

EVALUATING THE EFFECTIVENESS OF TWO TEACHING STRATEGIES TO IMPROVE
NURSING STUDENTS KNOWLEDGE, SKILLS, AND ATTITUDES IN QUALITY
IMPROVEMENT AND PATIENT SAFETY

by

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ABSTRACT

In 1999, the Institute of Medicine published a report *To Err Is Human: Building a Safer Health System*, which found that 44,000-98,000 people die as a result of preventable medical errors each year. Following this report in 2005, the Quality and Safety for Nurses (QSEN) project was established which defined a set of six core competencies that all nursing students should possess at graduation. Since the IOM report and the establishment of QSEN, nurse educators have been challenged with discovering effective teaching strategies to infuse the QSEN competencies into the nursing curricula. The purpose of the quantitative, pretest/post-test control group design study was to examine at the effectiveness of two teaching strategies, online modules in conjunction with a flipped classroom discussion seminar (experimental group) versus online modules only (control group), on baccalaureate-nursing students' knowledge, skills, and attitudes of the quality improvement (QI) and safety QSEN competencies. The online modules utilized in the study were developed by a group of experts through the Institute of Healthcare Improvement (IHI). Data were collected and analyzed using a sample of 64 senior baccalaureate-nursing students from one university in the southeastern United States that completed a web-based pre-test and post-test instrument with items adapted from two existing tools measuring QSEN competences. Two MANOVA analysis used to examine group differences demonstrated a statistically significant similar omnibus effect ($p=.028$) between the experimental group and the control group for knowledge, comfort of skills, and attitudes. A MANOVA examining group

differences between the experimental group and the control group on knowledge, comfort with skills, and attitudes of patient safety was not statistically significant ($p=.59$).

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CHAPTER I: INTRODUCTION

According to the landmark report published in 1999, *To Err is Human: Building a Safer Health System*, by the Institute of Medicine (IOM), an estimated 44,000 to 98,000 people die in hospitals each year as a result of preventable medical errors (Kohn, Corrigan, & Donaldson, 2000). The findings of this report created a shock-wave in the health care community and recommendations were made for sweeping changes to occur at all levels of the medical field. A series of reports followed this study. The third report in this series, *Health Professions Education: A Bridge to Quality* (Greiner & Knebel, 2003) recommended “All health professionals should be educated to deliver patient-centered care as members of an interdisciplinary team, emphasizing evidence-based practice, quality improvement approaches, and informatics” (p. 45). In 2005, the Robert Wood Johnson Foundation (RWJF) funded a study to support educating nurses on patient safety and healthcare quality. This multiple phase project was named Quality and Safety Education for Nurses (QSEN). QSEN was developed in response to the series of reports published by the Institute of Medicine (IOM) on the quality of healthcare in America.

During Phases I and II of the QSEN project, six competencies for nursing students were established based on the *Health Professions Education* (2003) report. They were 1) patient centered care; 2) evidence-based practice; 3) teamwork and collaboration; 4) quality improvement (QI); 5) safety; and 6) informatics (Cronenwett et al., 2007). Each of the six competencies was further developed to include a definition and a set of knowledge, skills, and

attitudes. The purpose of Phase III of the QSEN project was aimed to assist faculty 1) to develop expertise in teaching the quality and safety competencies; 2) to integrate the competencies in textbooks, licensing and accreditation standards; and 3) to promote innovation in teaching the competencies (Sherwood & Barnsteiner, 2012). Self-development modules were offered to faculty on the QSEN website, a platform was developed to allow for the sharing of innovative teaching strategies, and nine conferences were held across the country to promote train-the-trainer opportunities for faculty. Yet, at the end of Phase III, it was found that there was still a large group of faculty who had never heard of the QSEN competencies (Sherwood & Barnsteiner, 2012).

Sullivan, Hirst, and Cronenwett (2009) conducted a pilot study using the QSEN Student Evaluation Survey (SES) to assess students' self-reported preparedness to meet the knowledge, skills, and attitudes of the six QSEN competencies. In this study, students reported feeling the least prepared to perform skills in the areas of evidence-based practice and QI including using QI tools to evaluate effects of practice changes. Mansour (2012) conducted a review of the literature to examine current evidence of how student nurses and nursing faculty members perceive that patient safety education is being integrated into undergraduate nursing programs. The results of this literature review showed nursing curricula 1) continue to lack patient safety training; 2) that there is a mismatch between students perceptions and educators conceptualization of patient safety; and 3) there is a continuing lack of research on patient safety education in undergraduate nursing programs (Mansour, 2012). Barriers to implementing the QSEN competencies include a growing faculty shortage, continued need for faculty development in the competency areas, and already full curriculums (Chenot & Daniel, 2010).

Purpose of the Study

The purpose of this pretest-posttest control group design study was to evaluate the effectiveness of two teaching strategies, online modules only versus online modules in conjunction with a flipped classroom discussion seminar on nursing students' knowledge, skills, and attitudes about QI and patient safety.

Significance of the Study

The findings from the present study have the potential to inform nurse educators about effective teaching strategies that can be used to deliver critical content regarding QSEN competencies to undergraduate nursing students.

Teaching Strategies

Online Learning

The use of technology is one method faculty can use to integrate the QSEN competencies into the curricula. Online learning has been shown to be an effective means of engaging students, and allowing students to learn at their own pace (Bromley, 2010). Online learning tends to meet the needs of the adult learner and uses active learner centered teaching strategies. Online courses are often offered in an asynchronous format allowing students flexibility to work at their own pace at a time that is convenient (Keramidas, 2012). Research has shown active learning strategies help students to become more engaged in the learning process, enhances student metacognition, and promotes students' critical thinking (Jensen, Meyer, & Sternberger 2009; Popkess & McDaniel, 2011). However, one barrier to the use of online learning as a teaching strategy is testing the effectiveness of the students' learning. According to Kala, Isaramaliai, and Pothong (2010), the use of technology alone will not guarantee that students have the learning outcomes desired. One disadvantage of online learning

is students may acquire facts through the use of an online module, but there is concern that students may not be able to transfer the knowledge into the clinical setting (Bromley, 2010).

Flipped Classroom

In the flipped learning model teachers use technology to shift direct, or knowledge level learning outside of the classroom through the use of video lectures (Hamdan, McKnight, McKnight, & Arfstrom, 2013). Students access the video asynchronously and thus come to class prepared with basic knowledge of the content allowing the teacher to spend class time helping students to synthesis, analyze, apply, and evaluate the information learned online (Gullen & Zimmerman, 2013; Hamdan, McKnight, McKnight, & Arfstrom, 2013; Horn, 2013; Sams & Bergmann, 2013). Although research evidence on flipped classrooms is still evolving, current research has shown that students in a flipped classroom are more engaged, classroom discussions are more focused, students have more opportunity for self-paced learning opportunities, and teachers are able to give more personalized guidance to students (Goodwin & Miller, 2013; Millard, 2012).

Discussion Seminar

Guided discussion and group work have been shown to help students become more actively engaged while increasing their problem solving and critical thinking skills (Stevens & Brenner, 2009). Using seminar as pedagogy lends itself to an active learning environment allowing students to become engaged with content, provides for cooperative learning, allows students to practice collaboration with peers, and facilitates comprehension and application of concepts (Billings & Halstead, 2009). According to Browning (2012), students who present to fellow classmates have the ability to apply their knowledge, and preparing for the presentation requires students to think critically. Bonwell (2000) reported the following seven major characteristics associated with active learning: 1) students are involved in more than passive

listening; 2) students are engaged in activities (e.g., reading, discussing, and writing); 3) there is less emphasis placed on information transmission and greater emphasis placed on developing student's skills; 4) there is greater emphasis placed on exploration of attitudes and values; 5) student motivation is increased (especially for adult learners); 6) students can receive immediate feedback from their instructor; 7) students are involved in higher order thinking (analysis, synthesis, and evaluation) (p. 2).

Conceptual Framework

In 2003 the IOM published a report on *Health Professions Education* stating health education was in need of reform and all graduates should be educated to deliver patient-centered care, to be prepared to work on interdisciplinary teams, and to be able to utilize evidence-based practice, quality improvement approaches, and informatics (Greiner & Knebel 2003). Cronenwett et al. (2007) adapted the IOM competencies and developed a conceptual framework called the Quality and Safety Education for Nurses (QSEN). The purpose of the QSEN framework was to facilitate changes in nursing education. The following six core competencies are incorporated into the QSEN framework: 1) patient-centered care; 2) teamwork and collaboration; 3) evidence-based practice; 4) quality improvement (QI); 5) safety; and 6) informatics. Each competency was given a definition that was then shared with the nursing community. It was the goal of the QSEN team that these competencies, with their definitions, be used to guide changes in nursing curriculum development. The QSEN team found that the competency names and definitions needed further clarification. Each competency was further outlined with the knowledge, skills, and attitudes (KSAs) for pre-licensure nursing education (Cronenwett et al., 2007). The QSEN QI and safety competencies were used as the conceptual framework for this study. These two competencies with their definitions and KSAs can be found

in Appendix A. A further discussion on the development of the QSEN-based conceptual framework follows.

Quality and Safety Education for Nurses (QSEN)

Phase I. In 2005, the Robert Wood Johnson Foundation (RWJF) funded a national study to look at how to best educate nursing students on patient safety and healthcare quality. A \$590,000 grant was awarded to the University of North Carolina at Chapel Hill School of Nursing. The grant was used to launch a multi-phase project, Quality and Safety Education for Nurses (QSEN), in October 2005. During Phase I, 17 national nursing leaders were brought together to develop the quality and safety competencies that make up the QSEN framework: patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics. The team then worked to determine the knowledge, skills and attitudes of the six areas that pre-licensure nursing students should master (QSEN Press Release, 2005).

Phase II. Phase II of the project ran between April 2007 and October 2008. In 2007 the RWJF awarded PI Linda Cronenwett at the University of North Carolina at Chapel Hill \$1,094,477 to continue work on the QSEN project that had begun in Phase I. Phase II was used for generating and sharing of ideas between organizations that set standards for licensure, certification, and accreditation for graduate education and to formulate learning objectives for the six QSEN competencies. Fifteen pilot schools were selected to engage in making curricular changes that would incorporate the quality and safety competencies into undergraduate nursing courses. During Phase II, 40 QSEN faculty members were recruited to consult with nursing programs across the country on how to incorporate the QSEN competencies into the curriculum. A survey was conducted on nursing colleges to determine to what extent the competencies were

already in place, if faculty members were sufficiently prepared to teach the competencies, and how well nursing students were learning the competencies (QSEN Press Release, 2009).

Phase III. Phase III of the QSEN project ran between November 2008 and November 2011. During this phase the RWJF awarded two institutions, The American Association of Colleges of Nursing (AACN) and the University of North Carolina School Of Nursing a \$4.25 million grant to continue the work on QSEN that had begun in Phase I and II. The goals of Phase III were to help faculty develop expertise on how to teach the six QSEN competencies, to incorporate the QSEN competencies into textbooks, licensing, and accreditation and certification standards; and to promote continued innovation in teaching the competencies (QSEN Press Release, 2009).

Quality Improvement Competency (QI)

As defined by QSEN, QI is the ability “to use data to monitor the outcomes of care processes and use improvement methods to design and test changes to continuously improve the quality and safety of health care systems” (QSEN KSA’s [QI], 2013, Table 4). The goal of quality improvement is for patients to receive the correct care. Nursing encompasses the largest percentage of healthcare workers in the United States (US); therefore, nurses play a key role in improving health care quality. However, this has not been the case over the last 50 years (Sherwood & Barnsteiner, 2012). Before nurses can improve the care given, they must first evaluate how well they are doing. The collection of data is key to improving the quality of care. According to Barnstiner and Sherwood (2012), “it is essential that nurses be taught a systematic process of defining problems, identifying potential causes of those problems, and methods for testing possible solutions to improve care” (p. 113). The QSEN competency for QI lists the

proposed target KSAs that should be developed in pre-licensure nursing students. For a full listing of the QI KSAs, see Appendix A.

The knowledge competency encompasses (a) learning about outcomes of care, (b) being able to recognize the nurse as a part of a system of care that affects outcomes of patients, (c) being able to explain the importance of variation in measurement in assessing quality of care, and (d) being able to describe approaches for changing process (QSEN KSAs [QI], 2013).

The skill competency encompasses (a) learning how to seek information about outcomes of care and quality improvement projects in the care setting, (b) how to use tools, such as flow charts, cause and effect diagrams, control charts, and run charts to help understand variation, (c) learning to participate in a root cause analysis of a sentinel event, and (d) learning to use quality measures to understand performance. In addition, nurses must learn to design a small test of change in daily work using a method such as *Plan-Do-Study-Act*, and then utilize appropriate measures to evaluate the effect of change (QSEN KSAs [QI], 2013).

The attitudes competency encompasses (a) learning how to appreciate that continuous quality improvement is an essential part of daily work, (b) to value one's own and others contributions to outcomes in the care setting, (c) learn to appreciate how unwanted variations affect care, (d) to value the importance of measurement, and (e) to value and appreciate how individuals and teams can improve care (QSEN KSAs [QI], 2013).

Safety Competency

As defined by QSEN, safety “minimizes risk of harm to patients and providers through both system effectiveness and individual performance” (QSEN KSAs [Safety], 2013, Table 5). According to Sherwood and Barnsteiner (2012), to provide safe effective care the nurse needs to possess an understanding of “the complexity of care delivery, the limits of human factors, safety

design principles, characteristics of high-reliability organizations, and patient safety resources” (p. 394). A common framework related to patient safety is Reason's Adverse Event Trajectory, also known as “the Swiss Cheese Model.” The premise behind the Swiss cheese model is that, only when a series of holes ‘line up,’ can an accident trajectory pass through the defenses to cause harm to people, assets, and the environment. The holes arise from unsafe acts (usually short-lived windows of opportunity) and latent conditions (Reason, 2008, p. 101). It is important for students to learn and understand how nurses contribute to safe patient care (Sherwood & Barnsteiner, 2012). The QSEN competency for safety lists the proposed targeted KSAs that should be developed in pre-licensure nursing students. For a full listing of the safety, KSAs, see Appendix B.

The knowledge safety competency encompasses (a) learning to examine human factors and other basic safety design principles as well as commonly used unsafe practices (such as, work-arounds and dangerous abbreviations, (b) the benefits and limitations of safety enhancing technology such as barcodes, medications pumps, and computer order entry, (c) learning to delineate general categories of errors and hazards in care, (d) describe factors that create a culture of safety, (e) and describe processes used in understanding causes of error and allocation, such as root cause analysis and failure mode effects (Pre-licensure KSA [Safety], 2013, Table 5).

The skills safety competency encompasses (a) learning to participate as a team member, (b) being able to model effective use of technology to support safety and quality (c) learning how to participate as a team member, (d) to design, promote, and model effective strategies to reduce risk of harm to self and other, (e) to use organizational error reporting systems for near miss and error reporting, (f) to promote a practice that is conducive to highly reliable processes built on human factors research, (g) to engage in root cause analysis rather than blaming individuals

when errors or near misses occur, and (h) to use strategies to reduce reliance on memory such as forcing functions and check lists (Pre-licensure KSA [Safety], 2013, Table 5).

The attitudes competency encompasses (a) learning to value the contributions of standardization and reliability to safety, (b) to appreciate the cognitive and physical demands of human performance, (c) to value their own role in reporting and preventing errors, while valuing approaches to prevent blaming individuals, and (d) value the use of an organizational error reporting system (Pre-licensure KSA [Safety], 2013, Table 5).

Research Questions

The following research questions reflected the QSEN based conceptual model by focusing on the student outcomes of knowledge, skill, and attitudes around QI and patient safety.

They included the following:

1. Is there a significant difference in pre-licensure nursing students' knowledge of quality improvement as measured by test scores based on type of educational program on quality improvement (online module in conjunction with a flipped classroom discussion seminar vs. online modules only);
2. Is there a significant difference in pre-licensure nursing students' knowledge of patient safety as measured by test scores based on type of educational program on patient safety (online module in conjunction with a flipped classroom discussion seminar vs. online modules only);
3. Is there a significant difference in pre-licensure nursing students' attitudes about quality improvement as measured by self-reported attitude scores based on type of educational program on quality improvement (online module in conjunction with a flipped classroom discussion seminar vs. online modules only);

4. Is there a significant difference in pre-licensure nursing students' attitudes about patient safety as measured by self-reported attitude scores based on type of educational program on patient safety (online module in conjunction with a flipped discussion classroom seminar vs. online modules only);
5. Is there a significant difference in pre-licensure nursing students' comfort with skills of quality improvement as measured by self-reported skill scores based on type of educational program on quality improvement (online module in conjunction with a flipped classroom discussion seminar vs. online modules only); and
6. Is there a significant difference in pre-licensure nursing students' comfort with skills of patient safety as measured by self-reported skill scores based on type of educational program on patient safety (online module in conjunction with a flipped classroom discussion seminar vs. online modules only)?

Operational Definitions

Quality Improvement: Utilize data to monitor the outcomes of care processes and use improvement methods to design and test changes to continuously improve the quality and safety of health care systems (QSEN KSAs [QI], 2013, Table 4).

Safety: Minimizes risk of harm to patients and minimized through both system effectiveness and individual performance (Pre-licensure KSA [Safety], 2013, Table 5).

Knowledge: Facts or ideas acquired by study, investigation, observation or experience (Knowledge, 2013).

Skill: Ability to use one's knowledge effectively and readily in execution of performance (Skill, 2013).

Attitude: A feeling or emotion toward a fact or state (Attitude, 2013).

Online Learning Program: Organized offering of courses delivered primarily over the internet (International Association for K-12 Online Learning [iNACOL], 2011, p. 7).

Flipped Classroom: A hybrid approach to learning, using technology to move the classroom lecture to "homework" status and using face-to-face time for interactive learning (Missildine, Fountain, Summers, & Gosselin, 2013, p. 598).

Asynchronous learning: Communication exchanges which occurs at elapsed time between two or more people (iNACOL, 2011, p. 3).

Synchronous learning: Online learning where participants interact at the same time in the same space (iNACOL, 2011, p. 9).

Active Learning: Anything that involves students in doing things and thinking about the things they are doing (Bonwell, 2000, p. 2).

Summary

Nursing schools are being challenged with incorporating quality and safety competencies into already crowded curricula. Yet, at the end of Phase III of the QSEN project it was found there was still a large group of faculty who had never heard of the QSEN competencies (Sherwood & Barnsteiner, 2012, p. 59). Two barriers to implementing the QSEN competencies include a growing faculty shortage and continued need for faculty development in the competency areas (Chenot & Daniel, 2010).

The purpose of this pretest-posttest control group study was to evaluate the effectiveness of two teaching strategies, online modules only versus online modules in conjunction with flipped classroom seminar, on nursing students' knowledge, skill, and attitudes about patient

safety and QI. This study has the potential to provide information on effective ways to teach QSEN content to undergraduate nurses.

CHAPTER II:

REVIEW OF THE LITERATURE

This chapter presents an overview of a review of the literature pertinent to this study. The primary concepts addressed in this literature review are, QSEN, QI, patient safety, flipped classroom, online learning pedagogies, and discussion seminars. The literature review was completed using the following databases: CINAHL, Medline, ProQuest Nursing & Allied Health Source, Pub-Med, H.W. Wilson, and E.R.I.C. The following key words were used including QSEN, quality improvement, patient safety, nursing curriculum, online learning, flipped learning, the inverted classroom, and seminar.

Errors in Healthcare

The IOM published a report in 1999 entitled *To Err Is Human: Building A Safer Health System* (Kohn, Corigan, & Donaldson, 1999). This report looked at quality and safety issues in hospitals in the United States and found that 44,000-98,000 people die each year as a result of preventable medical errors. (Kohn, Corigan, & Donaldson, 1999). “An error is defined as the failure of a planned action to be completed as intended (i.e., error of execution) or the use of a wrong plan to achieve an aim (i.e., error of planning)” (Kohn et al., 1999, p. 28). The number of deaths attributed to preventable errors exceeded the number of deaths caused by motor vehicle accidents, breast cancer, and AIDS (Kohn et al., 1999). Most errors are not the result of individual healthcare providers but are the result of a failure of faulty systems and processes (Kohn et al., 1999). The findings of this report created a stir in the medical community and recommendations were made for sweeping changes to occur at all levels of the healthcare field.

Following *Too Err Is Human* a series of reports were released calling for reform of the healthcare system. These reports and their findings are outlined in Table 1.

Table 1

Summary of the Institute of Medicine Quality Chasm Series

Year	Report	Findings
2001	<i>Crossing the Quality Chasm: A New Health System for the 21st Century</i>	Safe, Timely, Effective, Efficient, Equitable, and Patient Centered Care (STEEEP)
2003	<i>Health Professions Education: A Bridge to Quality</i>	5 Competencies essential for all healthcare professionals: Patient-Centered Care Teamwork and Collaboration Evidence-Based Practice Quality Improvement & Safety Informatics
2004	<i>Keeping Patients Safe: Transforming the Work Environment for Nurses</i>	Links nurses and their work environment with patient safety and quality care
2006	<i>Identifying and Preventing Medication Errors</i>	Medication errors make up 3-4% of serious medical errors. Report gives a national agenda to prevent medication errors.

(Sherwood & Barnsteiner, 2012)

All of these reports call for healthcare reform and a need for health care professionals to re-evaluate what is being taught in healthcare preparation programs.

Health Professions Education Report

The Health Professions Education: A Bridge to Quality (2003) report concluded that healthcare education has not kept current with health care needs. The committee recommended an overarching vision for healthcare education programs: “All health professionals should be educated to deliver patient-centered care as members of an interdisciplinary team, emphasizing

evidence-based practice, quality improvement approaches, and informatics” (Greiner & Knebel, 2003, p. 45). The committee on the health professions summit (2003) established five core competencies that all healthcare providers should possess, regardless of their discipline: 1) patient centered care, 2) teamwork, 3) evidence based-practice, 4) quality improvement, and 5) informatics (Greiner & Knebel, 2003). Establishing the competencies was only the first step. The committee recommended that each competency be further developed with a set of knowledge, skills, and attitudes, and that an assessment tool with outcomes be established.

