty reports would indicate improvement in student preparedness, class participation, and development of an interactive learning environment.

Setting and Resources

The project was implemented in the fall semester of 2015 in a fundamental nursing care course in a pre-licensure baccalaureate nursing program at a liberal arts university in eastern North Carolina. The project leader was not the primary instructor for the course and would only have instructional contact during skills laboratory and simulation laboratory experiences. The primary instructor and one additional faculty member were responsible for assessing performance and providing formative feedback for the peer-led simulation scenario.

The nursing department contains a simulation hospital equipped with wireless video system. Each patient care room has two video cameras with audio recording. The video system allowed students in the lecture hall classroom to view the simulation as it

occurred as well as review a video recorded playback. A confidentiality statement was signed by the students prior to the use of video-recording and student video files are deleted upon completion of the program. Students receive an orientation to the equipment and faculty is available during scheduled and open laboratory hours to assist with technical issues. There is one full-time faculty, one part-time adjunct faculty, and two pre-nursing student workers assigned to assist in the simulation laboratory. The university has recently contracted for an upgraded learning management system that will accommodate the video-lecture integration of content into the courses.

Population

The project participants (n=24) consisted of first year pre-licensure nursing students enrolled in Fundamental Nursing Care during the fall 2015 semester at a small liberal arts university in southeastern North Carolina. The ages ranged from 20 years to 50 years with the mean age 26 years old. According to an admissions demographic questionnaire, the majority of the nursing students were self-identified as Caucasian (79%) females (96%). There was one male student. There were two Hispanics (8%), two African Americans (8%), and one Asian (4%). There are 10 full time faculty in the department with diverse backgrounds in clinical expertise, teaching experience, and experience with the use of technology and simulation. Simulation is currently utilized as a teaching strategy as a clinical experience in four nursing courses and the respective faculty are experienced in evaluation and debriefing. The Simulation Director has nine years teaching experience with the past five years focused on the use of simulation. Two faculty have two or less years teaching experience but more than 15 years of clinical practice experience. Three faculty have taught on-line or hybrid nursing courses and are

well equipped to assist with making instructional materials available electronically. Over the summer 2015 and fall 2015, the university offered several instructional sessions to assist faculty in the development of on-line teaching strategies. Many technical components of implementing a flipped classroom, such as recording and posting video-lecture, were addressed during this instruction.

Team Selection

The project leader's faculty advisor from the educational institution served as faculty chair of the committee. She provided guidance and recommendations in the development and implementation of the project and assisted with communication between the project leader and members of the educational institution's review board. Other members of the committee from the project implementation institution included one nursing faculty and the chair of the athletic training department. Both have used the simulation laboratory for their respective courses and displayed interest in utilizing flipped classroom methodologies. The athletic training faculty is also the chair of the project site's Institutional Review Board and would serve a resource for evaluation and methodology. The nursing faculty member shares an interest in evaluating critical thinking and is currently planning a project evaluating critical thinking ability in nursing students engaged in traditional clinical groups compared to a dedicated education unit model of clinical learning. The course coordinator and co-faculty for Fundamental Nursing Care, the course in which the flipped classroom model was implemented, were closely involved in all aspects of the project as well as his co-faculty for the course. Both of the Fundamental's faculty had previous experience in utilizing online learning activities in their courses. The Fundamental's co-faculty was the primary instructor for

the class periods utilizing the flipped format. Other project committee members included: Chair of the nursing department, Director of Instructional Technology and Distance Education, and a Professor of Justice Services Support who has an interest in the evaluation of critical thinking and experience in the administration of the Watson-Glaser II Critical Thinking Appraisal (WGCTA).

Best Practice Development and Project Implementation

The effectiveness of the flipped classroom implementation on critical thinking and cognitive learning was evaluated utilizing a variety of methods. Students were provided a brief overview of the project and informed consent obtained prior to initiation of the project. To establish pre-project implementation data, students were asked to complete cognitive tests prior to each peer-led simulation and Watson Glaser II Critical Thinking Appraisal (WGCTA) at the beginning of the project. Qualitative data was collected on the student end-of course evaluation and faculty focus group discussion. The integration of a flipped classroom model using on-line video lectures and peer-led simulation in class replaced the usual method of traditional lecture and class discussion. The course, Fundamental Nursing Care, was selected due to the feasibility of integration of simulation scenarios related to course specific content. Fundamental Nursing Care is a junior level course in the first semester of the nursing program and will be the students' first course experience with nursing clinical requirements. The course is a five semester hour credit that meets for a weekly three hour didactic class and completes 60 contact hours of laboratory and clinical over the 15 week semester. During the beginning of the course, the project leader explained the purpose and aim of the project and discussed the process for notification for non-participation or voluntary withdrawal from the project.

All students established baseline critical thinking scores using the WGCTA during the first part of the semester. Students were randomly divided into groups of five to six students by selecting simulation dates from a hat. Students also randomly drew identification numbers for use on the cognitive pre-and-post tests. The content to be covered during the Fundamental Nursing Care simulation scenarios included:

- Safety: Use of restraints
- Urinary Elimination: insertion of indwelling catheter and catheter care
- Medication Administration: thrombolytic therapy (subcutaneous heparin injection)
- Medication Administration: Mixing insulins with medication error
- Wound Care: Sterile dressing change using personal protective equipment.

These topics were selected due to their significant implications for NCLEX-RN content areas of reduction of risk, safety and infection control, and basic care. Previous student cohorts at the project institution have scored below 50% on the ATI Comprehensive Predictor and RN Fundamentals Assessment on items in these categories. Implementation of a new learning strategy such as a flipped classroom and peer led simulation will enhance learning of these essential nursing concepts.