Quality and Safety Education for Nurses (QSEN)

The QSEN project was the result of a series of annual weeklong summer conferences, held at Dartmouth between 2000 and 2005. Each year a group of 60-70 participants were invited to attend, 12 to 20 whom were nurses. During the conferences the participants worked as “an interprofessional team of educators devoted to building knowledge for leading improvement in health care” (Cronenwett, 2012, p. 50) During this same time period Linda Cronenwett, Dean of the College of Nursing at the University of North Carolina at Chapel Hill, who was invited regularly to attend the Dartmouth summer conferences, began sowing seeds with the RWJF for an initiative to improve quality and safety education in nursing. Between the years 2002-2004, as the idea began to take shape, a decision was made that any initiative to promote quality and safety education for nurses needed to support all nursing education programs including diploma, associate, and baccalaureate degree programs. Therefore, a decision was made that any grant should be held in a neutral site. A proposal was submitted to the RWJF in 2004 from The University of North Carolina at Chapel Hill (Cronenwett, 2012). The RWJF suggested that the project be broken down into several pieces. As the project progressed a team of experts was formed, which consisted of a group of individuals that could make strong contributions to each

competency, offer pedagogical expertise, or represented the major nursing organizations associated with accreditation and licensure (Cronenwett, 2012).

Phase I

In 2005, the RWJF funded the QSEN project. A grant for \$590,000 was awarded to the University of North Carolina at Chapel Hill School of Nursing (Brown, Feller, & Benedict, 2010; Phase 1/ QSEN, 2005). Phase I of the project was conducted from October 2005 to March 2007. During this phase, the group of experts adapted the five IOM competencies: 1) patient centered care, 2) teamwork and collaboration, 3) evidence-based practice (EBP), 4) quality improvement (QI), and 5) informatics; and added a sixth competency, 6) safety, for all registered nurses (Barnsteiner et al., 2013; Cronenwett et al., 2007; Sullivan, 2010). With a need to develop hundreds of community college, diploma, and university-based nursing faculty, the goal of the QSEN team was to support and help faculty in the easiest way possible to teach quality and safety education (Cronenwett, 2012). The team developed a definition for each of the six competencies and further developed a set of knowledge, skills, and attitudes (KSAs) that should be developed during prelicensure nursing education programs (Barnsteiner et al., 2013; Cronenwett et al., 2007; Sullivan, 2010). At the end of phase one several national presentations, publications, and a QSEN website had been launched all aimed at sharing the QSEN competencies (Cronenwett, 2012).

Phase II

Phase II of the QSEN project was conducted from April 2007 to October 2008. During Phase II the principle investigator, Cronenwett, received a grant from the RWJF for \$1,094,477 to continue the work of QSEN began in Phase I (Phase II, QSEN, 2007). The objective of phase II was to begin to develop KSAs for graduate education and to widen the network of QSEN

experts by attracting pre-licensure faculty to develop, test, and disseminate teaching strategies for the QSEN competencies (Barnsteiner et al., 2013; Cronenwett, 2012; Sullivan, 2010). During Phase II, 15 pilot schools of nursing representing baccalaureate, associate, and diploma education participated in a learning collaborative that focused on the integration of the six QSEN competencies into their specific curricula (Barnsteiner et al., 2013; Bertch, 2012; Cronenwett, Sherwood, & Gelman, 2009). Each of the 15 schools that participated in the 18 month collaborative was awarded a \$25,000 grant from the RWJF, selected three member project teams to participate in two conferences, and provided access to students for a survey (Cronenwett et al., 2009). During the collaborative 28 teaching strategies were peer reviewed and shared on the QSEN website. Team members' work was presented at more than 15 conferences (Cronenwett et al., 2009).

QSEN Student Evaluation Survey (SES). Part of the learning collaborative was an evaluation of the graduating student's perceptions of quality and safety content along with the competencies and KSAs in their nursing programs. For the purposes of evaluation, the QSEN student evaluation survey (SES) was created and administered to eligible students at the 15 QSEN pilot schools and two additional baccalaureate nursing programs (17 schools total) (Sullivan, Hirst, & Cronenwett, 2009). The survey was distributed to 1,665 students; a total of 575 students completed the survey for a 35% response rate. Due to exclusion criteria the final sample was $n=565$.

Under the knowledge content area, the most frequently identified content included in students' curriculum were patient-centered care, safety, and evidence-based practice and the least frequently included were quality improvement and teamwork and collaboration (Sullivan et al., 2009). Regarding skills content, students felt most prepared in skills related to patient-centered

care and informatics and least prepared in skills related to evidence based practice and quality improvement (Sullivan et al., 2009). Under the attitude content area the items receiving the lowest ratings of importance were the use of quality improvement tools such as flow charts, cause/effect diagrams, ability to locate evidence reports related to clinical practice topics and guidelines, and ability to evaluate practice changes using quality improvement methods and measures (Sullivan et al., 2009). In conclusion of this student survey, Sullivan et al. (2009) found that the level of inclusion of the six QSEN competencies varied among schools, but the quality improvement competency was consistently cited as the lowest perceived skill and perceived as the lowest importance, which is in conflict with the contemporary practice environment (Sullivan et al., 2009).

Phase III

Phase III of the QSEN project was conducted between November 2008 and January 2012. In 2008 the University of North Carolina at Chapel Hill received a grant from the RWJF for \$1.8 million dollars to continue the QSEN work that had begun in Phase I and II. The goals of Phase III were to continue to develop and evaluate methods to elicit and assess student learning of the KSAs for each of the six QSEN competencies and to develop faculty expertise necessary to assist with student learning and assessment (Barnsteiner et al., 2013).

In 2008, the AACN was awarded \$2.45 million from the RWJF to support faculty development to teach the QSEN competencies (*QSEN Press Release*, 2009). The AACN conducted eight train-the-trainer two and half day QSEN Institutes for faculty in pre-licensure nursing programs between January 2010 and November 2011. A total of 662 (38.6%) pre-licensure programs attended at least one of the institutes. All states except Vermont were represented (Barnsteiner et al., 2013). The grant from RWJF paid for the expense for two faculty

members from each school to attend the institute. The purpose of having two members from each institution was to provide support to each other to help make curriculum changes in their respective institutions (Barnsteiner et al., 2013).

After the first two institutes the AACN began to collect pre-institute data from each school prior to faculty attending the institute. The pre-institute data helped the AACN to establish benchmark data on the extent to which the QSEN competencies and KSA's were being integrated into each school curriculum (Barnsteiner et al., 2013). A post-institute survey was administered at one year and two years after attendance at one of the eight institutes. The results from the post-institute surveys demonstrated there is a continued need to support faculty with integration of quality and safety content for all six QSEN competencies across the curriculum. Overall nursing schools need to continue to integrate more content on working effectively as a team member, place more emphasis on informatics and the QI competencies, focus more attention on how to effectively analyze errors, while moving away from the “shame and blame” approach. Emphasis should be placed on helping students understand the complexity of healthcare systems impact on quality and safety (Barnsteiner et al., 2013).

Current Assessment of Quality and Safety Education

The Essentials of Baccalaureate Education (2008)

The *Essentials of Baccalaureate Education* (2008) provides a framework for the preparation of professional nurses and describes the expected outcomes for graduates of baccalaureate nursing programs (American Association of Colleges of Nursing [AACN], 2008). Following the IOM's recommendations for core knowledge needed for all healthcare professionals, and reports from several other healthcare agencies, *The Essentials of Baccalaureate Education*, were revised in 2008. The new essentials document emphasizes the

concepts of patient-centered care, ability to work in interprofessional teams, evidence-based practice, quality improvement, patient safety and informatics. These six concepts demonstrate an alignment with the six QSEN competencies. The nine baccalaureate essentials delineate the expected outcomes for graduates from all baccalaureate-nursing programs accredited by AACN (AACN, 2008). Essentials II, III, IV, and VI address inclusion of the QSEN competencies into pre-licensure baccalaureate curriculum. They are defined as follows:

1. Essential II: Basic Organizational and Systems Leadership for Quality Care and Patient Safety: Knowledge and skills in leadership, quality improvement, and patient safety are necessary to provide high quality health care;
2. Essential III: Scholarship for Evidence Based Practice: Professional nursing practice is grounded in the translation of current evidence into one's practice;
3. Essential IV: Information Managements and Application of Patient Care Technology: Knowledge and skills in information management and patient care technology are critical in the delivery of quality patient care; and
4. Essential VI: Interprofessional Communication and Collaboration for Improving Patient Health Outcomes: Communication and collaboration among healthcare professionals are critical to delivering high quality and safe patient care (AACN, 2008, p. 3).

Educational Needs Assessment for Improving Patient Safety

Nurses play an important role both in QI and patient safety efforts that lead to safer outcomes for patients. The IOM and other institutions with graduating nurses who have a beginning level in QI and patient safety methodology are challenging colleges of nursing. In 2002, the National Patient Safety Foundation (NPSF) conducted a two phase needs assessment of

physicians and nurses to explore both groups' experiences with error in medicine, and to better understand their attitudes toward and knowledge of patient safety (VanGeest & Cummins, 2003). The first phase of the study conducted independent focus groups of nurses and physicians, and the second phase conducted self-administered mailed surveys. For the purpose of this study only the results of the nurses' assessment will be discussed.

The nurses' focus groups included "a student nurse, deans of nursing schools, nurse educator, researcher, doctoral candidates, a surgical nurse, risk managers, and a nurse attorney" (VanGeest & Cummins, 2003, p. 13). For the self-administered mail surveys, a random sample of 1,200 nurses was selected from the American Nursing Association. A total of 386 nurses responded with a 34% response rate (Smith, Cronenwett, & Sherwood, 2007; VanGeest & Cummins, 2003). In the survey, over 95% of the nurses surveyed identified patient safety as an important issue in healthcare (VanGeest & Cummins, 2003). The focus groups also identified patient safety as an important issue, but felt that it was a systems issue, whereas only 49% of survey respondents found patient safety could be best addressed at systems level (VanGeest & Cummins, 2003). The focus groups discussed "the code of silence" that permeates the healthcare environment due to the fear, humiliation, and the systems punitive nature that prevents healthcare workers from reporting errors. Although over 80% (83.1) of the nurses' surveyed indicated they had identified an error in care, only 35.2% indicated they have worked with a non-punitive system for error reporting or examination (VanGeest & Cummins, 2003).

A total of 94% of the nurses surveyed indicated an interest in education or training on patient safety. Both groups were asked to identify topics that should be included in a patient safety curriculum. Both groups identified topics on learning from mistakes, non-punitive environments and systems for reporting errors, ethical issues, and models for dealing with unsafe

practice (VanGeest & Cummins, 2003). The study concluded that efforts were needed to improve patient safety education, and felt this could be done through a systematic approach with a comprehensive curriculum. The NPSF planned to use the results of the study to develop a comprehensive web-based patient safety curriculum for physicians and nurses (VanGeest & Cummins, 2003).

Assessing Quality and Safety Competencies of Pre-Licensure Nursing Students

During Phase II of the QSEN project, a descriptive study was conducted using a survey method to assess how schools of nursing were incorporating the QSEN competencies (Smith, Cronenwett, & Sherwood, 2007; Mansour, 2012). Schools were asked to identify which QSEN competencies were already being taught, what pedagogical strategies were being used, and how well prepared faculty members felt to teach the QSEN competencies (Smith et al., 2007; Thornlow & McGuinn, 2010). Schools were also asked to gauge how satisfied they felt their students were meeting the QSEN competencies, and what types of resources faculty members needed to integrate the QSEN competencies into the curriculum. Results were obtained from 195 schools of nursing from a sample of 629 schools for a response rate of 32% (Smith et al., 2007). The sample consisted of 40% Associate Degree (ADN) and 30% from baccalaureate or higher degree programs (Smith et al., 2007). The study found that 95% of the schools surveyed believed faculty members had threaded the six QSEN competencies into their curriculum, and that their students were developing the desired competencies. Patient-centered care was the most frequently threaded competency (95%) followed by safety (89%), teamwork (82%), evidence based practice (73%), QI (54%), and informatics (48%) (Mansour, 2012; Smith et al., 2007). Additionally, the study reported that most faculty were comfortable with teaching the content.

The faculty did report that many needed improvement in incorporating informatics, QI, and evidence based practice (Smith, Cronenwett, & Sherwood, 2007).

At the same time the study was being conducted, the QSEN faculty and advisory board conducted focus groups with nursing education faculty to critique a draft of the KSAs that had been developed for each of the six QSEN competencies (Smith et al., 2007). The results of the focus groups as reported by Cronenwett et al. (2007) were noticeably different from the data obtained in the survey study. Focus groups results indicated that most faculty members did not fully understand the fundamental concepts of the KSAs, nor did they have the expertise to teach the content. It was reported that many of the KSA's were actually lacking from schools curriculum (Cronenwett et al., 2007).

Frameworks for Patient Safety in the Nursing Curriculum

Chenot and Daniel (2010) conducted an exploratory study to examine the current status of patient safety awareness among pre-licensure nursing students (Chenot & Daniel, 2010; Mansour, 2012). Chenot (2007) developed the Healthcare Professional Patient Safety Assessment Curriculum Survey (HPPSACS) which was adapted from the Patient Safety/Medical Fallibility Assessment Pre and Post curriculum Survey (Madigosky, Nelson, Cox, & Anderson, 2006). During Phase I the (HPPSACS) was distributed to 400 scholarly professional nurses who were randomly selected from a mailing list of a scholarly professional nursing organization. A total of 150 surveys were returned (38%) and responses were used to establish validity and reliability of the tool (Chenot, 2007; Chenot & Daniel, 2010; Mansour, 2012). Phase II consisted of distributing the survey to 618 students in seven universities. A total of 318 surveys were returned (51%), and the demographic variables were correlated with patient safety awareness variables among the participants (Chenot, 2007; Chenot & Daniel, 2010; Mansour, 2012). The

content analysis demonstrated that all of the seven participating universities included at least three of the six QSEN core competencies in their curriculum (Chenot, 2007; Chenot & Daniel, 2010; Mansour, 2012). This study was the first known research conducted on student's perceptions about their awareness, skills, and attitudes regarding patient safety (Chenot & Daniel, 2010; Mansour, 2012).

Faculty Development Needs

Nurse educators are crucial to threading and teaching QSEN competencies throughout the nursing curriculum. Yet, most nursing faculty members completed their “education prior to the emphasis on quality improvement (QI) processes, safety and error prevention techniques” (Sherwood & Drenkard, 2007, p. 154). It is also

widely acknowledged that faculty are professionals with a great deal of autonomy and that most have had little advance preparation for the pedagogical part of their work, the way in which individual faculty learn to teach has been studied as a type of on-the-job or experiential learning. (Chism, 2004, p. 39)

With many faculty members already feeling stressed due to the current faculty shortage, it is important to support faculty development in learning the QSEN competencies and give faculty members easy ways to incorporate the QSEN competencies into already full curricula.

The aim of Phase III of the QSEN project was to develop faculty members in the expertise needed to incorporate the QSEN competencies into curricula using a multimodal approach. Three national QSEN forums, sponsored by the UNC College of nursing, were held between 2010 and 2012. The goal of the QSEN conferences was to provide exposure of innovative curricula design and teaching strategies, and QSEN research to faculty leaders. The AACN hosted eight regional faculty development institutes during Phase III to help prepare faculty members from undergraduate nursing programs to teach quality and safety content (QSEN Overview, 2013). In 2013 the AACN launched six web-based learning modules focused

on the six QSEN core competencies to further disseminate the QSEN teaching strategies that began in Phase III of the QSEN project (AACN QSEN Modules, 2013).

Thornlow and McGuinn (2010) presented a compelling case for the urgent need for incorporating quality and safety content into undergraduate nursing curricula. Ten years after the IOM report, *Too Err is Human: Building a Safer Health Care System*, there remains a need for undergraduate nursing programs to strengthen quality and safety knowledge in their curriculum. One of the “first steps in obtaining this goal is to equip baccalaureate nursing faculty with the knowledge, skills, and abilities needed to teach these concepts” (Thornlow & McGuinn, 2010, p. 71; Smith et al., 2007). Thornlow and McGuinn (2010) highlighted specific competencies required by faculty in order to be prepared to teach quality and safety in the undergraduate curriculum, and further developed a framework of expected outcomes, sample content, student learning strategies, and faculty development strategies. Thornlow and McGuinn (2010) suggested that QI and safety learning should be active and many of the student learning strategies listed in their framework involve work-based experiences after students have received foundational content.

In 2009 the Gordon and Betty Moore Foundation awarded a grant to the AACN to develop a QSEN institute targeting nursing schools in the 10-county San Francisco Bay area (Disch & Barnsteiner, 2013). Over a three-year period a total of four QSEN institutes were held. In 2010 the institute hosted nursing faculty from 22 schools of nursing, eight Bachelor of Science degrees, and four associate degrees; the 2011-2012 institutes hosted faculty and clinical leaders; and the 2013 hosted clinical leaders only (Disch & Barnsteiner, 2013). In 2010 a pre-institute survey of the 22 schools was conducted to determine the extent of the QSEN content being taught in each school's curriculum. The results of the survey demonstrated (78.7%) included

safety content, (73.3%) included patient-centered care content, (62.06%) included teamwork and collaboration content, (51.87%) included evidence-based practice content, (46.3%) included informatics content, and (39.86%) included QI content (Disch & Barnsteiner, 2013). The attendees at the institute reported content taught was helpful in developing knowledge, skills, and buy-in that would help them make curriculum changes over the next two years. In April 2011 a post-institute survey was conducted of the 22 schools that had attended the QSEN institute to assess the progress in training faculty of integration of content across the curriculum, and to determine the number of students who had been exposed to the content (Disch & Barnsteiner, 2013). Results demonstrated that out of the 655 faculty members at 20 of the schools, 327 (50%) had been trained on the QSEN competencies (Disch & Barnsteiner, 2013). Out of the 3,906 students enrolled in the 22 programs, 3,173 (81%) had completed a course that incorporated QSEN content over the previous two years (Disch & Barnsteiner, 2013). The respondents to the survey indicated that on average 89% of the courses incorporated QSEN content. In April 2012, a second post-institute survey was conducted of the 22 schools who had attend the QSEN institute to assess the progress in training faculty of integration of content across the curriculum, and to determine the number of students who had been exposed to the content (Disch & Barnsteiner, 2013). Results demonstrated that out of the 777 faculty members at the 22 schools, 72% had been trained on the QSEN competencies (Disch & Barnsteiner, 2013). Out of the 3,978 students enrolled in the 22 programs, 3,506 (88%) had completed a course that incorporated QSEN content over the previous two years (Disch & Barnsteiner, 2013). The respondents to the survey indicated that on average 90% of the courses incorporated QSEN content. All 22 schools at a rate of 100% incorporated safety, teamwork and collaboration, and evidence-based practice;

informatics in 20 schools at 91%; and 18 schools (82%) had integrated patient-centered care and QI (Disch & Barnsteiner, 2013).

Incorporating and Measuring QSEN in the Undergraduate Curriculum

Several studies have looked at innovative ways to incorporate QSEN competencies into both the classroom and clinical setting. Instructional strategies include partnering with health care agencies, using case studies, dedicating an education unit to teach quality and safety in the clinical setting, designing and implementing a small scale QI project, incorporating QSEN competencies in the clinical evaluation tool, and redesigning courses using the QSEN competencies (Brady, 2011; Cronenwett, Sherwood, & Gelman, 2009; Durham & Sherwood, 2008; Fater & Ready, 2011; Hall, Moore, & Barnsteiner, 2008; McKown, & Webb, 2010; (McLennon, Friesth, & Lasiter, 2013; Murray, Douglas, Girdley, & Jarzernsky, 2010; Walsh, Jairath, Patterson, & Grandjean, 2010).

Other studies have looked at the best way to measure student's achievement and student's own perceptions and awareness of the KSAs related to the six QSEN competencies. Measurement strategies include a clinical evaluation tool that measures the QSEN competencies, the *QSEN Student Evaluation Survey* (SES), the *Patient Safety Attitudes, Skills, and Knowledge* tool (PS-ASK), the *Quality Improvement Knowledge, Skills and Attitudes* tool (QuISKA), and the *Healthcare Professionals Patient Safety Assessment and Curriculum Survey* (HPPSACS) (Chenot & Daniel, 2010; Dycus & McKeon, 2009; Schnall et al., 2008; Sullivan, Hirst, & Cronenwett, 2009; Walsh, Jairath, Patterson, & Grandjean, 2010). The HPPSACS study also examined the nursing curricula from seven institutions and found that all schools included at least three of the six QSEN competencies, but only one of the seven schools included all six (Chenot & Daniel, 2010). Additionally, the pilot test of the SES surveyed 565 graduating nursing

students from 17 nursing schools. The study found that the highest percentage of students surveyed believed that topics of quality improvement, teamwork and collaboration were the topics students perceived as least addressed of the six QSEN competencies in their curriculums (Sullivan et al., 2009).

Institute for Healthcare Improvement: Open School

The Institute for Healthcare Improvement (IHI) was founded in the 1980s to help redesign health care into a system without errors, waste, delay, and unsustainable costs. Since its inception, the IHI has become a driving force for healthcare improvement in the United States (Institute for Healthcare Improvement, n.d.). In 2008, the IHI launched the IHI Open School with the purpose of providing learning opportunities about QI and patient safety at no charge to medical, nursing, public health, pharmacy, health administration, dentistry, and other allied health professional and faculty members through a set of online courses. According to Don Berwick, former President and CEO of the IHI, the Open School was developed to close the gap between education and practice in regards to quality improvement and patient safety (Institute for Healthcare Improvement [IHI], n.d.). “The mission of the IHI Open School is to advance health care improvement and patient safety competencies in the next generation of health professionals worldwide” (Institute for Healthcare Improvement: Open School, n.d.). At the current time the IHI Open School offers 13 online courses on patient safety and quality improvement. Students are required to take a quiz at the completion of each module and to pass must score a 75% or better. Each module was written and edited by world-renowned faculty. The IHI offers the courses to faculty and students for free. As of April 1, 2014, a total of 140,731 students and residents have completed an IHI open school course (Institute For Healthcare Improvement, n.d.).