During the first week of classes, each skills laboratory group of eight students was provided an orientation to the simulation and skills laboratory during their first skills laboratory session. Guidelines for simulation design and debriefing were provided to each group using the Jeffries Framework for Simulation Design (see Appendix B and C) (Jeffries, 2012). The faculty provided the learning objectives for each simulation scenario to the student groups. Course faculty posted online reading assignments, video

lectures of new content, and links to other educational resources. For the simulation scenario, students provided related laboratory data, appropriate physician orders, test results, and physiologic state of the manikin based on information from assigned reading, video-lecture, and standards of practice. Templates for simulation content, grading, and debriefing were provided to the students (see Appendix B, Appendix C, Appendix D, & Appendix E). Students indicated what supplies were needed for the simulation and, with assistance of the lab coordinator, gathered these for the presentation. Students were required to schedule a meeting with the simulation director one week prior to the simulation presentation to review content, supplies, and practice the scenario using the high-fidelity manikin. The small group of students presenting the scenario determined assignment of roles (primary nurse, student nurse, family member, computer/video operator, voice of patient). Course faculty observed all simulation scenarios and participated in the debrief session ensure comprehensiveness of content provided and clarify any misconceptions that arose during class discussion. The simulation director was available in the control room to assist with any technical difficulties or supply needs during the scenario presentation.

Prior to the simulation, all students completed a cognitive pre-test in the classroom on content from assigned homework and relevant to the simulation. Approximately one hour of class time was allotted for the peer-led simulation. The small group provided a 10-minute introduction to the scenario, identify learning objectives, and provide any background information needed to set the scene. The simulation ran approximately 20 minutes and was projected live into the lecture classroom and video recorded. Students in the classroom evaluated the simulation scenario using an

observation evaluation rubric that addresses concepts such as safety, skill performance, communication, and prioritization. The small group leading the simulation then returned to the classroom to guide the 20-30 minute interactive discussion on key concepts covered, examples of clinical decision-making, application of concepts in clinical practice, and areas for improvement.

Upon completion of the simulation and reflective discussion, a cognitive post-test was administered. The remainder of the class utilized hands-on learning activities and small group discussion utilizing the nursing process to develop an appropriate plan of care for the case presented during the simulation. At the completion of the course, critical thinking was reevaluated using the WGCTA.

Timeline and Budget

Project implementation took place during the fall semester and spanned approximately 15 weeks. A project work breakdown with milestones and proposed timeline served as a guide to monitor progress leading up to and during the project (Figure 1). A proposed budget identified projected expenses including faculty time, costs of equipment and classroom space, and any supplies or materials used during the simulation or assessments (Table 1). The department chair fully supported the project and approved the proposed budget.

Timeline Task: Fall 2015	June	July	Aug	Sept	Oct	Nov.	Dec
Develop Grading Rubrics and Guidelines for Peer-Led Simulation, Cognitive Learning Test by Project Leader and reviewed by course faculty							
Project Proposal							
Submit for IRB approval							
Meet with Faculty: Course calendar Develop video lecture							
Modify Course Evaluation(Student and Faculty)							
Orient Students to Sim Lab/Project							
WGCTA Critical Thinking Pre-test							
Student Peer Led Simulations (#5)							
WGCTA Critical Thinking Post-test							
Course Evaluation (Student and Faculty)							

Figure 1. Gantt Chart

Table 1

Proposed Budget: Approved by Department Chair

Materials	Cost
25 Watson-Glaser Critical Thinking Appraisal Booklets	\$396.00
Supplies used during simulation	\$20.00
Copier Cost for Pre/Post-test	\$20.00
Faculty class preparation time equivalent to traditional lecture	no additional cost
Audio/Video Recording	no additional cost
Simulation Lab/Classroom space	no additional cost
Simulation Faculty preparation time	no additional cost
Total:	\$436.00

Instruments

The cognitive pre-and post-test scores were not included in the course grade but used for as formative evaluation of cognitive gains after simulation instruction. The cognitive pre- and post-test (CPT) included approximately 10 multiple choice, fill in the blank, matching, and short answer questions assessing knowledge, comprehension, and application of the specified content assigned as homework. Two versions of the faculty-developed CPT were used as a pre-test and a post-test administered prior to the simulation scenario and at the end of class. A number coding system was used to maintain anonymity and track and compare individual pre- and post-scores.

The WGCTA was administered during the first half of the semester to establish a baseline score and repeated at the completion of the project to assess the effect a flipped classroom model using a peer-led simulation had on critical thinking. The WGCTA is a 40 item validated and reliable tool to assess reasoning skills using the subsets: recognition of assumptions, evaluation of arguments, and draw conclusions (Hassan & Madhum, 2007). Approximately 40 minutes were allotted for the WGCTA. The WGCTA manual provides recent norms for comparison and was found to have adequate face, content, criterion, and construct related validity.

Faculty perceptions of the flipped classroom model using a peer led simulation were evaluated in a small group discussion group led by the project leader. Open-ended questions to assess overall perception of class participation and student-preparedness, areas of concern, and suggestions for future implementation were used. Responses were evaluated for themes and key concepts. Student perception of the effectiveness of the peer-led simulation assignment and the flipped classroom concept was evaluated by a

three item Likert-style survey using the same five point format as the existing end of course evaluation.

Data Collection

Data collection was ongoing, with the WGCTA administered prior to implementation of the flipped classroom model and at the conclusion of the course. The CPTs were administered at the beginning and end of each class period that a peer-led simulation is presented. Data collected during the project was analyzed by comparison of mean pre- and post-test scores. The WGCTA composite pre- and post-scores were also evaluated to evaluate significant impact on critical thinking. A randomly assigned number coding system was utilized to ensure consistency during evaluation. For each assessment, the students used their assigned number when completing the CPT. The purpose of the CPT was to evaluate the effect the innovative teaching strategy using peer-led simulation had on student's ability to understand and apply new concepts. The data obtained in the pre- and post-test also provided formative data and guide the course instructor to clarify misconceptions or further discussion of specific content. Three Likert-style questions were added to the student end of course evaluations and collected anonymously during the final week of the course (see Appendix G). Faculty perceptions, challenges, benefits, and recommendations were evaluated in a small group guided discussion forum (see Appendix H). The employer survey was modified to address graduates' critical thinking ability in clinical practice. The results of the employer survey are kept and maintained by the chair of the nursing department and will not be included in the scope of this project. The employer survey results will be used to evaluate the long-term effects the project has on critical thinking in the nursing graduate and not included

in the scope of the current project. Employer satisfaction surveys provide important data for systematic program evaluation, to guide curricular changes, and maintain alignment with accreditation standards.

Ethics and Protection of Project Participants

Prior to implementation of the project, approval was obtained from the Institutional Review Board from the project implementation site and educational institution. All students were informed on purpose of the project and offered the opportunity to decline participation in the project without penalty or impact on course grade. While there were no formal declinations to participate, one student did not submit the CPTs, two students withdrew from the program during the project, and three others did not take at least one of the WGCTAs. These student's scores were not included in the evaluation of results. All test scores and feedback from the simulation assignment was used solely for formative feedback and not reflected in the students' course grade. Scores for the WGCTA and the CPT were recorded using a randomly assigned numeric student identification to maintain anonymity of student participants to the project leader. Content provided in the on-line video lectures by the faculty was equivalent to content that would traditionally be delivered in a face-to face classroom presentation. Faculty posted voice-over PowerPoint lectures and video links for students to review at home instead of using class time to deliver presentations of course content.

Project Implementation

Process of Project

During the first nursing faculty meeting of the semester, all nursing faculty were informed of the flipped classroom project being implemented in the Fundamental Nursing Care course during the fall semester. The dates for the administration of the WGCTA and classes implementing the flipped format were confirmed with the course coordinator and co-faculty. The course is on a 15 week calendar with five dates scheduled as exam days, five class meetings in the traditional lecture format, and five class meetings utilizing the flipped classroom model. An individual meeting was conducted with the course instructor responsible for the content to be covered in the flipped classroom model. The timeline was reviewed with milestones identified for development and review of CPTs. All forms and documents such as the Guided Debrief Template and Peer-Led Simulation Grading Rubric (see Appendix C; Appendix D) used for the flipped classroom and peer-led simulation were discussed.

After being informed of the project and provided the opportunity to ask questions and/or decline participation, students were randomly assigned into their peer-led simulation groups by drawing a card with the date the scenario was to be presented in class. The topic of the peer-led simulation corresponded to the course content and schedule. The Simulation Guidelines (see Appendix E) were reviewed with the entire group and time was allowed for questions. Students met with the simulation director for planning and preparation prior to the simulation presentation. The course instructor developed voiced-over PowerPoint presentations to post on the learning management

system for students to access prior to class in addition to assigned readings. Faculty did not track student online activity to validate viewing of the recorded lecture content.

The students were given the CPT at the beginning of class followed by the peer-led simulation. For the peer-led simulation, student groups developed and provided the simulation director with a summary of the scenario, list of supplies needed, physician orders, and any lab results that may be included in the simulation (see Appendix F). Students provided a hand-off report in the classroom to set the scene and identify student roles within the scenario. The scenarios typically included the role of nurse, nursing student, and family member. Some groups did include other roles. For example, a nurse manager was included in the scenario involving a medication error and a wound care nurse was utilized in the pressure ulcer dressing change scenario. After report, the student group returned to the simulation laboratory to act out the simulation scenario while the class viewed the live performance and evaluated the scenario using the grading rubric (see Appendix D). The student group then returned to the classroom for a peer-led debrief using the Guided Debrief Template (see Appendix C). The student group reviewed the learning objectives with the class and elaborated on concepts that were integrated into the simulation. At the conclusion of the peer-led debriefing, the course faculty identified key points that were highlighted in the simulation and allowed time for student comments and questions.

The remainder of the class time was utilized by small group hands-on activities applying concepts from the assigned readings, such as wound assessment and documentation, calculation intake and output on complex patient, and urinary specimen collection activity. Students also worked in their small groups to development of a plan

of care for the patient identified in the simulation scenario using the nursing process. At the conclusion of class, the post-test CPT was administered. Upon completion of the course, students were given the end of course evaluation survey and the comparative WGCTA.

Outcomes

The student performance on the CPT demonstrated improvement in scores after the flipped classroom (see Appendix I). The students scored higher on the CPT post-test (post-test mean 70.77) than on the CPT pre-test (pre-test mean 62.506). A two tailed paired t-test for a two-population mean was performed using Data Analysis in Microsoft Excel® (p=0.4) (Table 2).