At this time, the IHI has not collected data on who is using the courses, how they are being used, or what effect the courses are having on students learning. Mike Briddon, the managing editor of the IHI Open School stated that “a few schools that are using the courses are starting to understand the efficacy of the education.” The IHI is interested in “a project that measures the impact of the learning” (M. Briddon, personal communication, February, 21, 2013) (see Appendix C). For the purposes of this study, the students completed ten online modules from the IHI Open School. The names of the courses students completed are follow; for a further description of each course, see Appendix D.

Patient safety courses include *PS 102: Human Factors and Safety*; *PS 103: Teamwork and Communication*; *PS 104 Root Cause and System Analysis*; *PS 105 Communicating with Patient after Adverse Events*; and *PS 106 Introduction to the Culture of Safety*. Quality improvement courses include *QI 102: The Model for Improvement: Your Engine for Change*; *QI 103: Measuring for Improvement*; *QI 104 The Life Cycle of a Quality Improvement Project*; *QI 105: The Human Side of Quality Improvement*; and *QI 106: Mastering the PDSA Cycles and Run Charts*.

The goals of the IHI Open School courses are to help schools integrate courses about patient safety and QI into their curricula. It is the hope of the IHI Open School that the use of these courses will help students gain the skills crucial in helping them become change agents in healthcare. These courses offer nursing faculty an inventive way to incorporate patient safety and QI into the nursing curriculum, and allow faculty members the ability to take courses themselves, helping to further their expertise and comfort in teaching patient safety and QI content.

Teaching Strategies

Throughout the United States, traditional lecture in classroom instruction has been the mainstay of nursing education for many years. *The Future of Nursing Report* (2011) has called for a need to transform nursing education. The number of applications to entry-level baccalaureate programs increased more than 70% in the past five years from 120,000 applications in 2004 to 208,000 application in 2009 and increased an additional 5.6% from 2010-2011 to 255,671 applicants (AACN: Press Release, 2012). More than 75,000 qualified applicants were turned away in 2011 due primarily to a shortage of nursing faculty and resource constraints, such as limited classroom space, insufficient clinical placement sites, and budget cuts (AACN: Press Release, 2012). The faculty shortage is a key challenge in limiting the ability for colleges of nursing to ensure they are producing a well-educated workforce (Institute of Medicine [IOM], 2011). “Also, the ways in which nurses during the 20th century taught each other to care for people and learned to practice and make clinical decision are no longer adequate for delivering care in the 21st century” (IOM, 2011, p. 31).

Hodges (2011) stated that nursing education faces a challenge in preparing new nurses that will have the ability to work in a rapidly changing and highly complex healthcare world. Today’s nurses must be problem solvers and be able to collaborate and work with interdisciplinary teams (Hodges, 2011). Nurse educators are being challenged with breaking away from traditional established patterns of teaching and consider new innovative teaching approaches (Hodges, 2011). Research has shown that active learning strategies help students to be more engaged in the learning process and “has a positive effect on problem solving, critical thinking, and persistence” (Popkess & McDaniel, 2011, p. 89).

Active Learning

Active learning strategies lend themselves to a more learner centered pedagogy (Greer, Pokorny, Clay, Brown, & Steele, 2010). The use of learner-centered strategies improves outcomes in student knowledge, skills, and leads to increased confidence, collaboration, and critical thinking (Greer et al., 2010). Billings and Halstead (2009) found that two advantages to active learning strategies are that students are more engaged in their own learning, and have increased critical thinking skills. Some of the barriers that have been shown to implementing active learning strategies are, student and faculty resistance, lack of time, and structural barriers (Tedesco-Schneck, 2013). Despite the evidence that active learning strategies improve student outcomes, passive pedagogies continue to dominate nursing education (Tedesco-Schneck, 2013).

Some of the major characteristics associated with active learning are 1) students are engaged in more than passive listening; 2) students are engaged in activities; 3) there is less emphasis on information transfer and greater emphasis on developing students skills; 4) greater emphasis is placed on exploration of attitudes and values; 5) students motivation is increased, and 6) students are more involved in higher order thinking (Bonwell, 2000). Some of the obstacles that prevent faculty from using active learning strategies are (a) cannot cover as much course content in time available; (b) takes too much pre-class preparation; (c) large classes prevent implementation; (d) many instructors think they are good lecturers; (e) lack of resources, and (f) students are resistant to non-lecture approaches (Bonwell, 2000). A few advantages to the use of online learning are it allows students to study at a self-directed pace, and allows for greater flexibility and convenience (Moule et al., 2010).

Online Learning

The use of instructional technology lends itself to a more constructivist learning theory providing more active teaching and learning strategies. Constructivist learning theory is more student centered than teacher focused (Moule, Ward, & Lockyer, 2010). Students are allowed to construct their own knowledge, through analyzing information and reference to experience and understanding (Moule et al., 2010). Active learning strategies can be offered online through the use of Web 2.0 technologies, discussion boards, virtual chat rooms, video conferencing, interactive learning modules, social networking sites, and wikis (Moule et al., 2010). Billings and Halstead (2009) stated that when considering moving a course to an online format the faculty should consider if the course content and needs of the students can be best met through a fully online course, whether the course should be synchronous or asynchronous, or if a mix of online activities and campus meetings is better. The course design should allow students opportunities to practice and apply course principles, and require active participation with content, classmates, and the teacher (Billings & Halstead, 2009).

According to Kala, Isaramaliai, and Pothong (2010), the use of technology alone will not guarantee that students have the learning outcomes desired. Online learning can cause students to feel isolated, communication is only through words, such as discussion boards, and feedback from the instructor can be delayed. The one-way process of learning limits interaction and the opportunity for discussion (Klingbeil, Johnson, Tatka, & Doyle, 2009; Johnson & Mighten, 2005).

Fink (2003) stated that online learning is a strong method for providing information to students but lacks the ability to provide significant forms of doing and observing experiences.

Fink (2003) suggested the use of hybrid courses that continue to meet live after a significant portion of the coursework is done online.

Computer assisted learning. Technology use is increasing in nursing education programs. Education is no longer limited to the face-to-face classroom experience, and the use of technology by students is helping nurse educators to meet the IOM's and QSEN core competency of informatics (Benjamin & Ostrow, 2008). Petit dit Dariel, Sharrad, and Windle, (2013) conducted a study to report the underlying factors that influence the adoption of online learning in nursing education. The study used an exploratory descriptive design. Four factors were identified as follows:

1) e-learning advocates saw e-learning's potential to improve nurse education and prepare future nurses for their evolving role; 2) humanist had avoided e-learning because they valued human interaction, 3) skeptics doubted that technology could improve learning outcomes, and 4) the pragmatics only used e-learning as a tool to post lecture notes online to supplement what was covered in class. (Petit dit Dariel et al., 2012, p. 1289)

Dennison (2011) created a computer-assisted learning module on dialysis complications for non-expert nephrology nurses. A pretest/posttest format study was used to evaluate the effectiveness of the program. A total of 60 nephrology nurses completed the module. An improvement of more than 20% was demonstrated between the pretest and the posttest scores. Dennison (2011) concluded that the results of the study demonstrated that computer assisted learning can be an effective strategy to educate nephrology nurses.

Bromley (2010) explored the issues around online learning in nursing education. Bromley (2010) found that the literature about online learning demonstrates that online education promotes the development of higher order cognitive skills, allows students to learn at their own teachable moment, and facilitates independent learning and active learning. The successful online student is one who is an independent learner who can seek assistance when needed.

Disadvantages are social isolation and concerns about students transfer of knowledge into the clinical setting (Bromley, 2010).

Flipped Classroom

The flipped classroom model allows the teacher to deliver content, or teaching, outside of the classroom (Steed, 2012). Using the flipped model, content is delivered through homework, prior to class. Students are able to begin to assimilate the content; therefore, class time is spent with the student completing activities with the teachers' support, allowing for further assimilation of the content (Roseth, Akcaoglu, & Zellner, 2013; Steed, 2012). The foundation of the flipped classroom is that students come to class prepared and ready to learn. Learning then hinges on active involvement of the student where application and analysis are the focus of class time (Bristol, 2013). The teachers no longer spend class time imparting knowledge, but instead act as a facilitator, or mentor the students. The use of some type of learning technology or multi-media is often used in the flipped classroom model (Lage, Platt, & Treglia, 2000). Fink (2003) stated that active learning is enhanced when teachers find ways to "move students' initial exposure to the content to *outside-of-class* learning activities, that will free up in-class time for things like rich learning experiences" (p. 124).

Fulton (2012) shared the Byron School districts' top ten reasons for adopting a flipped classroom: (a) students move at their own pace, (b) doing homework in class give teachers better insight into student difficulties, (c) teachers can customize and update the curriculum and provide it to students 24/7 (d) students have access to multiple teacher expertise (e) teacher flip professional development by watching each other videos (f) classroom time can be used more effectively and creatively, (g) parents have a window into coursework, (h) student achievement is increasing, (i) learning theory supports the new approaches, and (j) the use of technology is

flexible and appropriate for 21st century learning. The use of the flipped classroom can make an impact with potential problems that most teachers face, such as getting students to prepare before class, student boredom with lectures, and poor retention of knowledge (Fink, 2003).

Lage et al. (2000) discussed how two faculty at Miami University used the flipped classroom to teach principles of microeconomics during the fall of 1996. Evidence from their class showed that students preferred the flipped classroom to the traditional lecture format classroom. The authors also believed that they were better able to meet the many different learning styles of their students.

Moravec, Williams, Aguilar-Roca, and O'Dowd (2010) discussed the implementation of learn before lecture (LBL) or flipped classroom in a large introductory biology class. Material that had previously been presented during class time from three lectures was introduced through pre-class worksheets or narrated PowerPoint videos. Each of the LBL homework assignments was associated with in class active-learning exercises. Students' learning was evaluated by student's performance in 2009 vs. students from 2007/2008 on LBL related questions. The percentage of students who answered five of six LBL exam questions was significantly higher ($p < 0.00$) in 2009 vs. 2007/2008. The mean increase in performance was 21% (Moravec et al., 2010). The authors of the study recommend starting with small numbers of topics that have proven to be difficult for students in the past to grasp from traditional lectures.

Missildine, Fountain, Summers, and Gosselin (2013) conducted a quasi-experimental study to determine the effects of a flipped classroom on academic success and satisfaction of nursing students. The study was conducted in two adult health courses offered in semester two and three of the nursing curriculum. A convenience sample of 589 students was recruited for the study. Three approaches to teaching were used; they included lecture only (LO), lecture plus

lecture capture (LLC) classroom format, and lecture capture plus innovation (LCI) using the flipped classroom approach, in which there were no classroom lectures. The examination scores were higher for the flipped classroom LCI group ($M=81.89$, $SD=5.02$) than for both the LLC group ($M= 80.70$, $SD= 4.25$) $p< 0.003$, and LO group ($M=79.79$, $SD =4.25$) $p< 0.001$. Students were less satisfied with the flipped classroom method than with either of the other methods ($p< 0.001$) (Missildine et al., 2013).

Herreid and Schiller (2013) discussed two major pitfalls to the flipped classroom. One is that students new to this method may be resistant as it requires work at home rather than first being exposed to content at school. Second, homework must be carefully tailored to prepare students for in class activities. Even with its drawbacks, Herreid and Schiller (2013) noted that the flipped classroom has great promise, as it combines active and student-centered learning.

According to Goodwin and Miller (2013), there is currently no scientific research that indicates that flipped classrooms are effective. Even though no hard scientific research on the flipped classroom exists, it does not mean teachers should not flip their classrooms. In a survey of 453 teachers who had flipped their classroom, 67 % of the teachers reported increased test scores, 80% reported improved student attitudes, and 99% said they would flip their classroom again (Goodwin & Miller, 2013).

Discussion Seminar

Using seminar as pedagogy lends itself to an active learning environment allowing students to become engaged with content, provides for cooperative learning, allows students to practice collaboration with peers and facilitates comprehension and application of concepts (Billings & Halstead, 2009). The teacher can act as a role model and help to clarify difficult

concepts while improving students problem solving and thinking skills (Billings & Halstead, 2009).

Seminar groups use discussion as a means of promoting learning among the participants, while allowing students to move from knowledge learning to higher order thinking including analysis, synthesis and evaluation (Schoolcraft & Novotny, 2000). The seminar method helps stimulate students desire to learn while getting them directly involved in their own learning (Schoolcraft & Novotny, 2000).

Johnson and Mighten (2005) compared a group of students who received structured lecture notes and participated in structured group discussion, to a group of students who received lecture only. The examination grades of the students who participated in the lecture notes and structured group discussion versus the lecture only group were significantly higher. Fewer students in the discussion group failed the course.

Browning (2012) conducted a longitudinal survey study to evaluate a critical care student led seminar class. The overall findings found that students who listened to and participated in the discussion did not feel they had learned as much as the students who presented the material.

Summary

In summary, this chapter contained a review of the literature for this research study. The primary concepts reviewed were errors in healthcare, quality, and safety education for nurses, (QSEN) Phases I, II, and III, and *The Essentials of Baccalaureate Education* pertaining to the QSEN competencies. The secondary concepts of the review examined current assessment of quality and safety education in nursing including, educational needs assessment for improving patient safety, assessing quality and safety competencies of pre-licensure nursing students, frameworks for patient safety in the nursing curriculum, faculty development needs,

incorporating and measuring QSEN competencies in the undergraduate curriculum, and the institute for healthcare improvement: open school. The tertiary concepts of the review included teaching strategies, active learning, online learning, flipped classroom, and seminar.

CHAPTER III:
RESEARCH METHODOLOGY

Introduction

Since the inception of QSEN in 2005 nurse educators have been challenged with discovering effective teaching strategies to infuse QI and patient safety into the nursing curricula (Barnsteiner et al., 2013). The purpose of this study was to evaluate the effectiveness of two teaching strategies, online modules only versus online learning modules in conjunction with a flipped discussion seminar classroom on nursing students' knowledge, skills, and attitudes about QI and patient safety. This chapter includes the research questions, the research design, setting, population and sample, sampling procedures, overview of the intervention, instruments, recruitment, data collection, and data analysis. Considerations around internal validity, external validity, and protection of human subjects are presented.

Research Questions

1. Is there a significant difference in pre-licensure nursing students' knowledge of quality improvement as measured by test scores based on type of educational program on quality improvement (online module in conjunction with a flipped discussion classroom seminar vs. online modules only)?
2. Is there a significant difference in pre-licensure nursing students' knowledge of patient safety as measured by test scores based on type of educational program on patient safety (online module in conjunction with a flipped discussion classroom seminar vs. online modules only)?

3. Is there a significant difference in pre-licensure nursing students' attitudes about quality improvement as measured by self-reported attitude scores based on type of educational program on quality improvement (online module in conjunction with a flipped discussion classroom seminar vs. online modules only)?
4. Is there a significant difference in pre-licensure nursing students' attitudes about patient safety as measured by self-reported attitude scores based on type of educational program on patient safety (online module in conjunction with a flipped discussion classroom seminar vs. online modules only)?
5. Is there a significant difference in pre-licensure nursing students' comfort with skills of quality improvement as measured by self-reported skill scores based on type of educational program on quality improvement (online module in conjunction with a flipped discussion seminar classroom vs. online modules only)?
6. Is there a significant difference in pre-licensure nursing students' comfort with skills of patient safety as measured by self-reported skill scores based on type of educational program on patient safety (online module in conjunction with a flipped discussion seminar classroom vs. online modules online modules only)?

This chapter describes the research design, setting, population and sample, sampling procedures, overview of the intervention, instruments, recruitment, data collection, and data analysis. Considerations around internal validity, external validity, and protection of human subjects are presented.

Research Design

The study utilized a pretest-posttest control group design. Controlled experimental research has been shown to be the gold standard for establishing evidence about causes and effects and meets the criteria for establishing causality (Polit & Beck, 2012). In an experimental study the researcher examines the cause and effect between the independent and dependent variables. The independent variable is the experimental or treatment variable and the dependent variable is the outcome variable (Fraenkel, Wallen, & Hyun, 2012). The researcher manipulates the independent variable, decides the nature of the treatment and to whom it will be applied and to what extent (Fraenkel, Wallen, & Hyun, 2012). To qualify as an experiment, a research design must possess the following three properties:

1. Manipulation. The experimenter does something to at least some of the participants-that is some type of intervention;
2. Control. The researcher introduces controls over the experimental situation, including devising a comparison group that does not receive the intervention; and
3. Randomization. The experimenter assigns participants to a control or experimental condition on a random basis (Polit & Beck, 2012, p. 203)

Table 2 illustrates the research design utilized in this study.

Table 2

Experimental Randomized Pre-test-Posttest Control Group Design

Treatment group	R	O ₁	X	O ₂
Control group	R	O ₁	C	O ₂

Note: R represents the random assignment of individuals to the group. O refers to the measurement of the dependent variable, O₁ is the pretest and O₂ is the posttest. The symbol X represents exposure to the treatment; C represents the control group (Fraenkel et al., 2012, p. 271).

Setting

The research was conducted within a college of nursing at a private university in the southeastern United States. During the time of the study the university employed 1,568 faculty and staff members and had a total enrollment of 8,341 students. Approximately 4,429 students were undergraduates, 2,259 were graduate students, and 1,766 were professional degree students. The University offers more than fifty programs with various majors and minors in 12 schools and colleges divided among three campuses. The university has been ranked among the leading regional colleges and universities in the south by *US News & World Report* for 20 consecutive years. In 2010, the university scored higher than its peer institutions on the National Survey of Student Engagement (NSSE) for five benchmarks of effective educational practice: 1) level of academic challenge, 2) active and collaborative learning, 3) student faculty interaction, 4) enriching education experiences, and 5) supportive campus environment. The Southern Association of Colleges and Schools accredit the university to award bachelor's, master's, and doctoral degrees. The college of nursing at the university offers a Bachelors of Science in Nursing, RN-BSN completion, Master of Science in Nursing, Doctor of Nursing Practice and PhD in nursing programs. The college of nursing is approved by the state licensing board of nursing. The Commission on Collegiate Nursing Education accredits the Bachelor of Science, Master of Science, and Doctor of Nursing Practice program.

Since 1902, the college of nursing has educated over 7,350 professional nurses. At the time of the study the college of nursing had 391 students, 297 undergraduate students and 94 graduate students. The most current pass rate for the NCLEX licensing exam for the May 2013 graduating class was 91.05% with one student remaining to test as of March 13, 2014. The

college of nursing holds a strong reputation for excellence, scholarship, leadership, education, clinical practice, and service.

The investigator is a faculty member at the study setting. The investigator serves as the course coordinator for the Leadership and Role Practicum Course. This course is a requirement for all senior students and is completed in their fourth and final semester of a two-year upper division baccalaureate-nursing program. The course is offered only once each year during the spring semester. The investigator recruited students from the Leadership and Role Practicum course to participate in the study. The investigator's qualifications include a master's degree in nursing with a focus in nursing education and five and one half years experience teaching in an undergraduate-nursing program.

Population and Sample

The target population for the study was 134 pre-licensure baccalaureate-nursing students enrolled in the *Leadership and Role Practicum* course. All undergraduate nursing students enrolled in the senior level *Leadership and Role Practicum* course were eligible for inclusion in the study. There were no exclusion criteria. A sample of student volunteers was recruited from the target population.

Sampling Procedures

The study-sampling frame utilized was a list of all students enrolled in the *Leadership and Role Practicum* course arranged alphabetically. All students in the target population were approached to participate in the study. Those who provided written informed consent and who completed both the pre-test and post-test were included.

In order for the study to be conducted efficiently, as there were study related scheduling issues, the entire target population of 134 students were randomly assigned to either the

experimental group or the control group. “Random assignment means that every individual that is participating in an experiment has an equal chance of being assigned to any of the experimental or control conditions being compared” (Fraenkel et al., 2012, p. 267). An alphabetical list of the 134 students enrolled in the *Leadership and Role Practicum Course* for the spring semester 2014 was used. Each student was given a number arbitrarily. The numbers 1-134 were placed in a container. The first number pulled out was assigned to the student at the beginning of the alphabet. This process was continued until all students had received a number. The investigator used an online program, *Research Randomizer*, to randomly select two sets of 67 unique numbers per set. Students were then placed in either the experimental group or the control group depending on the arbitrary number they were assigned.

When participants are randomly assigned to groups they are assumed to be comparable “with respect to an infinite number of biologic, psychological and social traits.” Therefore, differences can be attributed to the experimental treatment. Randomization helps to prevent systematic bias in the groups with respect to pre-intervention attributes that could affect outcome variables (Polit & Beck, 2012, p. 206). Although randomization does not guarantee the groups will be equal it is the trustworthiest method of equalizing the groups. “Any differences that do occur are the result of chance, rather than bias on the part of the researcher” (Fraenkel et al., 2012, p. 94).

Although 134 students were enrolled in the *Leadership and Role Practicum* course, participation was voluntary. Having an adequate number of participants in a study is important to assure that any statistical conclusions are valid (Polit & Beck, 2012). Prior to the implementation of the study, a power analysis was performed using previously reported data from the instruments that were used in this study. This was done to help the investigator target a

sample size adequate for reducing the risk of a Type 2 error and strengthening statistical conclusion validity. The minimum power of .80 is acceptable which should allow for less than 20% chance of committing a type II error (Kim & Mallory, 2014). With a two tail alpha of .05, it was projected that with 60 students in each group there would be satisfactory power of .80 or greater to detect .5 standard deviation difference between the two groups on the measures of knowledge, skills, and attitudes in the areas of QI and safety.

A total of 97 of the 134 nursing students enrolled in the Leadership and Role Practicum course consented to participate in the study. Although 97 students consented to participate, only 79 students completed the pre-test, 37 in the experimental group, and 42 in the control group. Only a total of 64 students that had completed the pre-test also took the post-test: 31 in the experimental group and 33 in the control group. Therefore the total sample size used for this study was 64 students. To prevent investigator bias, the participants' identity and group assignment remained confidential. Because the desired sample size of 60 students per group was not met for the study and there was no opportunity to increase the sample size a post hoc effect size or power was calculated.

Overview of the Intervention

All 134 students in the *Leadership and Role Practicum* course met for a period of 16 weeks in a large lecture format classroom. Students met as a group for a period of three hours each week. Students in the course were divided into two groups. The students in one group completed 120 hours of clinical in a hospital setting during the first eight weeks of the semester. Students in the second group completed 120 hours of clinical in a hospital setting during the second eight weeks of the semester. During the eight-week period that students were completing their 120 clinical hours, they also met each week in a two-hour flipped classroom discussion

seminar group. Therefore, students in the first group met in a seminar group for the first eight weeks of the semester, and students in the second group met in a seminar group for the second eight weeks of the semester. Each flipped classroom seminar group consisted of 10-13 students and was assigned one faculty member from the *Leadership and Role Practicum* course to act as a facilitator. The facilitator was not aware of which students in the group were or were not participating in the study. One to two students in the seminar group were assigned to teach the topic from the online module in seminar each week. Students assigned to teach were asked to write a lesson plan, which included learning objectives, and to find a research article that supported their topic. These items were shared with the other members in the seminar group a few days prior to class. Students were very creative with their teaching strategies, using visual aids, video clips, case studies, questions, and games to engage their other classmates. Students were graded on their leadership of the flipped classroom discussion seminar, and their participation in the group's discussion. The leadership grade counted as 40% of the student's grade in this course, and participation counted as 30% of the student's grade in this course.

For the purpose of this study, the students were randomly assigned to either group one or group two regardless of their participation in the study. Students in group one that consented to participate in the study and completed both the pre-test and post-test (n=31) served as the experimental group in the study; and students in group two who consented to participate in the study and completed both the pre-test and the post-test (n=33) served as the control group in this study.

Prior Instruction

Students in both the experimental and the control group were introduced to the QI and patient safety topics during the spring 2013 semester. Students in both groups completed two

online modules on patient safety, *Introduction to Patient Safety and Fundamentals of Patient Safety*, and one online module on QI, *Fundamentals of Improvement*, through the IHI Open School. Student's knowledge of this content was tested on four unit exams. At the beginning of the study both the experimental and control group students that consented to participate in the study took a pretest to assess their current knowledge, skills, and attitudes about QI and patient safety. Pretest scores demonstrated knowledge retained from the spring 2013 semester, but it was assumed because of randomization that this knowledge was similarly demonstrated for both groups. The pre-test gave a baseline of students' current knowledge, attitudes towards, and comfort with skills involved in QI and patient safety.

Experimental Group- Online Modules with Flipped Classroom (Group 1)

The experimental group, Group 1, was divided into six seminar groups of 10-12 students each. Students were placed into seminar groups based on the hospital where they completed their clinical assignment. Each seminar group was assigned one faculty member from the Leadership and Role Practicum course to act as a facilitator. There were a total of six faculty members in the *Leadership and Role Practicum* course. All six faculty members completed the 10 selected IHI Open School Modules. A training session was held with faculty members prior to the beginning of the seminar discussion groups. The investigator constructed a list of guiding questions that were to be discussed in each seminar group (see Appendix E). The seminar groups met for a period of eight weeks during the first half of the semester. The students in the experimental group completed 10 online modules on QI and patient safety during this 8-week period. Each student in the experimental group participated in a two hour flipped discussion seminar classroom each week where the topics introduced in the online modules were further discussed. Students were required to turn in a certificate of completion for the assigned online IHI Open

School module or modules each week. Each week one to two students were assigned to lead the discussion seminar. Each student in the seminar group was given a list of the guiding discussion questions to be covered and were expected to be prepared to discuss each topic. Faculty members helped to clear up any points of confusion and answered students' questions. Students in each flipped discussion seminar classroom were graded on their participation in the discussion. Therefore, students were required to come to seminar prepared to make a meaningful contribution to the group's discussion.

Control Group-Online Modules only (Group 2)

Students in the control group, Group 2, completed 10 online modules on QI and patient safety through the IHI Open School over the first eight weeks of the semester. Students were assigned to complete one or two modules each week. Students in the control group were required to turn in a certificate of completion for each module or modules completed that week in the lecture classroom. Following completion of the post-test, students in the control group participated in the flipped discussion seminar classroom during the second eight weeks of the semester. This ensured that all students had an equal opportunity to learn the knowledge, skills, and attitudes required by the QSEN conceptual framework on QI and patient safety.

Posttest

There were a total of 70 students in both the experimental group and the control group who consented to participate in the study that completed the posttest at the end of the first eight weeks of the semester. Only 64 students in both the experimental group and the control had also taken the pre-test. Students in both groups had completed the 10 online modules on QI and patient safety through the IHI Open School. Only the students in the experimental group had participated in the flipped discussion seminar classroom prior to completing the post-test.

Instruments

This study used two tools to assess pre-licensure baccalaureate nursing student's knowledge, skills, and attitudes about QI and patient safety, the *Quality Improvement Knowledge, Skills and Attitudes* (QulSKA) and the *Healthcare Professional Patient Safety Assessment Curriculum Survey* (HPPSACS). Two tools were required for this study, as the QulSKA has relatively few items focused on patient safety. Subscales related to knowledge, skills, and attitudes around patient safety from the two tools were combined into indexes to enhance psychometric rigor of the study. Specific details about how the subscales were combined are described in Table 3. For ease in administration, the two tools were combined into one web-based survey.

Quality Improvement Knowledge, Skills and Attitudes (QulSKA)

The present study used an adapted version of the *Quality Improvement Knowledge, Skills, and Attitudes* (QulSKA) questionnaire. Paula Dycus, the developer of this tool, to use and adapt the instrument, granted permission. A copy of the permission letter is in Appendix H. The original QulSKA questionnaire consists of 73 items that were constructed to measure the six QSEN competencies of quality improvement, safety, evidence-based practice, teamwork, patient-centered care, and informatics. The questionnaire consists of 17 items that measure knowledge, 45 items that measure skill, and 11 items that measure attitudes. The 17 knowledge items and 15 of the 45 skill items are multiple-choice (26 items) and true-false response formats (6 items). There are 30 skill items using a six-item Likert scale ranging from novice (not familiar with, never used) to expert (understand and used 9 or more times in my work and can teach others), and 11 items that measure self-reported attitudes using a four-item Likert scale that ranges from not important at all to high importance (Dycus & McKeon, 2009). “Content validity was

established by pediatric oncology, QI, and test construction experts” (Dycus & McKeon, 2009, p. 202). The QulSKA inter-item correlation coefficient was 0.839 ($P = .001$). In the Dycus and McKeon, (2009) study, the mean knowledge score (based on 100%) was 69.2 +/- 11.3. Scores were highest for safety (82.9%) and lowest for teamwork (48.6%). The mean skill rating was 3.3 +/- 0.74 (used 2-4 times). Lowest rated skills were in analysis and QI tools. The mean attitude rating was 3.8 +/- 0.25 (highly important (Dycus & McKeon, 2009, p. 202). This high inter-item correlation demonstrates that the QulSKA tool is a reliable instrument to measure quality and safety KSAs. Currently this instrument has been used to test the QSEN skills, knowledge, and attitudes of registered nurses and new graduate nurses. At this time no studies were found that had used this tool to test the QSEN competencies in nursing students.

For the purposes of this study the investigator chose to use only the questions that pertain to the knowledge, skills, and attitudes about QI and patient safety. The adapted QulSKA tool contains 30 questions that were constructed to measure the QSEN competencies of QI and patient safety. The adapted QulSKA questionnaire consists of six items that measure knowledge, nine items that measure skills, and three items that measure attitudes about QI, and eight items that measure knowledge, three items that measure skills, and one item that measures attitudes of safety. The adapted QulSKA contains 14 multiple-choice items that measure knowledge of QI and safety. There are 12 self-reported skill items using a six-item Likert scale ranging from novice (not familiar with, never used) to expert (understand and used > 9 or more times in my work and can teach others), nine items measure comfort with QI skills and three items measure comfort with safety skills. The remaining four items measure self-reported attitudes using a four-item Likert scale that ranges from not important at all to high importance: three for QI and one

for safety. Copies of the original and adapted version of the QulSKA tool are in Appendices F and G.

Healthcare Professional Patient Safety Assessment (HPPSACS)

The HPPSACS is a 34-item instrument that was adapted from the *Patient Safety/Medical Fallibility Assessment Pre and Post Curriculum Survey* (Chenot & Daniel, 2010). The *Patient Safety/Medical Fallibility Assessment Pre and Post Curriculum Survey*, created by the University of Missouri-Columbia School of Medicine, was designed for use with medical students. (Madigosky, Nelson, Cox, & Anderson, 2006). The HPPSACS was adapted by Chenot (2010) and was tested on 318 undergraduate nursing students from seven different colleges of nursing. The HPPSACS instrument was designed to assess healthcare professional's knowledge, skills, and, attitudes about patient safety. The HPPSACS consists of 18 items that measure attitudes about patient safety, five items that measure comfort of performing skills related to patient safety using a five-item Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), five multiple choice questions that measure knowledge, and six items asking respondents to reply either yes or no regarding patient safety situations they may have previously experienced (Chenot & Daniel, 2010). Nine of the items that measure attitudes were reversed scored: items 2,4,5,11,13,14,15,16, and 17. The six items that deal with patient safety situations were not used for this study. A varimax and sorted rotated factor structure matrix for the HPPSACS identified four factors with themes that were related to patient safety among nursing students. The themes were comfort (Factor I), error reporting (Factor II), denial (Factor III), and culture (Factor IV) (Chenot & Daniel, 2010). Chenot and Daniel (2010) HPPSACS was subjected to an alpha reliability analysis. The Cronbach alpha reliability coefficient for the scores on the entire scale was .71. The coefficients alpha for scores on the comfort, error reporting, denial, and culture

subscales were .82, .70, .65, and .64 respectively (Chenot & Daniel, 2010). Approval to use the instrument was obtained from both Madigosky and Chenot (see appendix K and L) A copy of the original HPPSACS instrument and the adapted HPPSACS (see Appendix I and J) along with copies of the correspondence from the instrument's creator acknowledging permission to use the instrument found in the appendices K and L.

Table 3 summarizes the variables and scoring for the six dependent variables for the study.

Table 3

Summary of Dependent Variable Scoring

	Items On Original Instruments	Items on Adapted Instrument	Type of Items	Possible Range of Scores
QI Knowledge	QulSKA (7items) 1,2,20,21,22,23 27	QulSKA (6 items) 1,2,11,12,13,14,	Correct Right/Wrong	0-100 Higher Scores better knowledge
QI Skill	QulSKA (15 items) 40,41,42,43,44,45 46,47,48,49,50,51 52,53,54	QulSKA (9 items) 15,16,17,18,19,20 21,22,23	Likert 1-6 Novice to Expert	15-90 Higher score =greater skills
Quality Attitudes	QulSKA (3 items) 63,64,69	QulSKA (3 items) 24, 25, 26	Likert 1-4 Not important- High importance	3-12 Higher scores more positive attitudes
Safety Knowledge Index	QulSKA (8 items) 7,8,9,10,11,12 15,16 HPPSACS (5 items) 24,25,26,27,28	QulSKA (8 items) 3,4,5,6,7,8,9,10 HPPSACS (5 items) 54, 55, 56, 57, 58	QulSKA Multiple Choice Correct Right/Wrong	0-100 Higher scores greater knowledge
Safety Skills Index	QulSKA (3 Items) 58,59,60 HPPSAC (5 items) 19,20,21,22,23	QulSKA (3 items) 24, 25, 26 HPPSACS 49, 50, 51, 52, 53	QulSKA Likert 1-6 Novice-expert HPPSACS Likert 1-4 Not important- High importance	8-43 Higher scores greater skill
Safety Attitudes Index	QulSKA (1 item) 68 HPPSACS (18 items) 1,2,3,4,5,6,7,8,9, 10,11,12,13,14, 15, 16,17,18,19	QulSKA (1 item) 30 HPPSACS (18 items) 31, 32, 33,34,35, 36, 37, 38, 39, 40, 41, 42, 43,44,45, 46, 47, 48	QulSKA Likert 1-4 Not important- High importance HPPSACS 1-5 Strongly disagree to strongly agree	19-94 Higher scores more positive attitudes Items 39, 41, 42, 48, 50, 51, 52, 53, and 54 are reversed scored.

Content Validity

Prior to administering the adapted version of the QulSKA and HPPSACS, content validity of the adapted tool was established. Obtaining the content validity evidence in a tool helps to establish that it has an appropriate amount of items that represent and measure the construct of interest (Polit, Beck, & Owen, 2007). The content validity index (CVI) was used to measure content validity, which is “based on experts’ rating of item relevance” (Polit et al., 2007, p. 459). “To calculate an item level CVI (I-CVI), experts are asked to rate the relevance of each item, usually on a 4 point scale” (Polit et al., 2007, p. 460). Once the CVI for each item has been calculated an overall scale for the tool is computed, which is called the S-CVI.

For the purpose of establishing the I-CVI on each item of the adapted QulSKA and HPPSACS and to compute the S-CVI, five doctorally-prepared nurse educators were asked to help establish content validity of the tool. All five nurse educators received a cover letter that explained the purpose of the tool and how it would be used. They were also given a list of operational definitions to use to define quality improvement, patient safety, knowledge, skills and attitudes. Items that measured QI knowledge, QI skills, QI attitudes, safety knowledge, safety skills and safety attitude items broke down the QulSKA and the HPPSACS questions. The reviewers was asked to rate the relevance of each item on a four-point scale, 1=not relevant, 2=somewhat relevant, 3=quite relevant, and 4=highly relevant. A copy of the cover letter and content validity tool can be found in the Appendix M).

The I-CVI score was computed for each item by adding the number of experts who rated an item either 3 or 4 and dividing it by 5, this number shows the proportion of experts who agree that the item is relevant. If all five experts rate that an item is either 3 or 4 in relevance, the item CVI is 1.00. The S-CVI can determine the proportion of items on the instrument that were rated

either 3 or 4 by all the content experts (S-CVI/UA or universal agreement), or by calculating the average I-CVI of all 65 questions on the survey, (S-CVI-AVE) (Polit et al., 2007). A criterion of .80 is used as a lower limit of acceptability for an S-CVI to show that a tool has content validity (Polit et al., 2007). Polit et al. (2007) believed that for a scale to be considered to have excellent content validity it should have an S-CVI/Ave of .90 or higher. For the adapted QulSKA and HPPSACS tool the S-CVI-AVE was .97 and the S-CVI/UA was .83. Questions 24, 25, 26, 27, 28, 29, and 30 were removed from the adapted QulSKA and HPPSACS. These questions asked participants to rate their comfort with performing certain statistical tests (i.e., ANOVA, t-test, chi square, regression analysis, etc.). This content was not covered in the online modules or flipped classroom discussion seminar so was found to not be pertinent to the study.

Recruitment

All 134 students in the Leadership and Role Practicum course were given a recruitment letter that explained the study (see Appendix N). A discussion of the research project and the benefits of participating in the research study were explained to all potential research participants by a colleague of the investigator who served as an intermediary. The colleague is an associate professor at the college of nursing and is not affiliated with the *Leadership and Role Practicum* course. The purpose of using an intermediary was to ensure that students did not feel coerced in any way to participate in the study as the investigator served as the course coordinator for the *Leadership and Role Practicum* course. The intermediary explained the study to the students using a script that was developed by the investigator (see Appendix O). Each student who agreed to participate in the study was asked to sign an informed consent (see Appendix P). Each student who consented to participate in the study received a light up pen worth approximately \$1.50.

Data Collection

The study was divided into three phases using a pre-test/ post-test control group design. During Phase I, students were recruited to participate in the study and asked to sign an informed consent. All students in the course had already been randomly assigned to group 1 (experimental) or group 2 (control) regardless of their consent to participate in the study. A pretest was administered to both the experimental group (group 1) and the control group (group 2) that had consented to participate in the study. The pre-test consisted of demographic data, age, gender, ethnicity, race, and prior degrees and an adapted version of the QulSKA and HPPSACS questionnaire. Students were asked to enter a unique four-digit ID number, the last four digits of their student ID, for use in comparing pretest and posttest scores. The QulSKA and the HPPSACS questionnaires were combined and converted into an online format through the use of survey monkey. Students were given access to the survey through an embedded link in the course management system used in the nursing *Leadership and Role Practicum* course. This helped to ensure students' answers remained confidential. There was one link for students in the experimental group (group 1) and a separate link for the students in the control group (group 2). The pre-test was completed prior to participants completing the selected online courses on QI and patient safety.

During Phase II, all students in the experimental group (group 1) and students in the control group (group 2) completed the 10 online modules on QI and patient safety. The experimental group (group 1) also participated in an eight-week, two-hour flipped discussion seminar classroom to further discuss the online content.

During Phase III, data were collected from the experimental group (group 1) and the control group (group 2) in the form of a posttest. The posttest was administered at the end of the

first eight weeks of the semester. The posttest collected the demographic data again as a mistake was found in the pre-test in the questions asking about prior degrees. Students had not been given the choice to select “no” prior degree. The post-test utilized the adapted version of the QulSKA and HPPSACS questionnaires combined. Students were given access to the survey through an embedded link in the course management systems used in the *Nursing Leadership and Role Practicum* course. Students were asked to enter the same unique four-digit ID number, the last four digits of their student ID, that they entered on the pretest for use in comparing pretest and posttest scores.

Data Analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 22. Demographic data was analyzed through the use of descriptive statistics. Prior to addressing the research questions the two groups were compared on demographic variables and pretest measures of the dependent variables to assure adequacy of the random assignment.

Prior to addressing the research questions, a t-test for independent samples means was completed to compare the mean scores between the experimental and the control groups on their pre-test measures of the dependent variables. A t-test is a parametric statistical test used to see if the difference between the means of two samples is significant (Fraenkel et al., 2012). The data analysis plan stated that if the groups were different on the pretest, even though they have been randomly assigned, a multivariate analysis of covariance (MANCOVA) would be done to compare groups on their posttest scores. “A (MANCOVA) extends ANCOVA to include two or more dependent variables in the same analysis” (Fraenkel et al., 2012, p. 237) and also accommodate a control variable.

If there were no significant differences on the pretest a MANOVA would be used. A MANOVA is used to test significance of differences in-group means for multiple dependent variables (Polit & Beck, 2012). Table 4 summarizes the statistical analyses per research question.

Table 4

Research Questions and Statistical Analysis

Research Question	Independent Variable	Dependent Variable	Statistical Analysis
Is there a significant difference in pre-licensure nursing students' knowledge of quality improvement as measured by test scores based on type of educational program on quality improvement (online module in conjunction with a flipped classroom seminar vs. online modules only)?	Type of educational program	QulSKA Knowledge Score	One Way MANOVA ^{XX}
Is there a significant difference in pre-licensure nursing students' knowledge of patient safety as measured by test scores based on type of educational program on quality improvement (online module in conjunction with a flipped classroom seminar vs. online modules only)?	Type of educational program	QulSKA Attitudes Score	One Way MANOVA ^{XX}
Is there a significant difference in pre-licensure nursing students' attitudes about quality improvement as measured by self-reported attitude scores based on type of educational program on quality improvement (online module in conjunction with a flipped classroom seminar vs. online modules only)?	Type of educational program	QulSKA Skill Score	One Way MANOVA ^{XX}
Is there a significant difference in pre-licensure nursing students' attitudes about patient safety as measured by self-reported attitude scores based on type of educational program on quality improvement (online module in conjunction with a flipped classroom seminar vs. online modules only)?	Type of educational program	QulSKA Knowledge Score HPPSACS Knowledge Score	One Way MANOVA ^{XX}
Is there a significant difference in pre-licensure nursing students' comfort with skills of quality improvement as measured by self-reported skill scores based on type of educational program on quality improvement (online module in conjunction with a flipped classroom seminar vs. online modules only)?	Type of educational program	QulSKA Attitude Scores HPPSACS Attitude Scores	One Way MANOVA ^{XX}
Is there a significant difference in pre-licensure nursing students' comfort with skills of patient safety as measured by self-reported skill scores based on type of educational program on quality improvement (online module in conjunction with a flipped classroom seminar vs. online modules only)?	Type of educational program	QulSKA Skill Score HPPSACS Attitude Score	One Way MANOVA ^{XX}

Note: ^{XX} MANCOVA will be performed if groups are significantly different on pre-test

Internal Validity

When conducting a study it is important for the researcher to identify potential threats to internal and external validity. According to Fraenkel et al. (2012), “Internal validity is the degree to which observed differences on the dependent variable are directly related to the independent variable, not to some other (uncontrolled) variable” (p. G-4). Most experimental studies possess a high degree of internal validity due to the use of randomization and control groups. Both of these attributes allow the investigator to control extraneous variables that might affect the outcome of the study.

Threats to Internal Validity

Testing can be a threat to internal validity when using a pretest/posttest design. When using a pretest-posttest there is a possibility of a pretest treatment interaction effect. An interaction effect is “the effect on a dependent variable of two or more independent variables acting in combination (interactively) rather than as unconnected factors” (Polit & Hungler, 1997, p. 459). The pre-test may alert the members of the experimental group and affect the results on their posttest. If a pretest treatment interaction occurs students in the experimental group may do better or worse than the control group on the posttest (Fraenkel et al., 2012). Treatment interaction allows the researcher to see if the randomization of the groups succeeded in making the groups equivalent (Fraenkel et al., 2012). A t-test was conducted after the pretest. The pretest showed the only statistically significant difference between the groups was age.

Instrumentation is another possible threat to internal validity when using a pretest/posttest design. Instrumentation reflects a change in the instrument used to collect data between two points (Polit & Beck, 2012). Even if the instrument is not changed participants can become bored when answering the same questions and answer haphazardly. These differences can bias the

results (Polit & Beck, 2012). The post-test was conducted 8 weeks after the pre-test for both groups, so it was anticipated that the effect of instrumentation may have been lessened.