Table 2

t-Test: Paired Two Sample for Means Cognitive Pre-and Post-Test

	Variable 1	Variable 2
Mean	62.506	70.44
Variance	196.67708	124.76615
Observations	5	5
Pearson Correlation	-0.183004718	
Hypothesized Mean Difference	0	
df	4	
t Stat	-0.911559172	
P(T<=t) one-tail	0.206783864	
t Critical one-tail	2.131846786	
P(T<=t) two-tail	0.413567728	
t Critical two-tail	2.776445105	

An overall improvement was also evident in the critical thinking scores (see Appendix J). When comparing data, the raw mean critical thinking score was 21.65 at the beginning of the course and 25.7 at the conclusion of the course. A paired t-test was conducted using the Data Analysis in Microsoft Excel® ($p=0.01$) (Table 3). A total of 17 students completed both the baseline and end of course WGCTA. Two students withdrew from the program due to academic and personal reasons. Other students were missing results for one of either the pre- or post-WGCTA and not included in data analysis.

Table 3

t-Test: Paired Two Sample for Means Watson Glaser Critical Thinking Appraisal II

	Variable 1	Variable 2
Mean	21.64705882	25.70588235
Variance	22.49264706	33.22058824
Observations	17	17
Pearson Correlation	0.47154057	
Hypothesized Mean Difference	0	
df	16	
t Stat	-3.058746835	
P(T<=t) one-tail	0.003750158	
t Critical one-tail	1.745883676	
P(T<=t) two-tail	0.007500317	
t Critical two-tail	2.119905299	

Student's end of course evaluation scores were collected at the conclusion of the semester. A total of 23 students responded and results were compiled. Based on these results, 87% of the students agreed the peer-led simulation was helpful to understanding new concepts and 78% agreed it helped apply critical thinking skills. Only 57% indicated the lecture videos were helpful and improved class preparedness, discussion, and learning. (Table 4)

Table 4

End of Course Evaluation Survey Questions

(N=23 Responses)	1 Strongly Disagree	2 Somewhat Disagree	3 Neither Agree nor Disagree	4 Somewhat Agree	5 Strongly Agree
1. The peer-led simulation helped me understand new nursing concepts.	0	2 (9%)	1 (4%)	15 (65%)	5 (22%)
2. The peer-led simulation helped me apply critical thinking skills.	0	0	5 (22%)	11 (48%)	7 (30%)
3. The lecture videos helped me be more prepared to participate in class discussion and learning activities.	1 (4%)	3 (13%)	6 (26%)	8 (35%)	5 (22%)

The primary instructor utilizing the flipped classroom model was asked a series of guided questions for perception of overall effectiveness and suggestions for future implementation (see Appendix H). Several benefits were noted for both faculty and students. The instructor for the flipped classroom reported a better sense of student understanding of use of the nursing process and application of concepts when engaging students in the small work groups. According to the instructor, students were engaged with each other in the hands-on learning activities and worked well in groups. The lead instructor indicated that preparation time for traditional lecture was relatively equivalent to preparation time required by the recorded video-lecture. Additional time was required outside of class hours for delivery of the presentation. It took approximately 45 to 60 minutes outside of class to record the lecture session whereas the traditional lecture required no out of class time for presentation.

Challenges for the students included difficulty in scheduling meeting times when all could attend to plan and prepare for the simulation. For the faculty, preparation of the video lecture was frustrating due to use of new learning management system features with limited training. There were technical audio problems with the video-lectures, which resulted in the session being recorded more than once. According to the lead instructor, the recording issues added an additional hour to course preparation time. Audio difficulties such as difficulty hearing and no volume arose during the simulation on two occasions. This technical problem was resolved during the course of the project.

The instructor indicated that initially there was no apparent increase in class preparedness using the flipped classroom model compared to previous cohorts. The students presenting the peer-led simulation were well prepared and participated in class

discussion however, the remaining students were less able to contribute to discussion based on assigned reading and video lecture. Students expressed uncertainty about faculty expectations for preparation for class and viewing of recorded-lectures. The lead instructor clarified that students were expected to have read all assigned content and viewed the video lecture prior to coming to class. Students voiced understanding and after the third flipped class, the instructor noted a slight improvement in overall class preparedness and participation than previous meetings.

Project Evaluation

Interpretation of Outcomes

The implementation of the flipped classroom using peer-led simulation as an interactive learning strategy was found to be an effective and engaging teaching methodology. Student learners demonstrated a significant improvement in critical thinking scores and an overall improvement in CPT scores after the implementation of the flipped classroom model. According to the end of course evaluations, the majority of the class agreed that the peer-led simulation was helpful for learning and application of new content to improve critical thinking. Only slightly more than half of the students (57%) felt the video lectures were helpful for class preparation.

Faculty reported overall satisfaction utilizing the flipped classroom and peer-led simulation model. According to faculty observation, the students who were presenting the peer-led simulation demonstrated an increase in preparation and class participation however, improvement was not evident among the entire class. Faculty also reported difficulty making the time to record the video lectures and were distressed when technical difficulties arose. As the Fundamentals course is taught by co-faculty, the unit tests and

exams contained content from both traditional and flipped classroom presentation.

According to course faculty, there was no discernable difference in student performance on content from either teaching method.

Comparison to literature. Consistent with the literature, the flipped classroom provided an engaging learning environment in which students reported having fun while learning and faculty were able to interact with students on more personal level to redirect and clarify misconceptions of learning (Critz & Knight, 2013). Critical thinking scores were significantly higher after the introduction of the peer-led simulation method of learning in this project as found in Goodstone et al. (2013). While this project did demonstrate improvement in the post CPT scores, the increase was not significant as in Brannan et al. (2008). The use of peer-evaluation in class during the simulation may also have contributed to the student's improved critical thinking scores as shown in Casey et al. (2011). Similar to findings by Valler-Jones (2014), participants in the peer-led simulation verbalized comments affirming a sense of achievement such as "we did it" and "good job as the nurse, you really explained that procedure well".

Interpretation of Process

The flipped classroom model was found to be effective teaching strategy to be used in nursing education. The peer-led simulation provided an interactive class activity and allowed for case-based discussion related to content presented. Students observing the simulation in the classroom were engaged in the evaluation and identification of key concepts included in the scenario.

Achievements. There were several unexpected positive outcomes as a result of implementing the flipped classroom into the Fundamental Nursing Care course. Students

using the grading rubric during the peer-led simulation were very observant and identified concerns to overall nursing care such as student not having hair pulled up during simulation or touching face with gloved hand. The grading rubric also highlighted misconceptions such as when it is appropriate to use sterile technique versus non-sterile technique for a dressing change.

Another highlight was a comment from an adjunct faculty member stating that this group of students was more proficient at using the nursing process than previous groups. Part of the in-class activity during the flipped classroom included development of a nursing plan of care for the patient presented in the peer-led simulation. For example, the scenario for wound dressing change using personal protective equipment included concepts related to nutrition, mobility, infection control, and sterile technique. With faculty guidance, students were encouraged to work in groups to devise appropriate diagnosis, goals, and interventions and discuss evaluation of care provided during the simulation. Each flipped class provided a case study experience for students to apply the nursing process and develop a plan of care.

Recommendations for improvements. While the junior level students performed well in the simulations, the peer-led simulation would likely be more effective in a higher level course. Students needed more foundational experience in basic nursing care to elevate the authenticity of the simulation scenarios. Case-based simulation scenarios would work well in the two medical surgical courses Adult Health I and Adult Health II during spring semester of junior and senior year respectively.

Another difficulty was inconsistency in the audio quality for the video lectures and transmission of the live simulation into the classroom. The learning management

system upgrade aimed to improve video capabilities was not easy to use and lead to frustration by faculty. The faculty attended training workshops for the system but still had difficulty recording the audio for lectures. Further training and support for use of the learning management system for creating video lectures is needed. The problem for the transmission of the audio during the simulation was resolved during the course of the semester.

For future implementation of the flipped classroom, the instructor suggested allowing more time to develop and record the video lectures. A template for video lecture may improve consistency of presentation among different faculty. It was also suggested that questions be imbedded in the recorded lecture for students to complete and discuss in class. These recommendations may improve class participation and preparedness. She also recommends the peer-led simulation concept may be better suited in higher level courses allowing students to acquire foundational skills prior to performing in a simulation scenario.

After the first two flipped classes, students voiced concerns about not feeling adequately prepared for unit tests and exams when the majority of class time was hands-on activities. There was some resistance by students that they were not being taught and they were “teaching themselves.” They felt the flipped classroom prepared them for clinical but not for tests. A student commented “there seems to be a disconnect between the test and the flipped classroom.” Students were reminded that the “lecture” was the online video and should be viewed prior to coming to class. Class would be used to clarify any confusing issues and answer questions. The course faculty made an effort to point out key concepts from the assigned readings that were identified in the simulation

and class activities and set aside time for questions. After the students expressed their concerns and the faculty were receptive to listen, the resistance to the flipped classroom dissipated and students began to enjoy the hands-on learning.

Plan for sustainability. As previously mentioned, the plan is to implement the flipped classroom using peer-led simulation in the adult medical surgical Adult Health I and Adult Health II courses. The flipped classes will be limited to specific course content and students will develop and present a simulation on the assigned disorder. The initial goal is to flip approximately 50% of the class periods with the remaining classes utilizing traditional lecture and quest speakers. Adult Health I already has many video-lectures embedded into the current content and the course coordinator is eager to bring simulation into the classroom. There are three faculty-led simulation clinical experiences in Adult Health I. The peer-led simulations would be used in addition to current simulation experiences. Adult Health II currently utilizes pathology specific group presentations that could easily be converted to the peer-led simulation. Students in Adult Health II currently participate in three interprofessional simulation experiences and have expressed the desire for more simulation and utilizing the nursing role in life-like situations. The course coordinator is supportive of the transition to implementing a flipped classroom model using peer-led simulation.

The faculty agree that evaluation and assessment of critical thinking ability is important to include in the program however, the ongoing use of the WGCTA will be discussed by the faculty. The program is in the first year of using Kaplan® Test Prep as supplemental assessments and student preparation for national examination. The Kaplan

package includes assessment of critical thinking and the faculty will determine if this is adequate for future comparison and evaluation.

Results of this project will be disseminated to all nursing faculty at the final faculty meeting of the Spring 2016 semester. A brief summary of the project will be presented at the Fall 2016 Nursing Advisory Board meeting for comments and input from community stakeholders. The project leader plans to present these findings at local, regional, and national simulation and education nursing conferences. A manuscript of the project will be submitted to an appropriate nursing education or simulation education journal.

Conclusion

Nursing graduates must develop the ability to assess a situation, plan, carry out a course of action and then evaluate the effectiveness of the intervention. The ability to critically think and develop independent learning skills must begin at the nursing student level. The use of simulation in the classroom provides a concrete experience for students to practice psychomotor skills, apply concepts in clinical situations, and explore how the principles used in the scenario can be applied in future practice (Jeffries, 2012). Critical thinking and cognitive learning were enhanced through the integration of peer-led simulation into the classroom. By bringing the simulation experience into the classroom, the large group was able to learn from and participate in the experience. Class time was spent on interactive and engaging activities with much of the content delivery taking place outside of class as reading assignments and video-lectures (Critz & Knight, 2013).

The flipped classroom model encouraged students to explore concepts independently and then apply this new knowledge in hands-on activities. Simulation

provided students the opportunity for students to participate in real-life situations in a safe and risk-free setting. Students were allowed to independently make clinical decisions and then reflect upon their actions in a guided discussion. This interactive and engaging learning strategy resulted in cognitive learning and development of critical thinking skills essential for successful entry into the workforce as new nurse graduates.