Contamination of treatments is a possible threat to internal validity. There was a risk of students from the experimental group (group 1) co-mingling and discussing what happened during the flipped discussion seminar class with the students in the control group (group 2). In an attempt to reduce the risk of contamination, students in the experimental group (group 1) were asked not to discuss what happened during the flipped discussion seminar class with students in the control group (group 2). Students were asked to uphold the college of nursing Academic Integrity Code. Each student in the undergraduate-nursing program consents to this code upon admission, which states

I pledge myself to neither give nor receive aid during tests or for any individual assignment or paper, nor to use any information other than that allowed by the instructor. I further pledge that I will not allow to go unreported to the proper person any violation of this Academic Integrity Code and that I will give true and complete information to the Academic Integrity Council. (*University Catalog*, 2012-2013, p. 9)

External Validity

External validity “is the degree to which study results can be generalized to settings or samples other than the one studied” (Polit & Beck, 2012, p. 727). This study had limited generalizability due to several factors. The study was conducted using one nursing class at one university setting. A convenience sample of student volunteer was used. Students in this setting who volunteered may be atypical of other students within the same geographical area and or nationally.

Ethical Consideration

Prior to data collection, approval was obtained from the Institutional Review Board (IRB) at both the participating university and The University of Alabama where the investigator was a

doctoral student. Permission was obtained from the dean of the college of nursing to utilize students. Permission was obtained from the dean of the undergraduate program of the college of nursing to randomly assign students to the experimental and the control group. All participating students were asked to sign a consent form prior to collecting any data (see Appendix L). A faculty member who was not a member of the Leadership and Role Practicum course was used as an intermediary to consent students to help protect students' anonymity. Student's participation in the study was voluntary. Students were assured that their participation or lack of participation in the study would not affect their grade either positively or negatively. All students were asked to identify a unique four-digit ID number that allowed the researcher to connect the results of his/her pre-test and posttest without being able to connect the results to an individual student.

Summary

In summary, this chapter discussed the research design, setting, population and sample, sampling procedures, overview of the intervention, instruments, recruitment, data collection, and data analysis. Threats to internal validity and external validity were discussed and ethical considerations presented. The study compared two groups of nursing students, on their knowledge, skills, and attitudes about QI and patient safety. One group, the experimental group, completed 10 online modules on QI and patient safety and participated in a flipped discussion seminar classroom. The control group completed the 10 online modules on QI and patient safety only. The experimental pretest/posttest control group design was used.

CHAPTER IV: RESEARCH RESULTS

The purpose of this study was to evaluate the effectiveness of two teaching strategies, online modules only versus online modules in conjunction with a flipped classroom discussion seminar on nursing students' knowledge, skills, and attitudes about QI and patient safety. Six research questions guided this study.

1. Is there a significant difference in pre-licensure nursing students' knowledge of quality improvement as measured by test scores based on type of educational program on quality improvement (online in conjunction with a flipped discussion classroom seminar vs. online modules only)?
2. Is there a significant difference in pre-licensure nursing students' knowledge of patient safety as measured by test scores based on type of educational program on quality improvement (online in conjunction with a flipped discussion classroom seminar vs. online modules only)?
3. Is there a significant difference in pre-licensure nursing students' attitudes about quality improvement as measured by self-reported attitude scores based on type of educational program on quality improvement (online in conjunction with a flipped discussion classroom seminar vs. online modules only)?
4. Is there a significant difference in pre-licensure nursing students' attitudes about patient safety as measured by self-reported attitude scores based on type of educational program on quality improvement (online in conjunction with a flipped discussion classroom seminar vs. online modules only)?

5. Is there a significant difference in pre-licensure nursing students' comfort with skills of quality improvement as measured by self-reported skill scores based on type of educational program on quality improvement (online in conjunction with a flipped discussion classroom seminar vs. online modules only)?
6. Is there a significant difference in pre-licensure nursing students' comfort with skills of patient safety as measured by self-reported skill scores based on type of educational program on quality improvement (online in conjunction with a flipped discussion classroom seminar vs. online modules only)?

The study utilized a quantitative methodology with a pretest-posttest control group design. The study was conducted in three phases. During Phase I, participants were randomized into the experimental or control group, consented, and completed the pre-test. During Phase II, the participants in the experimental group completed ten online modules on QI and patient safety through the IHI Open School and participated in an eight-week, two-hour flipped classroom discussion seminar class. During the same time period, the participants in the control group completed 10 online modules on QI and patient safety through the IHI Open School only. During Phase III, participants from both the experimental group and the control group completed the post-test. Both the pre-test and the post-test utilized an adapted version of the QulSKA and HPPSACS questionnaire (see Appendices F and I).

Demographics

A total of 79 of a potential 134 undergraduate baccalaureate nursing students enrolled in the *Leadership and Role Practicum* course served as participants and completed the pre-test with 37 in the experimental group and 42 in the control group. Only 64 of the original 79 participants completed the post-test with 31 in the experimental group and 33 in the control group. The actual

sample size was 64 participants. Prior to taking the pre-test, students had been randomly assigned to either the experimental group or the control group to prevent systematic bias in the groups with respect to pre-intervention attributes that could affect outcome variables.

Demographic Characteristics of the Sample

Demographic data were collected from the participants and utilized to help compare the two groups. Participant's ages ranged from 21-51 years in age, 93.8% female and 6.3% males. A comparison of demographics by group can be found in Table 5.

Table 5

Demographics Characteristic of Experiment and Control Groups (n=36)

	Variable	Experimental Group (n=31)	Control Group (n=33)
Gender	Male	3	1
	Female	28	32
	Mean Age	29.03	25.12
Ethnicity	Hispanic or Latino	2	2
	Asian	4	2
	Black or African American	5	8
	White	22	23
Prior Degree	None	13	20
	Associate	4	1
	Bachelors	14	11
	Masters	0	1

Data Analysis

This study utilized parametric techniques for data analysis, independent samples t-test, MANOVA, and MANCOVA. Data were downloaded from Survey Monkey into SPSS, labels were changed, and new variables were formed for the knowledge, skills, and attitudes questions for both QI and safety with correct answers and scale scores added. The experimental group and

control group data were merged together for purposes of data analysis. All data was examined for duplicate cases and incomplete data were removed.

Data were analyzed using Statistical Product and Service Solutions (SPSS). Prior to addressing the research questions the two groups were compared on their demographic and pretest measures of the dependent variables to assure adequacy of the random assignment. An independent samples *t*-test was completed to compare the means scores between the experimental and control group on age and the pre-test measures of knowledge, skills, and attitudes of QI and patient safety. All tests were conducted with two tailed $\alpha=.05$.

Assumptions

Parametric statistics are more powerful than non-parametric statistics, but there are certain assumptions about the data that should be met in order for the analyses to have statistical conclusion validity. It is important to check that the data meet these assumptions prior to analysis. For the purpose of this study, the researcher examined the data to assure they met assumptions related to normality, linearity, univariate and multivariate outliers, and homogeneity of variance-covariance matrices. Along with statistical assumptions, effect sizes and observed power within the MANOVAs was examined.

Normality and Outliers

Descriptive statistics and Z-scores were calculated for both the pre-test and post-test scores to check the data for the assumption of normality and to check the data for outliers. The pretest QI attitude scores were not normally distributed. The Z-scores demonstrated one outlier present for the pretest QI attitude score. The case with one outlying score was located and the participant's QI attitude score was winsorized such that a score one unit below the next lowest observed in the distribution was assigned to the participant. Winsorizing a participants' score is

a useful method to help normalize the distribution but the participant maintains his/her rank within the data. Data transformation of non-normal variables was performed but it did not change the results of the analysis. Therefore, all findings in this chapter used untransformed data.

Internal Consistency

The adapted version of the QulSKA and the HPPSACS was evaluated for internal consistency. The Cronbach’s alpha is the most widely used method for determining internal consistency. “The normal range of values is between .00 and +1.00, and higher values reflect higher internal consistency” (Polit & Beck, 2012, p. 333). According to Pallant (2010), a scale should ideally have a Cronbach's alpha coefficient of .70 or higher. The Cronbach's alpha coefficient was computed on the full set of Likert -type items from the combined QulSKA and HPPSACS tool (39 items) and separately for each Likert-type items from the QulSKA and HPPSACS tools on skill and attitudes of QI and safety items. The Cronbach's alpha coefficient for the adapted QulSKA and HPPSACS tool was .88, which exceeds the minimally acceptable range of .70. The Cronbach's alpha coefficient for the Likert-type items from the HPPSACS tool (23 items) was .61. The Cronbach's alpha coefficient for the Likert-type items taken from the QulSKA tool (16 items) was .92. The Cronbach's alpha coefficient for separated scales results are reported in Table 6.

Table 6

Alpha Reliability Analysis

Tool	Number of Items	Cronbach's alpha coefficient
Skill of QI (QulSKA) N=9	9	.93
Skill of Safety (QulSKA) N=3	3	.91
Skill of Safety (HPPSACS) N=5	5	.90
Attitudes of QI (QulSKA) N=3	3	.60
Attitudes of Safety (HPPSACS & QulSKA)	18/1	.40

**Comparison of the Experiential and Control Groups on Age and Pre-Test Scores for
Dependent Variables**

Independent sales t-tests were used to compare the experimental and control groups on age and the pre-test scores for knowledge, skills, and attitudes for QI and safety. Results are reported in Table 7. The experimental group was significantly older than the control group. No other significant differences between the groups were noted for pre-test scores for the dependent variables.

Table 7

Independent Sample t-test for Pre-Test Scores

Variable	N	Mean	SD	df	Mean _D	t	Sig.
Age							
Experimental	31	29.03	7.92	62	3.91	2.31	.024
Control	33	25.12	5.47				
Knowledge QI							
Experimental	31	.69	.206	62	.09	.18	.860
Control	33	.70	.175				
Knowledge Safety							
Experimental	31	.67	.124	62	.06	1.67	.101
Control	33	.61	.147				
QI Skill							
Experimental	31	20.80	6.30	62	1.58	.91	.367
Control	33	18.96	6.99				
Safety Skill							
Experimental	31	22.06	5.35	62	.83	1.27	.207
Control	33	20.48	4.52				
QI Attitude							
Experimental	31	11.25	1.06	62	.19	-.08	.941
Control	33	11.06	1.78				
Safety attitude							
Experimental	31	51.41	3.87	62	1.16	-1.22	.225
Control	33	52.57	3.67				

Note: Mean_D = Mean Difference SD=Standard Deviation.

Research Questions Analyzed

Knowledge, Skills, and Attitudes of QI

In this section, research questions one, three, and five will be addressed. The questions are 1) is there a significant difference in pre-licensure nursing students' knowledge of quality improvement as measured by test scores based on type of educational program on quality improvement (online in conjunction with a flipped discussion classroom seminar vs. online modules only); 3) is there a significant difference in pre-licensure nursing students' attitudes about quality improvement as measured by self-reported attitude scores based on type of educational program on quality improvement (online in conjunction with a flipped discussion classroom seminar vs. online modules only); and 5) is there a significant difference in pre-licensure nursing students' comfort with skills of quality improvement as measured by self-reported skill scores based on type of educational program on quality improvement (online in conjunction with a flipped discussion classroom seminar vs. online modules only)?

To answer research questions one, three, and five, a one-way between groups MANOVA was performed to investigate the differences between the experimental group and the control group on knowledge, skills, and attitudes of QI. Three dependent variables were included in the analysis, knowledge, attitude, and skill scores of QI. The independent variable was type of educational program, online in conjunction with a flipped discussion classroom seminar vs. online modules only. Preliminary assumption testing for MANOVA was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance, covariance matrices, and multicollinearity, with no serious violations noted. There was a statistically significant omnibus effect for the difference between the experimental group and the control

group on the composite of dependent variables, $F(3, 60) = 3.236$, $p = .028$; Wilks Lambda = .86; partial eta squared = .139, the observed power was .716.

However, when the results of the dependent variables were considered separately, there was no significant univariate difference between the experimental and control groups for any of the variables. An inspection of the mean scores indicated that the experimental group had slightly higher knowledge scores ($M = .70$, $SD = .15$) than the control group ($M = .62$, $SD = .20$), slightly higher skill scores, ($M = 29.00$, $SD = 8.41$) than the control group ($M = 25.333$, $SD = 8.54$) and had slightly similar attitude scores ($M = 11.19$, $SD = .980$) than the control group ($M = 11.57$, $SD = .830$). To further explore the data, participants' attitudes about QI and comfort with skills with QI were examined at the item level. These results are presented in Table 8 and 9.

Table 8

Attitude of QI

Attitude QI Scale 1-4	Experimental Median Score	Control Median Score
Importance of teamwork in patient outcomes	4.00	4.00
Importance of performance measurement to patient outcomes	4.00	4.00
Importance nurses participation in QI projects	4.00	4.00

With respect to attitudes about QI, overall attitudes were highly positive for both groups with a median of 4.0 on a four-point Likert scale. For QI skills, overall, the experimental group had higher medians for the QI skills compared to the control groups reporting lower skills in the areas of patient charts, and the control group reporting additional low skills in control charts and QI methodology.

Table 9

QI Skills

QI Skills Scale 1-6	Experiential Median Score	Control Group Median Score
Pie Charts	4.00	4.00
Graphical Representation	4.00	3.00
Collecting Data	3.00	3.00
Process Mapping	3.00	3.00
Histograms	3.00	3.00
Run Charts	3.00	3.00
QI Methodology,	3.00	2.00
Control Charts	3.00	2.00
Pareto Charts	2.00	2.00

Knowledge, Skills, and Attitudes of Safety

In this section, research questions two, four, and six will be addressed. The questions are 2) is there a significant difference in pre-licensure nursing students' knowledge of patient safety as measured by test scores based on type of educational program on quality improvement (online in conjunction with a flipped discussion classroom seminar vs. online modules only); 4) is there a significant difference in pre-licensure nursing students' attitudes about patient safety as measured by self-reported attitude scores based on type of educational program on quality improvement (online in conjunction with a flipped discussion classroom seminar vs. online modules only); and 6) is there a significant difference in pre-licensure nursing students' comfort with skills of patient safety as measured by self-reported skill scores based on type of educational program on quality improvement (online in conjunction with a flipped discussion classroom seminar vs. online modules only)?

To answer research questions two, four, and six, a one way between groups multivariate analysis of variance was performed. The one way between groups MANOVA was performed to investigate the differences between the experimental group and the control group on knowledge, skills, and attitudes of safety. Three dependent variables were included in the analysis, knowledge, attitude, and skill scores of safety. The independent variable was type of educational program, online in conjunction with a flipped discussion classroom seminar vs. online modules only. Because age was significantly correlated with knowledge of safety, a MANCOVA was used to address the research questions with age as a covariate. Preliminary assumption testing for MANCOVA was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance, covariance matrices, and multicollinearity, with no serious violations noted. There was no statistically significant omnibus effect for the difference between the experimental group and the control group on the combined dependent variable after adjusting for the covariate of age, $F(3, 59) = .652, p = .59$; Wilks Lambda = .968; partial eta squared .032, the observed power is .179. An inspection of the mean scores indicated that the experimental group had slightly higher knowledge scores ($M = .73, SD = .108$) than the control group ($M = .68, SD = .157$), slightly higher skill scores, ($M = 25.77, SD = 6.89$) than the control group ($M = 25.4, SD = 6.58$) and slightly lower attitude scores ($M = 51.58, SD = 3.87$) than the control group ($M = 53.6, SD = 7.60$). To further explore the data participants' attitudes about patient safety and comfort with skills of patient safety were examined at the item level and results are presented in Table 10 and Table 11.

Table 10

Attitudes of Patient Safety

Attitude of Patient Safety Scale 1-5	Experimental Median Score	Control Median Score
41. Only physicians can determine cause of an error	5.00	4.00
46. Faculty and staff communicate importance of safety	5.00	5.00
52. If I saw an error I would keep it to myself	4.00	4.00
51. If no harm to patient no need to report	4.00	4.00
39. Competent professional do not make errors	4.00	4.00
44. Learning how to improve safety	4.00	4.00
40. Healthcare professional should work to improve care	4.00	4.00
38. Making errors is inevitable	4.00	4.00
53. Most errors can't do anything about	4.00	4.00
48. Reporting systems do little to reduce error	4.00	4.00
36. How important is standardization of process to patient safety	4.00	4.00
55. Gap between best care and what is provided	3.00	3.00
49. Physicians should report errors to patient	4.00	3.00
50. Effective responses to error focus on personal involved	4.00	3.00
54. An effective strategy to prevent is work harder	3.00	2.00
47. Healthcare workers routinely report errors	3.00	3.00
45. Healthcare workers share medical errors and cause	2.00	3.00
43. Culture makes easy to deal with errors	2.00	3.00
42. Healthcare workers should not tolerate uncertainty	2.00	3.00

Overall, the experimental group had slightly higher medians for attitudes about patient safety except for items, 45, 43, and 42 which pertained to sharing medical errors, culture of

safety, and tolerating uncertainty. Where the experimental group had slightly lower medians, the control group reported lowest medians in areas of effective strategies to prevent errors, item 54.

Table 11

Comfort with Patient Safety Skills

Comfort Skills of Patient Safety Scale (1-6)* or (1-5)**	Experimental Median Score	Control Median Score
68. Supporting a peer on how to respond to an error*	4.00	4.00
32. Root Cause Analysis**	3.00	3.00
31. Error Reporting Systems**	3.00	3.00
59. Disclosing an error to faculty*	4.00	4.00
56. Completing an incident report*	4.00	3.00
57. Analyzing a case to find cause of an error*	4.00	3.00
60. Disclosing an error to another healthcare professional*	4.00	4.00
33. Failure Modes & Effect Analysis**	2.00	3.00

Overall, the experimental group had slightly higher medians for skills about patient safety except for items 33, which pertained to the use of failure modes and effect analysis.

Chapter Summary

Data were collected and analyzed for the purpose of evaluating the effectiveness of two teaching strategies on pre-licensure baccalaureate nursing student's knowledge, skills, and attitudes of QI and patient safety. While there was a significant omnibus effect for the difference between the experimental and control groups' knowledge, skills, and attitudes of QI, no univariate difference were demonstrated. Data were equivocal about whether the use of online modules in conjunction with a flipped classroom discussion seminar was more effective than the use of online modules only on participants' knowledge, skills, and attitudes of QI. However item level data suggested the experimental group had higher medians for QI skills compared to the

control group. Due to a small sample size and low observed power these findings should be interpreted with caution.

There was no statistically significant omnibus effect for the difference between the experimental and control group for knowledge, skills, and attitudes of safety. These results do not support the use of one teaching strategy over the other. Due to a small sample size and low observed power, these result should be interpreted with caution.

CHAPTER V:

DISCUSSION

The purpose of the study was to evaluate the effectiveness of two teaching strategies, online modules only versus online modules in conjunction with a flipped classroom discussion seminar on pre-licensure baccalaureate nursing students' knowledge, skills, and attitudes about QI and patient safety. The study used a pre-test post-test control group design. This chapter presents a summary of the findings of the data presented in Chapter IV along with a summary of the results, conceptual framework, limitations of the study, conclusions, implications for nursing education, recommendations for further research, and contributions of the study.

Summary of the Study

The findings of this study demonstrated the beginning knowledge, comfort with skills, and attitudes towards QI and patient safety of a group of pre-licensure baccalaureate nursing students. After baseline knowledge was established, students were divided into an experimental group and a control group. The experimental group completed ten online modules on QI and patient safety through the IHI Open School and participated in an eight-week flipped classroom discussion seminar. The control group completed ten online modules on QI and patient safety through the IHI Open School only. The experimental group and control group's post-test scores were compared with the groups mean pre-test scores to determine the effectiveness of the two teaching strategies. The results of the post-test demonstrated a statistically significant omnibus effect between the experimental group and control groups on knowledge, skills, and attitudes of QI $p=.028$. However, univariate analysis demonstrated no statistically significant difference

between the experimental group and control group's knowledge, skills, and attitudes of patient safety $p=.59$. The six guiding research questions for this study were:

1. Is there a significant difference in pre-licensure nursing students' knowledge of quality improvement as measured by test scores based on type of educational program on quality improvement (online modules in conjunction with flipped discussion classroom seminar vs. online modules only);
2. Is there a significant difference in pre-licensure nursing students' knowledge of patient safety as measured by test scores based on type of educational program on patient safety (online modules in conjunction with flipped discussion classroom seminar vs. online modules only);
3. Is there a significant difference in pre-licensure nursing students' attitudes about quality improvement as measured by self-reported attitude scores based on type of educational program on quality improvement (online modules in conjunction with flipped discussion classroom seminar vs. online modules only);
4. Is there a significant difference in pre-licensure nursing students' attitudes of patient safety as measured by self-reported attitude scores based on type of educational program on patient safety (online modules in conjunction with flipped discussion classroom seminar vs. online modules only);
5. Is there a significant difference in pre-licensure nursing students' comfort with skills of quality improvement as measured by self-reported skill scores based on type of educational program on quality improvement (online modules in conjunction with flipped discussion classroom seminar vs. online modules only);
and

6. Is there a significant difference in pre-licensure nursing students' comfort with skills of patient safety as measured by self-reported skill scores of patient safety based on type of educational program on patient safety (online modules in conjunction with flipped discussion classroom seminar vs. online modules only)?

Major Findings of the Study

The results of the present study demonstrated a statistically significant omnibus effect for the difference between the experimental group and control groups' knowledge, comfort with skills, and attitudes of QI, $p=.028$. However, these differences were not statistically significant. The item level data for attitudes and skills suggest the experimental group had higher medians for QI skills. However because of low power and ceiling effect for QI attitudes, more research is needed for use of the flipped classroom.

Research has shown that active learning strategies, such as those used in a flipped classroom, improves outcomes in student knowledge, skills, and leads to increased confidence, collaboration, and critical thinking (Greer et al., 2010). The use of the flipped classroom in the present study with the experimental group allowed students to be introduced to the QI and safety topics prior to coming to class. Class time, using the flipped classroom discussion seminar pedagogy, allowed students to become active participants in the learning environment and to become more fully engaged with the QI and safety content.