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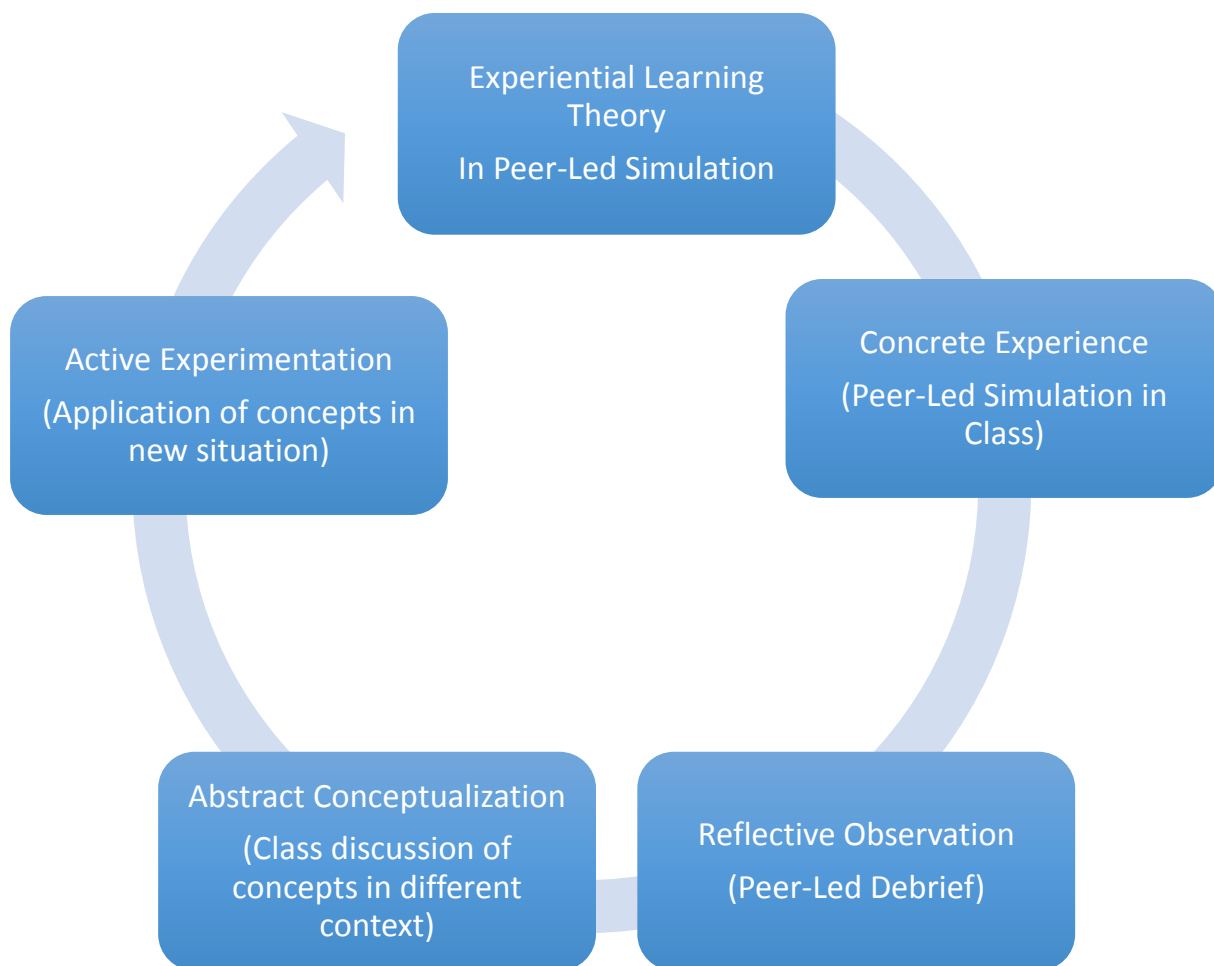
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Appendix A

Theoretical Framework Diagram



Appendix B

Simulation Template

Time: 20 minutes

Title of Scenario:	
Objectives: (Provided by Faculty)	
Brief Overview of Scenario	
Patient Name:	
Admitting Diagnosis:	
Past Medical History:	
Report:	
Supplies:	
Medication:	
Labs:	
Physician Orders:	

Based on Jeffries Framework for Simulation Design (Jeffries, 2012)

Appendix C

Guided Debrief Template

Time: 20-30 minutes

General Opening Questions	How did you feel during the care of.....? What do you think went well? What could have been done differently?
Scenario Specific Questions	What were potential causes for the patient's symptoms? How did you determine the actual cause of the symptoms? What factors need to be considered when planning care? Describe the clinical decisions made in the scenario. Describe communication with the provider, the family, the patient. How does this scenario apply the concepts from assigned reading? How could potential problems be avoided? What safety practices were used in the scenario? How was information reported? Documentation?
General Wrap-up Questions	What have you learned from this simulation? How can this be applied in future practice? How can these principles be applied in a different situation?

Based on Jeffries Framework for Simulation Design (Jeffries, 2012)

Appendix D

Peer-Led Simulation Group Presentation Grading Rubric

	Points	Points	Points	Points
The objectives were clearly identified and addressed in the simulation scenario.	15 (15%) Comments:	10 (10%) Comments:	5 (5%) Comments:	0 (0%) Comments:
The concepts addressed in the simulation provided clear linkages by applying concepts in the textbook to real-life clinical practice scenarios	15 (15%) Comments:	10 (10%) Comments:	5 (5%) Comments:	0 (0%) Comments:
The roles portrayed in the simulation were identifiable and authentic.	10 (10%) Comments:	7 (7%) Comments:	4 (4%) Comments:	0 (0%) Comments:
Clear communication among participants was evident in the simulation (nurse, patient, family, provider)	10 (10%) Comments:	7 (7%) Comments:	4 (4%) Comments:	0 (0%) Comments:
Proper techniques for various procedures was demonstrated in the simulation	10 (10%) Comments:	7 (7%) Comments:	4 (4%) Comments:	0 (0%) Comments:
Interventions in the simulation were prioritized according to patient condition and situation.	10 (10%) Comments:	7 (7%) Comments:	4 (4%) Comments:	0 (0%) Comments:
The pre-brief information provided pertinent background and patient information relevant to the simulation.	10 (10%) Comments:	7 (7%) Comments:	4 (4%) Comments:	0 (0%) Comments:
The debrief discussion highlighted ways concepts in simulation could be applied in other situations.	10 (10%) Comments:	7 (7%) Comments:	4 (4%) Comments:	0 (0%) Comments:
Adequate time was spent on the pre-brief (10-15 min), simulation (20-30 min) and de-brief (20-30 min)	10 (10%) Comments:	7 (7%) Comments:	4 (4%) Comments:	0 (0%) Comments:

Score: _____ Overall Comments: _____

Appendix E

Peer-Led Simulation Group Presentation Guidelines

- Groups and topic selection will be randomly assigned during the first weeks of class.
- Groups will devise a scenario following the Simulation Template applying the concepts and skills included in the topic.
- Each topic will include a list of objectives (provided by faculty) that must be addressed during the simulation.
- Each group will designate members to portray the role of: primary nurse, secondary nurse, nursing assistant, family member, control room (voice and computer), and other roles essential to the scenario.

Timeline:

Groups will submit the completed Simulation Template to Mrs. Malpass and Mrs. Matthews at least **10 days** prior to the simulation.

The group must meet with Simulation Director or Course Faculty **one week** prior to simulation to review scenario and gather supplies.

At least **3 days** prior to the simulation, the group must schedule a practice session for the simulation and finalize materials.

Pre-Brief: (10 min)

The group will present the objectives, concepts to be included, and a brief background of the scenario to be presented. A hand-off report will be given to the “nurses” and classroom observers.

Peer-Led Simulation: (20-30 min)

The simulation presentation will be projected live in the classroom. A peer and faculty evaluation will be conducted during the live simulation.

The recorded session will then be replayed in class for discussion and review.

Debrief: (20-30 min)

The group will lead the debrief session following the Debrief Template. The discussion should include strengths and areas for improvement.

Appendix F

Sample of Student Peer-Led Simulation

Fundamental of Nursing
 Student-Led Simulation # 1
 Concept Plan

Title of Scenario: Wound Care (Sterile Dressing Change Using PPE)

Scenario Overview: Mr. Jones is a 62 year old paraplegic patient admitted with a low-grade fever and a purulent wound on his right hip. His wife was caring for him at home, as insurance would only cover a NAP to visit once a week to assist in bathing and other basic hygienic care. His wife recently quit her job to provide care full time to her husband. As such, they have experienced a gap in their insurance for three weeks, resulting in there being no one to visit and ensure adequate care. All intake activities, wound culture and appropriate labs have been completed. The team has been tasked to evaluate the wound in question during dressing change.

Indication of Admission: Fever secondary to infected wound

Objectives:

1. Assess risk for pressure ulcers using the Braden scale.
2. Assess and categorize pressure ulcers based on staging system.
3. Demonstrate dressing change and proper use of PPE.
4. Recognize complications of wound healing.
5. Explain when and how to use various absorbent, collagen, alginate, gauze, hydrogel, and hydrocolloid dressing.
6. Explain factors involved in the development of pressure ulcers.

In-Simulation Room

Equipment Checklist:

1. Braden and PUSH scales
2. Non-sterile gloves
3. Hydrogel dressing 3-4 cm larger than wound

The following if cleaning is necessary:

- a. Moisture-proof bag
- b. Normal saline solution (body temp)

- c. Emesis basin
- d. Sterile gauze for cleaning
- e. Disposable clippers or scissors (trim hair or dressing as required)
- f. Skin prep
- g. Measuring device (cm)
- h. Tape

Medications: Vancomycin IV 500mg every 6 hours; Hydrochlorothiazide 20mg PO B.I.D; no pain management (Pt has no sensation from the umbilicus down);

Documentation Forms: Provider order, informed consent...

Preparation of Simulator: will need to moulage a stage II pressure ulcer over right iliac crest

Participant Roles: Will- Mr. Jones; Leandra- Wife; Shawna- Nursing student; Emily- RN

Laboratory Data: Wound culture- MRSA +; CCr – 100mL/min

Patient Data: P- 85 bpm; R- 18/min; BP- 126/84; T: 101.8 F; SPO2: 98% (room air)

Past Medical History: Paraplegic x 5 years post fall from ladder at home; stage II hypertension controlled with thiazide diuretic

Physician Orders: See Orders

Hand-Off Report: TBD

PHYSICIAN ORDERS		
Date	Time	
		Admit to Medical Surgical Unit
		Diagnosis: Fever
		Condition: Stable
		Full Code
		Allergies: NKDA
		Contact Precautions
		Diet: Regular
		Consult PT and Wound Treatment Team
		Vital signs every 4 hours
		Wound Care: Dressing change to Rt hip daily and prn. Clean with NS and apply Hydrogel dressing.
		IV: Saline Lock
		Labs: CBC, Chem Panel Stat, then daily; Wound Culture Rt Hip
		Strict I&O
		Meds: Vancomycin 500mg IVPB q 6 hrs
		HCTZ 20 mg po bid
		Wound drainage rt hip for culture and sensitivity