The item level analysis of the data, while weak, are consistent with other research conducted on the use of the flipped classroom. Moravec, Williams, Aguilar-Roca, and O'Dowd (2010) found that students who had participated in a flipped classroom demonstrated significantly higher exams scores. Missildine, Fountain, Summers, and Gosselin (2013) conducted a quasi-experimental study with a sample of 589 nursing students to determine the

effectiveness of the use of a flipped classroom on academic success and satisfaction. The results of their study demonstrated examination scores were higher for the flipped classroom group than students who had participated in lecture only lecture plus lecture capture. Goodwin and Miller (2013) collected data on 453 teachers who had flipped their classroom. The results of their study demonstrated that 67% of the teachers reported increased test scores.

The item level analysis of the data, while weak, are consistent with other research conducted on the use of a discussion seminar. Johnson and Mighten (2005) found that students that had structured lecture notes and participated in structured group discussion had significantly higher examination scores than students that had received lecture only.

The results of the study showed no statistically significant difference between the experimental and control groups knowledge, skills, and attitudes of patient safety, $p=.59$. The results of the study do not support the use of one teaching strategy over the other as being more effective in improving participant's knowledge, comfort with skills, or attitudes of patient safety. The results should be interpreted with caution due to a small sample size and low observed power. The study may have lacked sufficient power to detect any significant effect even if one actually existed. Although there was no statistically significant difference between the two groups, the experimental group did have higher knowledge scores of patient safety. Both groups raised their knowledge of patient safety scores between pretest and post-test, and both groups raised their comfort with skills of QI scores between pretest and post-test. These results suggest that both teaching strategies positively influenced students' knowledge and skills of patient safety.

Prior research on online learning, such as the use of online modules, has been shown to be a strong method for providing information to students; yet it lacks the ability to provide

significant doing and observing experiences (Fink, 2003). Kala, Isaramalai, and Pohthong (2010) found that the use of technology alone will not guarantee that students have the learning outcomes desired. Dennison (2011), in a pretest/posttest format study on a sample of 60 nephrology nurses, demonstrated an improvement a 20% improvement between the pretest and the posttest scores.

Limited research has been conducted on nursing student's attitudes of QI and patient safety. Only two studies were found in the literature, Sullivan et al. (2009) and Chenot and Daniel (2010). Both of these studies collected data on nursing student's attitudes, but neither study attempted to make a change in student's attitudes. Although the present study demonstrated a statistically significant difference in participant's attitudes of QI, the experimental group actually dropped their attitudes of QI scores slightly between the pre-test and the post-test, and the experimental group raised their attitudes of QI score slightly between the pre-test and posttest.

Although there was no significance difference between the group's patient safety attitude scores, the control group raised their safety attitude score more than the experimental group. These finding would suggest the online modules only had more effect on increasing participant's attitudes of QI and patient safety than the online modules in conjunction with the flipped classroom discussion seminar. This study had a small sample size, for that reason these results warrant further study with a larger sample. The alpha reliability of the QI and safety attitudes scale was both low at Cronbach's alpha of QI (.60), and safety (.40), suggesting further psychometric testing should be conducted on these scales.

Conceptual Framework: QSEN

The conceptual framework for this study was the QI and Safety QSEN competencies along with their KSAs. For a full list of the QI and Safety QSEN competencies along with their KSAs, see Appendix A. The results of this study demonstrated that the use of online modules, though the IHI Open School, in conjunction with a flipped classroom discussion seminar was an effective pedagogy that nursing faculty could use to integrate the QI and patient safety QSEN competencies along with their KSA'S into the curricula. Following is a discussion of the QSEN QI and safety competencies introduced through the IHI Open School courses.

QI QSEN KSAs

The IHI Open School modules on QI introduced students to the QI knowledge competencies of outcomes of care, the importance of variation and measurement to assess quality, the healthcare professional's role in parts of systems of care and care processes that affect patient outcomes, and describe approaches for changing processes of care. Students were introduced to QI skills pertaining to QI projects in the care setting, how to use tools such as flow charts, how to participate in a root cause analysis of a sentinel event, how to use cause and effect diagrams in making processes care explicit, control charts and run charts that demonstrate variation, how to design a small test of change using the Plan-Do-Study Act (PDSA) cycle, and how to use measures to evaluate change. Through the use of a flipped classroom discussion seminar students were able to discuss QI knowledge, practice QI skills, and become aware of their attitudes of QI, such as how to appreciate the necessity of quality improvement as part of the daily work of all healthcare professionals, how to value their own contributions to patient outcomes, how to appreciate how value measurement can demonstrate good patient care, how

unwanted variations affect care, how to appreciate the value of change, and how individuals and teams can improve care that were introduced through the IHI Open School Modules.

Safety QSEN KSAs

The IHI Open School Modules on patient safety introduce students to the safety knowledge QSEN competencies of examining human factors and other basic safety design principles, unsafe practices used by nurses such as work-arounds, the benefits and limitations of selected safety-enhancing technologies such as barcoding, effective strategies to reduce reliance on memory, and factors that create a culture of safety such as communication and error reporting systems. Students are introduced to the safety skills of technology used to demonstrate standardized practices that support safety and reduce reliance on memory such as forcing functions and checklists, strategies to reduce risk of harm to self and others, how to communicate observations or concerns related to hazards and errors to patients, and how to use organization error reporting systems for near miss and error reporting. Through the use of the flipped class discussion seminar students were allowed to practice, discuss, and become aware of their safety attitudes such as value the contributions of standardization to safety, appreciate the cognitive and physical limits of human performance, and value their own role in preventing errors.

This study was the first known study to evaluate the efficacy of the IHI Open School modules on nursing student's knowledge, skills, and attitudes of QI and patient safety. The use of the online modules as a pedagogy demonstrated effectiveness in introducing participants to the QI and patient safety QSEN competencies. The results of this study suggest the use of the IHI Open School modules in conjunction with the flipped classroom discussion seminar were a more effective pedagogy than the use of the online modules alone. These finding would suggest further evaluation of students learning after completion of the IHI Open School modules is

needed. This study had a small sample size; therefore, further study of the IHI Open School modules should be conducted utilizing a larger sample size

Limitations of the Study

The present study has limited generalizability. The study was conducted using one nursing class at one university setting. Students in this setting may be atypical of other students with the same geographical area and or nationally. A convenience sample of students was used and student participation in the study was voluntary.

A power analysis was conducted prior to the study which determined a sample size of 60 students in each group would provide adequate statistical power of .80 or greater to detect .5 standard deviation difference between the two groups on the measure of knowledge, skills, and attitudes in the area of QI and safety. Although 97 students consented to complete the study, only 79 students completed the pre-test, 37 in the experimental group and 42 in the control group. At the time of the post-test, the intermediary spoke to the students about the importance of completing the post-test if they had completed the pre-test. The post-test was open for a total of three weeks. Several e-mails were sent to students asking them to please complete the post-test. There were a total of 70 students who completed the post-test, but only 64 students completed both the pre-test and the post-test. Therefore the projected sample size of 60 students per group to meet statistical power was not met.

According to Tabachnick and Fidell (2007), while significance might demonstrate differences between groups, calculating the effect size will reflect the proportion of variance in the dependent variables that is associated with the independent variables. A value of effect size in a two-group test of mean differences is estimated at .20 for small effect, .50 for medium effects, and .80 for large effects. Cohen (1988) concluded that a power of .80 is considered to be

an acceptable level. The effect size for the present study for knowledge, skills, and attitudes of QI was partial eta squared of .139 or 13.9% variance and observed power of .72. The effect size for the present study for knowledge, skill, and attitudes of safety, adjusted for age, were partial eta squared of .032 or 3.2% and observed power of .179. As the observed power is not above .80 for either QI or safety the results should be interpreted with caution due to the lower observed power. The investigator concludes that the study lacked sufficient power to detect any significant effect even if one actually exists. This would be reasonable due to the sample size of 31 in the experimental group and 33 in the control group.

The use of a new adapted tool could have caused a threat to internal validity. The scale scores for attitudes of QI and Attitudes of Safety both demonstrated low Cronbach's alpha and low test-retest reliability coefficients this may have been due to the small sample size, and time between pre-test and posttest. According to Polit and Beck (2012), attitudes are one attribute that may change between test-retest. Typically reliability coefficients tend to be higher on these items when tests are administered less than a month apart.

Conclusions of the Study

The present study was the first known study to test the efficacy of the IHI Open School courses on baccalaureate-nursing students' knowledge, skills, and attitudes of QI and patient safety. The results of this study demonstrated that the online modules through the IHI Open School in conjunction with the flipped classroom discussion seminar had more effect on pre-licensure nursing student's knowledge of QI and patient safety, and comfort with skills of QI and patient safety than the online modules only. Neither teaching strategy had an effect on students' attitudes of QI and patient safety. Although the online modules in conjunction with the flipped classroom discussion seminar proved to be more effective, participants who completed the online

modules only did raise their comfort with skills of QI and safety scores showing that the online modules only did have some effect. Participants who completed the online modules only actually lowered their knowledge of QI scores an average of eight points between pretest and post-test, but they did raise their knowledge of safety score an average of seven points demonstrating that the online modules only did have some effect on participant's knowledge of safety.

The adapted QulSKA and HPPSACS tool demonstrated reliability with a Cronbach's alpha of the entire tool of .88, which exceeds the minimally acceptable range of .70. The attitudes of QI and safety scales did not demonstrate reliability with a Cronbach's alpha for attitudes of QI at .60 and attitudes of safety at .40 both which fall below the minimally acceptable range of .70. This could be due to a lower sample size, and further psychometric testing of the instruments should be completed with a larger sample to check for reliability of the attitude scales. Although the attitude scales did not demonstrate reliability, the participant's scores gave the investigator insight into student's current attitudes of QI and safety that could be used to develop further educational programs.

Implications for Nursing Education

Nurses play an important role both in QI and patient safety efforts that lead to safer outcomes for patients. Since the IOM report *Too Err Is Human: Building a Safer Health System* (Kohn et al., 1999) and the establishment of the QSEN conceptual framework, nursing education has been challenged to graduate nurses who have a beginning knowledge in QI and patient safety methodology (Barnsteiner et al., 2013; AACN, 2008). Most nursing faculty members completed their "education prior to the emphasis on quality improvement (QI) processes, safety, and error prevention techniques" (Sherwood & Drenkard, 2007, p. 154). With many faculty members feeling stressed due to the current faculty shortage, already crowded curricula, and lack of

comfort with teaching the QI and safety QSEN competencies, it is important to help faculty members find creative, easy, and innovative methods to incorporate the QI and safety QSEN competencies.

This study provided weak initial support for one effective strategy to increase students' knowledge and skills of QI and patient safety. The IHI Open School Modules provided an efficient way to introduce students to the QSEN concepts of QI and patient safety but the investigator would suggest augmenting the content with further teaching such as a flipped classroom discussion seminar.

The adapted QulSKA and HPPSACS tool can be used to demonstrate student's current attitudes about QI and patient safety and comfort with skills of QI and patient safety. The QSEN competencies state that an expected outcome for graduates of a baccalaureate-nursing program is that students demonstrate a prescribed set of knowledge, skills, and attitudes of quality improvement and safety. This information, when collected, could be useful to faculty in demonstrating that the QSEN competencies of QI and safety outcomes have been met or demonstrate areas of weakness that need further development. The data could be used to inform nursing curriculum revision including the addition of a course.

The participants in this study demonstrated the need for further education on the use of QI skills such as pareto charts, control charts, QI methodology, run charts, histograms, process mapping, and collecting data. The participants rated each of these skills as being familiar with or having some understanding, but did not feel skilled or proficient with the use of these techniques. Participants did demonstrate high attitudes toward the value of QI. The participants in this study demonstrated the need for further education on the use of safety skills such as how to conduct a root cause analysis, use of error reporting systems, and failure modes and effect analysis. The

participant's attitudes of patient safety were low in the areas around the culture of safety between healthcare workers, the code of silence that prevails in healthcare around medical errors, and where healthcare workers should tolerate uncertainty in patient care. The participants were neutral in their attitudes towards the gap between "best care" and what one provides on a daily basis, that an effective strategy after an error occurs is to work harder, and that healthcare workers routinely report errors. These items could be further enhanced through classroom discussion, practice in the skills lab, simulation, and post clinical conferences.

The IHI Open School courses could be used to enhance faculty development in the areas of QI and patient safety. The IHI courses address all of the QSEN QI and safety competencies along with their knowledge, skills, and attitudes. Nurse educators need to learn to speak the language of QI and patient safety along with their KSAs. This will allow faculty to feel more comfortable with teaching these concepts.

Recommendations for Further Research

The present study was the first known study to test the efficacy of the IHI Open School courses on baccalaureate-nursing student's knowledge, skills, and attitudes of QI and patient safety. The current study looked at the effectiveness of two teaching strategies on student nurse's knowledge, skills, and attitudes of QI and safety. There are significant opportunities for future research on effective pedagogies to incorporate the QI and safety QSEN competencies into nursing curricula.

One recommendation for a future study would be to continue to build on the results of the current study and examine the efficacy of the IHI Open School courses utilizing a larger sample size and more diverse population. Studies could include multiple sites and inclusion of associate degree, masters, and doctoral nursing students.

A second recommendation for a future study would be to conduct further research on the use of the flipped classroom in nursing education.

A third recommendation for a future study would be an examination of nursing faculty's current knowledge, comfort with skills, and attitudes of QI and safety. Faculty development in the area of QI and safety is essential to spreading content throughout the nursing curriculum. The efficacy of the IHI Open School courses could be tested with nursing faculty members.

A fourth recommendation for a future research study would be to conduct further testing of the QulSKA and the HPPSACs tools to establish reliability.

Contributions of the Study

The present study was the first known study to test the efficacy of the IHI Open School courses on baccalaureate nursing student's knowledge, skills, and attitudes of QI and patient safety, which is the study's most significant contribution. According to the IHI Open School website at the current time, over 61 universities are utilizing the IHI open school modules. The courses are offered for free to both faculty and students. According to Mike Briddon, managing editor of the IHI Open School, the IHI Open School is interested in research that measures the impact of learning from the IHI Open school modules on local settings (Briddon, 2013). Due to the small sample size, the results of the study warrant further investigation with a larger sample before any conclusions can be drawn about the most effective method prompting the knowledge, skills, and attitudes of QI and safety.

The present research adds to a growing body of research on effective teaching strategies to incorporate the QSEN competencies with their KSAs into the nursing curricula. It is one of only a few studies that measures student's current knowledge, skills, and attitudes of the QI and safety QSEN competencies. Previous research has demonstrated that the QI QSEN competency

was one topic that student's perceived as least addressed in their curriculum (Sullivan et al., 2009).

Conclusion

Since the IOM report and the establishment of QSEN nurse educators have been challenged with discovering effective teaching strategies to infuse the QSEN competencies into the nursing curricula. *The Future of Nursing Report* (2011) has called for a need to transform nursing education. Nurse educators are being challenged to break away from traditional established patterns of teaching and consider new innovative teaching strategies (Hodges, 2011).

This study's purpose was to evaluate the effectiveness of two teaching strategies, online modules only versus online modules in conjunction with a flipped classroom discussion seminar on nursing student's knowledge, skills, and attitudes of QI and patient safety. Data were collected on 64 pre-licensure baccalaureate-nursing students from one university in the southeastern United States. The results of the data demonstrated that the use of the online modules in conjunction with the flipped classroom had an effect in increasing nursing student's knowledge of QI and patient safety and was effective in increasing participant's comfort with skills of QI. The results of the data demonstrated that both teaching strategies had an effect on nursing student's comfort with skills of patient safety and QI. The results of the data demonstrated that neither teaching strategy had an effect on nursing student's attitudes of QI and patients safety.

The present study had a small sample size (n=64) with observed power of .72 on knowledge, skills, and attitudes of QI and .179 on knowledge, skills, and attitudes of safety. The observed power was below the acceptable level of .80 and should be interpreted with caution. The investigator concludes that the study lacked sufficient power to detect any significant effect

even if one actually existed and recommends further testing utilizing a larger sample size and more diverse population.

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Appendix A

Quality Improvement

Definition: Use data to monitor the outcomes of care processes and use improvement methods to design and test changes to continuously improve the quality and safety of health care systems.		
Knowledge	Skills	Attitudes
Describe strategies for learning about the outcomes of care in the setting in which one is engaged in clinical practice	Seek information about outcomes of care for populations served in care setting. Seek information about quality improvement projects in the care setting	Appreciate that continuous quality improvement is an essential part of the daily work of all health professionals
Recognize that nursing and other health professions students are parts of systems of care and care processes that affect outcomes for patients and families. Give examples of the tension between professional autonomy and system functioning	Use tools (such as flow charts, cause-effect diagrams) to make processes of care explicit. Participate in a root cause analysis of a sentinel event	Value own and others' contributions to outcomes of care in local care settings
Explain the importance of variation and measurement in assessing quality of care	Use quality measures to understand performance. Use tools (such as control charts and run charts) that are helpful for understanding variation Identify gaps between local and best practice	Appreciate how unwanted variation affects care. Value measurement and its role in good patient care
Describe approaches for changing processes of care	Design a small test of change in daily work (using an experiential learning method such as Plan-Do-Study-Act) Practice aligning the aims, measures and changes involved in improving care Use measures to evaluate the effect of change	Value local change (in individual practice or team practice on a unit) and its role in creating joy in work. Appreciate the value of what individuals and teams can do to improve care

(QSEN Institute, n.d. Table 1 and Table 2)

Appendix B

Safety

<p>Definition: Minimizes risk of harm to patients and providers through both system effectiveness and individual performance.</p>		
Knowledge	Skills	Attitudes
<p>Examine human factors and other basic safety design principles as well as commonly used unsafe practices (such as, work-arounds and dangerous abbreviations) Describe the benefits and limitations of selected safety-enhancing technologies (such as, barcodes, Computer Provider Order Entry, medication pumps, and automatic alerts/alarms) Discuss effective strategies to reduce reliance on memory</p>	<p>Demonstrate effective use of technology and standardized practices that support safety and quality. Demonstrate effective use of strategies to reduce risk of harm to self or others Use appropriate strategies to reduce reliance on memory (such as, forcing functions, checklists)</p>	<p>Value the contributions of standardization/reliability to safety. Appreciate the cognitive and physical limits of human performance</p>
<p>Delineate general categories of errors and hazards in care. Describe factors that create a culture of safety (such as, open communication strategies and organizational error reporting systems)</p>	<p>Communicate observations or concerns related to hazards and errors to patients, families and the health care team. Use organizational error reporting systems for near miss and error reporting</p>	<p>Value own role in preventing errors</p>
<p>Describe processes used in understanding causes of error and allocation of responsibility and accountability (such as, root cause analysis and failure mode effects analysis)</p>	<p>Participate appropriately in analyzing errors and designing system improvements. Engage in root cause analysis rather than blaming when errors or near misses occur</p>	<p>Value vigilance and monitoring (even of own performance of care activities) by patients, families, and other members of the health care team</p>
<p>Discuss potential and actual impact of national patient safety resources, initiatives</p>	<p>Use national patient safety resources for own professional</p>	<p>Value relationship between national safety campaigns and</p>

Appendix C

Correspondence with IHI Open School

From: Michael Briddon <mbriddon@IHI.org>
Sent: Monday, February 25, 2013 9:14 AM
To: Karen L. Maxwell
Subject: RE: Research needs for IHI open school (1)

Hi Karen,

No, you don't need special permission. Please just appropriately cite the source in any presentations or publications.

And yes, please stay in touch as you develop your topic. I'm happy to help in any way I can.

Best,
Mike

Michael Briddon
Managing Editor
[IHI Open School for Health Professions](#)
Institute for Healthcare Improvement
P: 617-301-4983
mbriddon@ihi.org

From: Michael Briddon <mbriddon@IHI.org>
Sent: Monday, August 26, 2013 10:36 AM
To: Karen L. Maxwell
Subject: RE: IHI Open school courses

Hi, Karen –

It's nice to hear from you. I'm really excited about the work you'll be conducting around the IHI Open School courses.

In terms of course development:

The courses are created by world-renowned IHI faculty. In a nutshell, we tapped our top experts (Don Berwick, Lucian Leape, Lloyd Provost, Jim Reinertsen) to create a curriculum that would teach the basics of quality improvement, patient safety, and leadership. Now, as we've grown, we've spread into new topic areas, including person- and family-centered care, health care operations, and population health. We have an internal editorial team – several members of the Open School team and some physician advisors – that closely examines how learners interact with our courses and thinks through what topics/areas we should focus on next.

We keep a close focus on changing trends in education and do our best to ensure our content is interactive and engaging. We also keep a close eye on all the feedback we get from end-of-course surveys to make improvements in the future. Lastly, we ensure we have a steady stream of engaging standalone content on our website that can help complement the lessons presented within our curriculum. The purpose of this is to bring new visitors to our site and provide faculty with an easy way to integrate different courses into their curricula.

I hope this information is helpful. If you need anything else, just let me know.

Thanks,
Mike

Michael Briddon
Senior Managing Editor
[IHI Open School for Health Professions](#)
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Karen L. Maxwell

From: Michael Briddon <mbriddon@IHI.org>
Sent: Thursday, February 21, 2013 1:07 PM
To: Karen L. Maxwell
Subject: RE: Research needs for IHI open school (1)

Hi Karen,

My name is Mike Briddon and I'm the Managing Editor of the IHI Open School. Thanks for your email and your offer, and sorry for the delay – these four-day weeks always turn into the busiest ones for some reason!

Two possibilities came to mind when I read your email:

1. A few schools that are using the courses are starting to understand the efficacy of the education. It would be great feedback for us – and perhaps something that could become publishable – if you're interested in developing a project that measures the impact of the learning in your local setting.
2. We're trying to identify all of the different schools and organizations that are using the IHI Open Schools within their curricula and training. Because we offer the courses for free on our site, professors often don't tell us when they are using one of our modules. This is a trend that has caught on during the past year and we'd love to some help in trying to identify who is using the courses, how they are using them, and what positive effects (we hope!) they are having.

Does either of those ideas appeal to you? I'm happy to set up a phone call in the coming week or two if you'd like to explore further.