Run Date: 09/24/15 Run Time: 0530 Run User: 2SL.SAM		University General Hospital		Page 1	
Name: Jones, Alex DOB: 08/13/1953 MR# : PCS71900 SPEC#: 0345:TR003CK		COLL:09/24/15-0500- RECD:09/24/15-0530		STATUS:COMP REQ#650 SUBM DR: Wilson, Charline MD	
COMMENTS: NONE QUERIES: NONE					
Test	Result	Flag	Reference		
CBC with Differential and Platelets					
Hgb	12		13.5-17 g/dL		
Hct	40%		40-45%		
RBC	5.5		4.6-6.0 X10 ¹² /L		
WBC	10.9	H	4.0-10.5X10 ³ /uL		
Lymphs	29		14-46%		
Neutrophils	62		40-74%		
Lymphocytes (ALC)	2.0		0.7-4.5X10 ³ /uL		
Neutrophils (ANC)	4.3		1.8-7.8X10 ³ /uL		
Monocytes	6		4-6%		
Eosinophils	2		0-7%		
Basophils	0		0-3%		
Platelet Count	0.2		0.15-0.4 X10 ¹² /L		

Appendix G

Questions for Student Course Evaluation

1. The peer-led simulation helped me understand new nursing concepts.
5-Strongly Agree 4-Agree 3- Neither Agree or Disagree 2- Disagree
1-Strongly Disagree
2. The peer-led simulation helped me apply critical thinking skills.
5-Strongly Agree 4-Agree 3- Neither Agree or Disagree 2- Disagree
1-Strongly Disagree
3. The lecture videos helped me be more prepared to participate in class
discussion and learning activities.
5-Strongly Agree 4-Agree 3- Neither Agree or Disagree 2- Disagree
1-Strongly Disagree

Appendix H

Faculty Small Group Guided Discussion Forum

1. What are some of the perceived faculty and student benefits from the implementation of the flipped classroom model with a peer-led simulation?
2. What are some of the challenges faculty and students experienced during the implementation of the flipped classroom model with a peer-led simulation?
3. What effect did the flipped classroom model with a peer-led simulation have on class participation and/or student preparedness?
4. What recommendations or suggestions do faculty have for future implementation of the flipped classroom model using a peer-led simulation in this or other nursing courses?

Appendix I

Cognitive Pre-and Post-Test Scores

Topic	Wound Care		Urinary		Pain Management		Medication Administration		Medication Administration	
	Pre-Test 1	Post-Test 1	Pre-Test 2	Post-Test 2	Pre-Test 3	Post-Test 3	Pre-Test 4	Post-Test 4	Pre-Test 5	Post-Test 5
1	50	40	80	80	70	70	50	40	25	85
2	40	60	60	70	70	20	60	60	20	85
3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	50	30	70	90	80	60	50	80	40	80
5	50	60	60	100	20	80	50	30	30	85
6	70	70	90	90	100	60	40	50	20	85
7	80	60	70	60	80	80	50	50	N/A	N/A
8	50	50	60	70	80	50	60	80	55	95
9	80	70	70	90	70	70	60	60	45	85
10	60	50	80	70	80	80	50	40	N/A	N/A
11	70	60	90	90	80	60	30	50	45	75
12	60	60	70	70	80	80	70	50	50	85
13	60	70	80	50	80	80	60	60	50	85
14	80	60	60	80	70	80	90	60	45	85
15	60	90	80	80	100	70	50	50	N/A	N/A
16	70	80	80	90	80	80	70	90	60	100
17	50	40	90	90	100	80	50	70	55	85
18	90	100	90	100	100	80	90	70	55	100
19	50	50	60	70	60	50	40	40	15	75
20	N/A	N/A	N/A	N/A	100	70	60	70	N/A	N/A
21	80	80	80	90	100	70	50	70	60	80
22	60	50	50	60	100	60	60	40	15	80
23	40	70	70	80	60	100	50	50	60	80
24	70	80	50	60	70	60	60	60	60	70
Avg	62.61	62.17	72.17	78.26	78.75	70.42	56.25	57.08	42.75	84.25
Min	40	30	50	50	20	20	30	30	15	70
Max	90	100	90	100	100	100	90	90	60	100

Appendix J

Results of Watson Glaser Critical Thinking Assessment II

Student	Pre-Test WGCTA II Form D Raw Scores (% Score)		Post-Test WGCTA II Form E Raw Scores (%Score)		Percent Score Change +/-	
	Raw Score	% Score	Raw Score	% Score	Change	% Change
1	23	58%	33	83%	+25	
2	31	77%	36	90%	+13	
3	22	55%	25	63%	+8	
4	26	65%	27	68%	+3	
5	24	60%	26	65%	+5	
6	24	60%	23	58%		-2
7	31	78%	32	80%	+2	
8	16	40%	27	68%	+28	
9	18	45%	17	43%		-2
10	16	40%	33	83%	+43	
11	21	53%	18	45%		-8
12	16	40%	27	68%	+28	
13	24	60%	26	65%	+5	
14	17	43%	16	40%		-3
15	20	50%	20	50%	0	0
16	21	53%	27	68%	+15	
17	18	45%	24	60%	+15	
Average	21.42	54%	25.38	63%	+16	-4

* Note: According to the Watson-Glaser TMII Critical Thinking Appraisal Technical Manual and User's Guide Form D and Form E are equivalent.