Thanks,
Mike

Michael Briddon
Managing Editor
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Appendix D

IHI Open School Courses

Course Name	Course Description
PS 102: Human Factors and Safety	This course is an introduction to the field of “human factors”: how to incorporate knowledge of human behavior, especially human frailty, in the design of safe systems.
PS 103: Teamwork and Communication	In this course, students will learn what makes an effective team.
PS 104: Root Cause and System Analysis	This course introduces students to a systematic response to error called root cause analysis (RCA).
PS 105: Communicating with Patients after Adverse Events	In this course, students will learn why communicating with patients after adverse events can feel so difficult for health care professionals – and why it’s nonetheless essential
PS 106: Introduction to a Culture of Safety	This course introduces students to a culture of safety, encouraging people to speak up about safety concerns, to talk about mistakes, and errors and how to learn from these events.
QI 102: The Model for Improvement: Your Engine for Change	This course will teach students how to use the Model for Improvement to improve everything from their tennis game to hospital’s infection rates.
QI 103: Measuring for Improvement	In this course, students will learn how to use three basic kinds of measures: outcome, process, and balancing measures. Students will learn how to collect, display, and interpret data.
QI 104: The Life Cycle of a Quality Improvement Project	This course builds on the first 3 quality improvement courses, students will begin to see how people in real health care settings actually use methodologies to improve care.
QI 105: The Human Side of Quality Improvement	In this course, students will learn why culture change is crucial to the success of many improvement projects
QI 106: Mastering the PDSA Cycles and Run Charts	This practical course will teach students how to create and use three essential tools for improvement: PDSA (Plan-Do-Study-Act) templates, measurement planning forms, and run charts

(Institute For Healthcare Improvement: Open School, n.d.)

Appendix E

Guiding Questions for Discussion Seminar IHI Open School Modules

PS 102: Human Factors and Safety

1. Discuss the basic concepts of the science of human factors to healthcare scenarios.
2. Discuss how changes to processes can mitigate the effects of factors that contribute to error.
3. Discuss the basic concepts of simplification, standardization, constraints and forcing functions, and redundancies.
4. Discuss the risks and benefits of the use of technology in the creation of safe care.

PS 103: Teamwork and Communication

1. Discuss why teamwork is important to patient safety.
2. Discuss the attributes of an effective team, (i.e. characteristics and behaviors of the effective team leader, and how to conduct an effective briefing).
3. Discuss two mechanisms to encourage safe patient care transitions.
4. Discuss SBAR, and the purpose of verbal repeat back.

PS 104: Root Cause and Systems Analysis

1. Discuss how adverse events can be used as learning opportunities.
2. Discuss the purpose of a root cause analysis, which types of adverse events are appropriate for a root cause analysis.
3. Discuss how a root cause analysis can be used to address system problems in healthcare.

PS 105: Communicating with Patients after Adverse Events

1. Discuss the importance of communication after an adverse event.
2. Discuss the steps a clinician should take after an adverse event occurs.
3. Discuss the perspective of the patient, and the impact on the provider after an adverse event occurs.
4. Discuss the importance and structure of an effective apology.

PS 106: Introduction to the Culture of Safety

1. Discuss the importance of speaking up about safety concerns and comment on why this is difficult.
2. Discuss the elements of a culture of safety.
3. Discuss examples of ways in which a culture of safety can help improve the care the nurse provides.
4. Discuss ways a nurse can foster a culture of safety in their day-to-day work.

QI 102: The Model for Improvement: Your Engine for Change

1. Discuss the model for improvement to plan used to execute an improvement project.
2. Discuss the key elements of an effective aim statement.
3. Discuss the three kinds of measures: process measures, outcome measures, and balancing measures.
4. Discuss how to change concepts to come up with a good ideas to test.
5. Discuss how to test change on a small scale, using the Plan-Do-Study Act (PDSA) cycle.

QI 103: Measuring for Improvement

1. Discuss some of the key differences between measurement for improvement, measurement for accountability, and measurement for research.
2. Discuss the value of plotting data over time.

3. Discuss and identify the basic elements of a run chart.
4. Discuss the basics of sampling: why and how.

QI 104: The Life Cycle of a Quality Improvement Project

1. Discuss the four phases of an improvement project.
2. Discuss how an improvement project moves through each one of the four phases.
3. Discuss how sociologist Everett Roger's five attributes of innovations that spread, and how to apply them to an improvement project.
4. Discuss and describe the components of the IHI's Framework for Spread.
5. Discuss the Framework for Spread and how to use it for a simple project of spread.

QI 105: The Human Side of Quality Improvement

1. Discuss the three common barriers to change.
2. Discuss Everett Roger's five stages of diffusion of innovations.
3. Discuss how to leverage the differences among people for positive outcomes.
4. Discuss the concepts of intrinsic and extrinsic motivation, and how to evaluate the relative effectiveness of each.
5. Discuss how activities related to improving processes can influence the culture of an organization.

QI 106: Mastering the PDSA Cycles and Run Charts

1. Discuss the use of the Plan-Do-Study-Act (PDSA) (Cycles 1 and 2).
2. Discuss how to complete the fields of a measurement planning form.
3. Discuss how to create a run chart using an Excel-based Template.
4. Discuss sample run charts and demonstrate how charts show performance improvement run.

Appendix F

QulSKA

Age: _____

Gender: Male Female

Place of Employment: SJCRH campus Affiliate
International Outreach Site

Level of nursing education: Diploma Associates Degree BSN MSN
 Masters in another field

Year of graduation from nursing school: _____

Previous Quality Improvement training: Yes No

If yes, please list when and where and name of training program (Such as Six Sigma, PI training, etc.):

List any nursing or quality improvement certifications obtained:

Multiple Choice Questions	
Please Circle the BEST answer to the following	
1. Which of the following strategies can help nurses learn about the outcomes of care in their area of clinical practice? a. Collecting data on infection rates b. Monitoring staff satisfaction c. Implementing an education plan d. Discussing potential action plans with the surgeon	
2. Understanding the source of practice variation is important because: a. it determines the type or action required b. it identifies the root cause of the problem c. all variation, regardless of source, must be eliminated to achieve quality d. it is the first step to increasing variation	
3. Which source provides the strongest level of support for evidence-based practice? a. Meta analyses b. Randomized control trials c. Hospital policy d. Opinion of respected authorities	
4. Evidence-based practice is defined as: a. promoting the publication of research findings among practicing nurses b. dissemination of research findings at conferences c. collecting data from subjects using measurement devices	

d. integrating best research practices with clinical expertise and patient values

5. A reliable source for locating clinical practice guidelines for a new chemotherapy protocol is:

- a. State Board of Nursing
- b. Internet nursing blog
- c. Nursing textbook
- d. Oncology Nursing Society (ONS)**

6. If you were considering discussing the use of a new medication (Medication X) with physicians for pediatric post-op patients, what is your conclusion based on the studies listed below?

- a. ask the physicians to try the new drug
- b. postpone asking the physicians to try the new drug until further studies are conducted**
- c. call the pharmaceutical firm to get more information about the drug.
- d. conduct your own study

Study	Design	Sample			Setting	Findings: Pain Relief
		Size	Age	Diagnosis		
Study A	Quasi-experimental	8	Peds	post-op thoracotomy	Community hospital	Medication X more effective than Morphine
Study B	Quasi-experimental	13	adult	Cancer-related Chronic pain	Out-pt	Medication X more effective than Morphine
Study C	Randomized control trial	52	peds	trauma	Trauma-centers multi-site	Morphine more effective than Medication X

7. All of the following contribute to increased patient safety except:

- a. implementation of human factors processes in the design of medical devices and technology

<ul style="list-style-type: none"> b. use of abbreviations for common medications c. systems and processes that limit or prevent workarounds d. computerized physician order entry (CPOE) 	
<p>8. A potential drawback of using only automatic bed alarms to prevent falls</p> <ul style="list-style-type: none"> 1. not all nurses know how to use bed alarms 2. other strategies to prevent falls may not be tried 3. families may not like the bed alarms 4. there are no drawbacks with bed alarms 	
<p>9. All of the following elements are important for creating and sustaining a culture of healthcare safety except:</p> <ul style="list-style-type: none"> a. structures and systems that ensure an organization-wide awareness of patient safety performance gaps b. job descriptions that require direct accountability of leaders, managers, and frontline caregivers for closing performance gaps in patient safety c. leaders embrace a culture where safety and quality are openly discussed d. staff are reprimanded when they make 2 or more medication errors within a 6 month period <p>10. Actions immediately following a near-miss medication error indicating a culture of safety include:</p> <ul style="list-style-type: none"> a. congratulating the person that caught the error b. identifying how the error was detected c. reprimanding the person who made the error d. reporting the incident to the physician <p>11. Which of the following is an example of a culture of safety in a healthcare organization?</p> <ul style="list-style-type: none"> a. No more than 50% of the staff are agency b. Near misses are reported c. Nurses routinely work double shifts d. Most patient transfers occur during shift change 	
<p>12. Recently, a child died as a result of an overdose of chemotherapy t. Which tool can be used to help understand the causes of the error as well as allocation of responsibility and accountability?</p> <ul style="list-style-type: none"> a. Root cause analysis (RCA) b. Failure Modes and Effects Analysis (FMEA) c. Flow charting d. Brainstorming 	
<p>13. In which of the following scenarios is teamwork and patient safety enhanced?</p> <ul style="list-style-type: none"> a. A nurse asks a colleague to decipher a poorly written medication order because she is afraid to call the ordering physician. . b. The discharge planning team for a cystic fibrosis patient is led by the patient's respiratory therapist c. A doctor orders chest restraints for a patient because of litigation concerns despite the team's recommendations for 24 hour supervision without restraints. 	

<p>d. A supervisor insists that a medical nursing team assume care for a critically ill patient because there is nowhere else for the patient to be admitted.</p>	
<p>14. System facilitators to effective team functioning include all of the following except:</p> <ul style="list-style-type: none"> a. Holding meetings in the nursing break room b. Scheduling patient coverage for team members at meeting time c. Sending emails to team with their “to do’s” prior to the meeting d. Training team leaders in communication 	
<p>15. A team convenes to explore medication errors. An <u>ineffective</u> strategy to enhance team functioning would be to:</p> <ul style="list-style-type: none"> a. define the roles of all team members b. develop ground rules for communication c. include as many staff members as possible on the team d. ensure that the meeting starts and ends on time 	
<p>16. Which of the following examples best describes how technology and information management improve quality and safety in patient care?</p> <ul style="list-style-type: none"> a. a computerized physician order entry (CPOE) system that includes built in logic to check for oversights in drug selection and dosing b. sections in the electronic medical record for narrative discussion rather than drop boxes or check boxes c. distinct and separate sections for nursing and medicine to avoid confusion d. identical data fields for all specialties 	
<p>17. Which of the questions best informs the nurse of how a patient with chronic pain manages his/her comfort?</p> <ul style="list-style-type: none"> a. “You appear comfortable—you aren’t in pain, are you?” b. “What is a tolerable level of pain for you?” c. “Is there medicine left in your bottle or do you need another prescription?” d. “What medicine do you take to eliminate your pain?” 	
<p>18. Which of the following are common barriers related to patients and families becoming actively involved in the patient’s health care processes?</p> <ul style="list-style-type: none"> a. cultural and religious beliefs b. a paternalistic healthcare environment c. a patient-centered care environment d. open communication between healthcare providers, patient and family 	
<p>19. An effective strategy to empower patients and families in health care processes is to:</p> <ul style="list-style-type: none"> a. Include patients and families in medical rounds b. Invite patients to help other patients with similar diagnoses. c. Request family members to call their insurer for a list of covered services d. Ask patients/families when they would like to be discharged 	
<p>20. Which of the following tools is beneficial for understanding steps of a process (such as medication administration)?</p> <ul style="list-style-type: none"> a. run chart 	

- b. control chart
- c. flow chart**
- d. Pareto chart

21. The following table shows 8 hospitals' ventilator associated pneumonia (VAP) rates per 1000 patient days for 2 consecutive years:

	VAP rate per 1000 patient days	
	2003	2004
Hospital A	10	11
Hospital B	14	13
Hospital C	16	14
Hospital D	15	15
Hospital E	11	11
Hospital F	9	10
Hospital G	8	10
Hospital H	7	6
VAP rate Mean	11.25	11.25
VAP rate Standard Deviation	3.37	2.8

The analysis of these data indicate that:

- a. There is a data collection error in 2003.
- b. The average VAP rate in 2003 was greater than 2004.
- c. There is greater variability for VAP rate among hospitals in 2003.**
- d. Year 2003's performance for VAP is better than year 2004's.

22. Which of the following studies **best** measures patient outcomes?
- a. nursing compliance with documentation of central line care
 - b. nursing compliance with the new medication policy
 - c. patient central line infection rate**
 - d. frequency of crash cart logs documentation

23. Which of the following tools help understand process variation within a clinical process such as the difference in the interval from the time from order to the first dose of an antibiotic?
- a. Pareto chart
 - b. Pie chart
 - c. Control chart**
 - d. Flow chart

24. The nurse asks the mother of a minor child to sign a consent form for a central line insertion. The mother informs the nurse that she does not understand the surgical

<p>procedure because no one has explained it to her. The nurse's best response is:</p> <ol style="list-style-type: none"> tell the patient/family not to worry—the surgeon does this particular procedure nearly every day inform the mother that the procedure is routine with rare complications before signing the consent. explain the procedure to the mother before having the consent form signed. request that the surgeon explain the procedure to the mother before obtaining consent for the procedure. 	
<p>25. When is it important to communicate to other healthcare providers the care that has been provided to a patient as well as the care that is needed by the patient?</p> <ol style="list-style-type: none"> only at shift-to-shift report only at transfer to another facility during lunch or other breaks any time there is a transition of care of the patient 	
<p>26. Standardized approaches to hand-off communication between caregivers, such as I PASS the BATON:</p> <ol style="list-style-type: none"> are important because they provide an opportunity to ask and respond to questions. are used mainly for lunch and other breaks to ensure that everything is communicated are not effective for interdisciplinary hand-offs because providers communicate differently. are used to solve system failures associated with patient hand-off. 	
<p>Please Circle the Correct Answer—True or False</p>	
<p>27. A good way to change a care process is to pilot the new process and evaluate the results before implementing changes in all areas/units of care. True False</p>	
<p>28. Patient outcomes improve when healthcare providers know how to find, critically appraise, and incorporate evidence-based practice.</p> <p style="text-align: center;">True False</p>	
<p>29. To be an effective member of a team, an individual must first understand the team's strengths, limitations, and values. True False</p>	
<p>30. Nurses have expertise to devise electronic assessment tools because of their knowledge of patient care. True False</p>	
<p>31. A barrier to using technology in healthcare is varying knowledge and experience of health care workers. True False</p>	
<p>32. Patient coordination, integration, and continuity of care are the sole responsibility of the case manager. True False</p>	
<p>Rating Questions: Circle the correct response</p>	
<p>Please rate your level of proficiency/skills with these process or terms listed in the</p>	

<p>sections below using the following scale</p> <p>1 Novice—not familiar with and never used</p> <p>2 Familiar—heard of the process/term but never used</p> <p>3 Understand—understand the process/term and have used 1-2 times</p> <p>4 Skilled--understanding of the process/term and have used 3-5 times</p> <p>5 Proficient—understand the process/term and use 6-8 times in my work</p> <p>6 Expert—understand the process/term and use >9 times in my work and am able to teach the concept to others</p>	
33. Team training 1 2 3 4 5 6	
34. Assuming the role as team member 1 2 3 4 5 6	
35. Assuming the role as team leader 1 2 3 4 5 6	
36. Locating and using high quality sources of healthcare information 1 2 3 4 5 6	
37. Using information technology to monitor outcomes of patient care 1 2 3 4 5 6	
38. Patient Centered Care 1 2 3 4 5 6	
39. Integrating religious and cultural values into the patient's plan of care 1 2 3 4 5 6	
40. Process mapping or flowcharting 1 2 3 4 5 6	
41. Quality improvement methodology such as Plan-Do-Check-Act or Six Sigma 1 2 3 4 5 6	
42. Collecting data from retrospective or concurrent chart or record review 1 2 3 4 5 6	
<u>Graphical representation of data</u> 1 2 3 4 5 6	
43. Run charts 1 2 3 4 5 6	
44. Control charts 1 2 3 4 5 6	
45. Histograms 1 2 3 4 5 6	
46. Pie charts 1 2 3 4 5 6	
47. Pareto charts 1 2 3 4 5 6	
<u>Simple statistical analysis of data</u>	
48. Measures of central tendency—mean, median, mode 1 2 3 4 5 6	
49. Standard deviation 1 2 3 4 5 6	
50. Normal (Gaussian distribution) 1 2 3 4 5 6	
<u>More complex statistical analysis of data</u>	
51. t-test 1 2 3 4 5 6	
52. Chi square 1 2 3 4 5 6	
53. ANOVA 1 2 3 4 5 6	
54. Regression analysis 1 2 3 4 5 6	
55. literature searches for relevant evidence-based practice 1 2 3 4 5 6	
56. Critical appraisal of research studies 1 2 3 4 5 6	
57. Putting most current best practices or guidelines into my everyday clinical practice 1 2 3 4 5 6	
58. Error reporting systems 1 2 3 4 5 6	
59. Root cause analysis (RCA) 1 2 3 4 5 6	
60. Failure Modes & Effects Analysis (FMEA) 1 2 3 4 5 6	
61. Electronic Medical Record (EMR) 1 2 3 4 5 6	
62. Computerized Physician Order Entry (CPOE) 1 2 3 4 5 6	

Please Circle your response	
<p>Use the following scale to answer the questions in this section:</p> <p>Rating scale for attitude questions: 1—not important at all 2---low importance 3---moderate importance 4---high importance</p>	
63. How important is it for nurses to participate in quality improvement projects? 1 2 3 4	
64. How important is performance measurement is to improving patient outcomes? 1 2 3 4	
65. How important is teamwork to improving patient outcomes and care? 1 2 3 4	
66. How important is using evidence based practice to determine best clinical practice? 1 2 3 4	
67. How important is reading current professional literature/journals to remain current with issues in clinical practice? 1 2 3 4	
68. How important is standardization of processes and procedures to improving patient safety? 1 2 3 4	
69. How important is teamwork, including interdisciplinary collaboration, to improving patient outcomes? 1 2 3 4	
70. How important is it for nurses to be involved in the design, selection, implementation, and evaluation of information technologies to support patient care? 1 2 3 4	
71. How important is it to include Patient Centered Care concepts (respecting patients' unique values and beliefs, patients'/families' active engagement in planning of care, patient family empowerment) in developing a plan of care for each patient? 1 2 3 4	
72. How important is it to recognize that a patient's expectations regarding pain relief influence the success of the pain management plan? 1 2 3 4	
73. How important is it to include the patients and their families in the development of a pain management plan of care? 1 2 3 4	

Appendix G

QulSKA Adapted

Multiple Choice Questions

Please Circle the BEST answer to the following

1. Which of the following strategies can help nurse **learn** about the outcomes of care in their area of clinical practice:

a. Collecting data on infection rates

b. Monitoring staff satisfaction

c. Implementing an education plan

Discussing potential action plans with the surgeon

2. Understanding the source of practice variation is important because:

a. it determines the type or action required

b. it identifies the root cause of the problem

c. all variation , regardless of source, must be eliminated to achieve quality

d. it is the first step to increasing variation

3. All of the following contribute to increase patient safety except:

a. implementation of human factors processes in the design of medical devices and technology

b. use of abbreviations for common medications

c. systems and processes that limit or prevent workarounds

computerized physician order entry (CPOE)

4. A potential drawback of using only automatic be alarms to prevent falls

a. not all nurses know how to use bed alarms

b. other strategies to prevent falls may not be tried

c. families may not like the bed alarms

d. there are no drawbacks with bed alarms

5. All of the following elements are important for creating and sustain a culture of healthcare safety except:

a. structures and systems that ensure an organization-wide awareness of patient safety performance gaps

b. job descriptions that require direct accountability of leaders, managers, and frontline caregivers for closing performance gaps in patient safety

c. leaders embrace a culture where safety and quality are openly discussed

d. staff are reprimanded when they make 2 or more medication errors within a 6 month period

6. Actions immediately following a near-miss medication error indicating a culture of safety include:

a. congratulating the person that caught the error

b. identifying how the error was detected

c. reprimanding the person who made the error

d. reporting the incident to the physician

7. Which of the following is an example of a culture of safety in a healthcare organization?

a. No more than 50% of the staff are agency

b. Near misses are reported

8. Recently, a child died as a result of an overdose of chemotherapy. Which tool can be used to help understand the causes of the error as well as allocation of responsibility and accountability?

a. Root cause analysis (RCA)

b. Failure Modes and Effects Analysis (FMEA)

c. Flow charting

d. Brainstorming

9. A team convenes to explore medication errors. An ineffective strategy to enhance team functioning would be to:

a. define the roles of the team members

b. develop ground rules for communication

c. include as many staff members as possible on the team

d. ensure that the meeting starts and ends on time

10. Which of the following examples **best** describes how technology and information management improve quality and safety inpatient care?

a. computerized physician order entry (CPOE) system that includes built in logic to check for oversights in drug selection and dosing

b. sections in the electronic medical record for narrative discussion rather than drop boxes of check boxes

c. distinct and separate sections for nursing and medicine to avoid confusion

d. identical data fields for all specialties

11. Which of the following tools is beneficial for understanding steps of a process (such as medication administration)

a. run charts

b. control chart

c. flow chart

d. Pareto chart

12. The following table shows 8 hospital's ventilator associated pneumonia (VAP) rates per 1000 days for 2 consecutive years:

	VAP rate per 1000 patient days	
	2003	2004
Hospital A	10	11
Hospital B	14	13
Hospital C	16	14
Hospital D	15	15
Hospital E	11	11
Hospital F	9	10
Hospital G	8	10
Hospital H	7	6
VAP rate Mean	11.25	11.25
VAP rate Standard Deviation	3.37	2.8

The analysis of these data indicate that:

- a. There is a data collection error in 2003
- b. The average VAP rate in 2003 was greater than 2004
- c. There is greater variability for VAP rate among hospital in 2003**
- d. Year 2003's performance for VAP is better than year 2004's

13. Which of the following studies **best** measure patient outcomes?

- a. nursing compliance with documentation of central line care
- b. nursing compliance with the new medication policy
- c. patient central line infection rate**
- d. frequency of crash cart logs documentation

14. Which of the following tools help understand process variation within clinical process such as the difference in the interval from the time from order to the first dose of antibiotic?

- a. Pareto chart
- b. Pie chart
- c. Control chart**
- d. Flow chart

Please rate your level of proficiency/skills with these process or terms listed in the sections below using the following scale

1 **Novice**- not familiar with and never used

2. **Familiar**- head of the process/term but never used

3. **Understand**-understand the process/term and have used 1-2 times

4. **Skilled**-understanding of the process/term and have used 3-5 times

5. **Proficient**-understand the process/term and use 6-8 times in my work

6. **Expert**- understand the process/term and use >9 times in my work and am able to teach the concept to others

15. Process mapping or flowcharting 1 2 3 4 5 6

16. Quality improvement methodology such as Plan-Do-Check-Act or Six Sigma 1 2 3 4 5 6

17. Collecting data from retrospective or concurrent chart or record review 1 2 3 4 5 6

18. Graphical representation data 1 2 3 4 5 6

19. Run Charts 1 2 3 4 5 6

20. Control Charts 1 2 3 4 5 6

21. Histograms 1 2 3 4 5 6

22. Pie Charts 1 2 3 4 5 6

23. Pareto charts 1 2 3 4 5 6

24. Error reporting systems 1 2 3 4 5 6

25. Root cause analysis (RCA) 1 2 3 4 5 6

26. Failure Modes & Effect Analysis (FEMA) 1 2 3 4 5 6

Please circle your response

Use the following scale to answer the questions in this section:

Rating scale for attitude questions

1-not important at all

2-low importance

3.-moderate importance

4-high importance

27. How important is it for nurses to participate in quality improvement projects 1 2 3 5

28. How important is performance measurement to improving patient outcomes?

29. How important is standardization of process and procedures to improving patient safety? 1 2 3 4

30. How important is teamwork, including interdisciplinary collaboration to improving patient outcomes? 1 2 3 4

Appendix H

Permission from Dycus to Use QUISKA Instrument

RE: QuISKA Questionnaire
Paula Dycus [Paula.Dycus@lebonheur.org]
You replied on 4/17/2013 7:48 PM.
Sent: Wednesday, April 17, 2013 3:27 PM
To: [Karen L. Maxwell](mailto:Karen.L.Maxwell); lmckeon@uthsc.edu
Attachments:  [PDycus_QUISKA_instrumentde~1.doc \(129 KB\)](#) [[Open as Web Page](#)]

I have attached a copy of the original instrument. I have not made any revisions and you have permission to use this for your project.
This was actually placed in SurveyMonkey for the staff to complete electronically.

Paula

Paula Dycus, DNP, RN, CPHQ, NEA-BC
Administrative Director of Professional Practice & Research
Magnet Program Director
Le Bonheur Children's Hospital
50 N. Dunlap
Memphis, TN 38103
901-287-5983 (office) 901-287-6013 (fax)

Appendix I

Healthcare Professionals Patient Safety Assessment

HPPSACS Curriculum Survey (*Phase II and Phase III*)

Instructions

Circle the number on the answer sheet that corresponds to your level of agreement with the following statements:

	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
1. Making errors in healthcare is inevitable.	1	2	3	4	5
2. Competent healthcare professionals do not make medical errors that lead to patient harm.	1	2	3	4	5
3. Healthcare professionals should routinely spend part of their professional time working to improve patient care.	1	2	3	4	5
4. Only physicians can determine the causes of a medical error.	1	2	3	4	5
5. Healthcare professionals should not tolerate uncertainty in patient care.	1	2	3	4	5
6. The culture of healthcare makes it easy for healthcare professionals to deal constructively with errors.	1	2	3	4	5
7. Learning how to improve patient safety is an appropriate use of time in health programs in school.	1	2	3	4	5
8. Healthcare professionals routinely share information about medical errors and what caused them.	1	2	3	4	5
9. In my clinical experiences so far, faculty and staff communicate to me that patient safety is a high priority.	1	2	3	4	5
10. Healthcare professionals routinely report medical errors.	1	2	3	4	5

11. Reporting systems do little to reduce future errors.	1	2	3	4	5
12. Physicians should be the healthcare professionals that report errors to an affected patient and their family.	1	2	3	4	5
13. Effective responses to errors focus primarily on the healthcare professional involved.	1	2	3	4	5
14. If there is no harm to a patient, there is no need to address an error.	1	2	3	4	5
15. If I saw a medical error, I would keep it to myself.	1	2	3	4	5
16. Most errors are due to things that healthcare professionals can't do anything about.	1	2	3	4	5
17. After an error occurs, an effective strategy is to work harder to be more careful.	1	2	3	4	5
18. There is a gap between what we know as 'best care' and what we provide on a day to day basis.	1	2	3	4	5

Instructions

Circle the number on the answer sheet that corresponds to your level of comfort with doing the following:

Very
Uncomfortable Uncomfortable Neutral Comfortable Comfortable
 Very

19. Accurately completing an incident report.	1	2	3	4	5
20. Analyzing a case to find the causes of an error.	1	2	3	4	5
21. Supporting and advising a peer who must decide how to respond to an error.	1	2	3	4	5
22. Disclosing an error to a faculty member.	1	2	3	4	5
23. Disclosing an error to another healthcare professional.	1	2	3	4	5

Instructions

Circle the number on the answer sheet that corresponds to your best answer:

In the past:

24. Have you observed a medical error in your clinical experiences? 1) Yes 2) No
25. Have you disclosed a medical error to a faculty member? 1) Yes 2) No
26. Have you disclosed a medical error to a staff member? 1) Yes 2) No
27. Have you disclosed a medical error to a fellow student? 1) Yes 2) No

28. Have you reported an error using an incident report? 1) Yes 2) No

29. Did your nursing program of study provide sufficient coverage on the topic of patient safety?

1) Yes 2) No

Created for the University of Missouri-Columbia School of Medicine, 2004.

Permission to use these adapted

Appendix J

Adapted HPSACS Instrument

Circle the number on the answer sheet that corresponds to your level of agreement with the following statement:

	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
31. Making errors in healthcare is inevitable	1	2	3	4	5
32. Competent healthcare professionals do not Make medical errors that lead to patient harm.	1	2	3	4	5
33. Healthcare professionals should routinely Spend part of their professional time working To improve patient care.	1	2	3	4	5
34. Only physicians can determine the cause of a medical error.	1	2	3	4	5
35. Healthcare professionals should not tolerate uncertainty in patient care	1	2	3	4	5
36. The culture makes it easy for healthcare makes it easy for healthcare professionals to deal constructively with errors.	1	2	3	4	5
37. Learning how to improve patient safety is an appropriate use of time in health programs in school.	1	2	3	4	5
38. Healthcare professionals routinely share information about medical errors and what caused them.	1	2	3	4	5
39. In my clinical experiences so far, faculty and staff communicate to me that patient safety is a high priority.	1	2	3	4	5
40. Healthcare professionals routinely report medical errors.	1	2	3	4	5
41. Reporting systems do little to reduce future errors.	1	2	3	4	5

42. Physicians should be the healthcare professionals that report errors to an affected patient and their family.	1	2	3	4	5
43. Effective response to errors focus primarily on the healthcare professional involved.	1	2	3	4	5
44. If there is no harm to a patient, there is no need to address an error	1	2	3	4	5
45. If I saw a medical error, I would keep it to myself.	1	2	3	4	5
46. Most errors are due to things that healthcare professional can't do anything about.					
47. After an error occurs, an effective strategy is to work harder to be more careful.					
48. There is a gap between what we know as "best care" and what we provide on a day to day basis.					

Instructions

Circle the number that corresponds to your level of comfort with doing the following:

	Very Uncomfortable	Uncomfortable	Neutral	Comfortable	Very Comfortable
49. Accurately completing an incident report	1	2	3	4	5
50. Analyzing a case to find the cause of an error.	1	2	3	4	5
51. Supporting and advising a peer who must decide how to respond to an error.	1	2	3	4	5
52. Disclosing an error to a faculty member	1	2	3	4	5
53. Disclosing an error to	1	2	3	4	5

another healthcare professional.

Instructions

Circle the number that corresponds to your best answer:

54. According to the Institute of Medicine's Too Err is Human report, more than _____ Preventable adverse events occur in US hospital each year.

- a) One thousand
- b) One hundred thousand**
- c) One million
- d) One hundred million

55. Adverse events occur in ____% of hospitalizations:

- a) 0.02-0.04%
- b) 0.2-04%
- c) 2-4%**
- d) 20-40%

56. Successful error reporting systems are most often:

- a). Confidential and punitive
- b) Confidential and non-punitive**
- c) Non-confidential and punitive
- d) Non-confidential and non-punitive

57. Latent factors are:

- a). Factors that have effects that are delayed**
- b) Factors that happen later, after the fact
- c) Factors that do not affect anything
- d) Factors that affect things immediately

58. At healthcare facilities, medical errors can be reported to the Risk Management Department by:

- a). Physicians only
- b) Physicians and staff
- c) Physicians, staffs and patients
- d) Physicians, staff, healthcare students, patients, and visitors**

*Original tool Created for the University of Missouri- Columbia School of Medicine, 2004
Permission to use these adapted materials is granted with acknowledgement*

Appendix K

Permission to use Chenot's Instrument

From: Chenot, Theresa [mailto:tchenot@ju.edu]
Sent: Wednesday, October 23, 2013 9:33 PM
To: Karen L. Maxwell
Cc: Wendy.Madigosky@ucdenver.edu
Subject: RE: Healthcare Professionals Patient Safety Assessment

Hi Karen - yes, you have my permission to use the adapted instrument with acknowledgement. I have copied Dr. Madigosky so she is aware of your progression and that she has already given permission noted below. The tool is actually within the dissertation in the appendices if you still have that copy otherwise please e-mail me and I can forward to you. Please keep us posted on your findings/publications. If interested - next year's QSEN conference is already scheduled in Baltimore and info is posted at www.qsen.org. Thank you - Teri

From: Karen L. Maxwell [maxwell_kl@mercer.edu]
Sent: Wednesday, October 23, 2013 9:21 PM
To: Chenot, Theresa
Subject: Re: Healthcare Professionals Patient Safety Assessment

Teri,

I am currently a doctoral student at The University of Alabama. I spoke with you last spring about using the HPPSACs tool in my dissertation, we also met at the QSEN conference in May. I have read through your dissertation and your article. I just want to make sure I have your permission to use the tool. The only questions I do not plan to use are questions 24-29. Do you have a copy of the tool that you can send me? Thanks so much for any help. I am in the process of writing my proposal.

Karen Maxwell

Maxwell_kl@mercer.edu

404-310-1228

Appendix L

Scoring Information for Chenot's Instrument

Hi Karen-

Attached are the instruments with scoring information. The green highlighted items were reverse scored and the yellow highlights indicate the correct responses. You certainly may use the questionnaires from our study with attribution. Although I did not pursue determining the reliability and validity of the questionnaire, Dr. Chenot did this on her adapted version and published this in the Journal for Nursing Education in 2010. I've copied her on this email in case you'd like to connect with her as well.

Best of luck in your final studies. If you end up using a version of this instrument, please do keep us informed about your results!

Sincerely,

Wendy Madigosky MD MSPH | Director, Foundations of Doctoring Curriculum University of Colorado Anschutz Medical Campus | School of Medicine
(303) 724-6420 | Wendy.Madigosky@ucdenver.edu | Building 500, Room E1317

-----Original Message-----

From: Karen L. Maxwell [mailto:maxwell_kl@mercer.edu]

Sent: Thursday, March 07, 2013 11:20 AM

To: Madigosky, Wendy

Subject: Healthcare Professionals Patient Safety Assessment

Dr. Madigosky,

I am currently a doctoral student at The University of Alabama. I am completing my last semester of course work and will be moving onto my dissertation this summer. I plan to look at Quality and Safety Education in undergraduate nursing students. I found a copy of the Healthcare Professionals Patient Safety Assessment Survey that had been adapted for the use with nursing students in a dissertation by Teri Chenot. I am writing to see if I could have a copy of the original survey and any documents that might explain how to score the document and that discusses the reliability and validity of the tool. At this time I would just like to preview the document to see if it is a tool I might be able to use in my research. If I find it is something that I could use I will ask permission before use and also if I see any changes I would like to make. Please let me know if you would be willing to share this survey with me.

Thanks so much for your consideration of this request.

Karen Maxwell, MSN, RN-BC

Clinical Assistant Professor

Georgia Baptist College of Nursing of Mercer University Office Number: 267

Appendix M

Email about Content Validity

Dear Colleague,

I would like to ask you to help establish the content validity of a tool that I plan to use for my dissertation. The purpose of this tool is to measure undergraduate nursing student's knowledge, skills, and attitudes of quality improvement and patient safety. The following operational definitions will be used to define quality improvement, patient safety, knowledge, skills and attitudes

1. **Quality Improvement:** Utilize data to monitor the outcomes of care processes and use improvement methods to design and test changes to continuously improve the quality and safety of health care systems
2. **Safety:** Minimizes risk of harm to patients and minimized through both system effectiveness and individual performance
3. **Knowledge:** Facts or ideas acquired by study, investigation, observation or experience
4. **Skill:** Ability to use one's knowledge effectively and readily in execution of performance
5. **Attitude:** A feeling or emotion toward a fact or state

The following scale will be used to rate the relevance of each item:

1= not relevant

2= somewhat relevant

3= quite relevant

4=highly relevant

I would like to thank-you in advance for your time and expertise on this project.

Sincerely,

Karen Maxwell, MSN, RN-BC

Content Validity Index

Please rate the content relevance of the following items using the following scale

1=Not Relevant

2=Somewhat Relevant

3=Quite Relevant

4=Highly Relevant

Quality Improvement Knowledge

1. Which of the following strategies can help nurses **learn** about the outcomes of care in their area of clinical practice?

a. Collecting data on infection rates

b. Monitoring staff satisfaction

c. Implementing an education plan

d. Discussing potential action plans with the surgeon

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

2. Understanding the source of practice variation is important because:

- a. **it determines the type or action required**
- b. it identifies the root cause of the problem
- c. all variation , regardless of source, must be eliminated to achieve quality
- d.it is the first step to increasing variation

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

11. Which of the following tools is beneficial for understanding steps of a process (such as medication administration)

- a. run charts
- b. control chart
- c. **flow chart**
- d. Pareto chart

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

12. The following table shows 8 hospital's ventilator associated pneumonia (VAP) rates per 1000 days for 2 consecutive years:

	VAP rate per 1000 patient days	
	2003	2004
Hospital A	10	11
Hospital B	14	13
Hospital C	16	14
Hospital D	15	15
Hospital E	11	11
Hospital F	9	10
Hospital G	8	10
Hospital H	7	6
VAP rate Mean	11.25	11.25
VAP rate Standard Deviation	3.37	2.8

The analysis of these data indicate that:

- a. There is a data collection error in 2003
- b. The average VAP rate in 2003 was greater than 2004
- c. **There is greater variability for VAP rate among hospital in 2003**

d. Year 2003's performance for VAP is better than year 2004's

Not Relevant Relevant	Somewhat Relevant	Quite Relevant	Highly
1	2	3	4

13. Which of the following studies **best** measure patient outcomes?

- a. nursing compliance with documentation of central line care
- b. nursing compliance with the new medication policy
- c. patient central line infection rate**
- d. frequency of crash cart logs documentation

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

14. Which of the following tools help understand process variation within clinical process, such as the difference in the interval from the time from order to the first dose of antibiotic?

- a. Pareto chart
- b. Pie chart
- c. Control chart**
- d. Flow chart

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

On the following section students will be asked to rate comfort with Skills of Quality Improvement

Please rate your level of proficiency/skills with these process or terms listed in the sections below using the following scale

- 1 **Novice**- not familiar with and never used
- 2. **Familiar**- heard of the process/term but never used
- 3. **Understand**-understand the process/term and have used 1-2 times
- 4. **Skilled**-understanding of the process/term and have used 3-5 times
- 5. **Proficient**-understand the process/term and use 6-8 times in my work
- 6. **Expert**- understand the process/term and use >9 times in my work and am able to teach the concept to others

Quality Improvement Skill

15. Process mapping or flowcharting 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

16. Quality improvement methodology such as Plan-Do-Check-Act or Six Sigma 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

17. Collecting data from retrospective or concurrent chart or record review 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

18. Graphical representation data 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

19. Run Charts 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

20. Control Charts 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

21. Histograms 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

22. Pie Charts 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

23 Pareto charts 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

Simple statistical analysis of data

24. Measure of central tendency- mean, median, mode 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
---------------------	--------------------------	-----------------------	------------------------

1	2	3	4
25. Standard Deviation 1 2 3 4 5 6			
Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

26. Normal (Gaussian distribution) 1 2 3 4 5 6			
Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

More complex statistical analysis of data

27. t-test 1 2 3 4 5 6			
Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

28. Chi Square 1 2 3 4 5 6			
Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

29. ANOVA 1 2 3 4 5 6			
Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

30. regression analysis 1 2 3 4 5 6			
Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

Quality Improvement Attitude

In the following section students will be asked to rate their attitude about quality improvement
Use the following scale to answer the questions in this section:

Rating scale for attitude questions

1-not important at all

2-low importance

3.-moderate importance

4-high importance

34. How important is it for nurses to participate in quality improvement projects 1 2 3 4

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

35. How important is performance measurement to improving patient outcomes?

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

36. How important is standardization of process and procedures to improving patient safety? 1 2 3 4

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

The following sections will look at knowledge, skills, and attitudes about patient safety
Patient Safety Knowledge

3. All of the following contribute to increase patient safety except:
- a. implementation of human factors processes in the design of medical devices and technology
 - b. use of abbreviations for common medications**
 - c. systems and processes that limit or prevent workarounds
 - d. computerized physician order entry (CPOE)

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

4. A potential drawback of using only automatic bed alarms to prevent falls
- a. not all nurses know how to use bed alarms
 - b. other strategies to prevent falls may not be tried**
 - c. families may not like the bed alarms
 - d. there are no drawbacks with bed alarms

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

5. All of the following elements are important for creating and sustain a culture of healthcare safety except:
- a. structures and systems that ensure an organization-wide awareness of patient safety performance gaps
 - b. job descriptions that require direct accountability of leaders, managers, and frontline caregivers for closing performance gaps in patient safety
 - c. leaders embrace a culture where safety and quality are openly discussed
 - d. staff are reprimanded when they make 2 or more medication errors within a 6 month period**

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

6. Actions immediately following a near-miss medication error indicating a culture of safety include:
- a. congratulating the person that caught the error**
 - b. identifying how the error was detected
 - c. reprimanding the person who made the error
 - d. reporting the incident to the physician

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

7. Which of the following is an example of a culture of safety in a healthcare organization?

- a. No more than 50% of the staff are agency
- b. Near misses are reported**
- c. Nurses routinely work double shifts
- d. Most patients transfers occur during shift change

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

8. Recently, a child died as a result of an overdose of chemotherapy. Which tool can be used to help understand the causes of the error as well as allocation of responsibility and accountability?

- a. Root cause analysis (RCA)**
- b. Failure Modes and Effects Analysis (FMEA)
- c. Flow charting
- d. Brainstorming

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

9. A team convenes to explore medication errors. An ineffective strategy to enhance team functioning would be to:

- a. define the roles of the team members
- b. develop ground rules for communication
- c. include as many staff members as possible on the team**
- d. ensure that the meeting starts and ends on time

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

10. Which of the following examples **best** describes how technology and information management improve quality and safety inpatient care?

- a. computerized physician order entry (CPOE) system that includes build in logic to check for oversights in drug selection and dosing**
- b. sections in the electronic medical record for narrative discussion rather than drop boxes of check boxes
- c. distinct and separate sections for nursing and medicine to avoid confusion
- d. identical data fields for all specialties

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

61. According to the Institute of Medicine's Too Err is Human report, more than _____ Preventable adverse events occur in US hospital each year.

- a) One thousand
- b) One hundred thousand**
- c). One million
- d). One hundred million

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

62. Adverse events occur in ___% of hospitalizations:

- a) 0.02-0.04%
- b) 0.2-04%
- c) **2-4%**
- d) 20-40%

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

63. Successful error reporting systems are most often:

- a). Confidential and punitive
- b) Confidential and non-punitive**
- c) Non-confidential and punitive
- d) Non-confidential and non-punitive

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

64. Latent factors are:

- a). Factors that have effects that are delayed**
- b) Factors that happen later, after the fact
- c) Factors that do not affect anything
- d) Factors that affect things immediately

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

65. At healthcare facilities, medical errors can be reported to the Risk Management Department by:

- a). Physicians only
- b) Physicians and staff
- c) Physicians, staffs and patients
- d) Physicians, staff, healthcare students, patients, and visitors**

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

Patient Safety Skill

On the following section students will be asked to rate comfort with Skills of patient safety

Please rate your level of proficiency/skills with these process or terms listed in the sections below using the following scale

- 1 **Novice**- not familiar with and never used
2. **Familiar**- head of the process/term but never used
3. **Understand**-understand the process/term and have used 1-2 times
4. **Skilled**-understanding of the process/term and have used 3-5 times
5. **Proficient**-understand the process/term and use 6-8 times in my work
6. **Expert**- understand the process/term and use >9 times in my work and am able to teach the concept to others

31. Error reporting systems 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

32. Root cause analysis (RCA) 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

33. Failure Modes & Effect Analysis (FEMA) 1 2 3 4 5 6

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

Level of comfort with doing the following:

Very Uncomfortable	Uncomfortable	Neutral	Comfortable	Very Comfortable
1	2	3	4	5

56. Accurately completing an incident report 1 2 3 4 5

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

57. Analyzing a case to find the cause of an error. 1 2 3 4 5

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

58. Supporting and advising a peer who must decide how to respond to an error.

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

59. Disclosing an error to a faculty member

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

60. Disclosing an error to another healthcare professional.

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

Patient Safety Attitudes

In this section students will be able to rate their attitudes about patient safety

Use the following scale to answer the questions in this section:

Rating scale for attitude questions

1-not important at all

2-low importance

3.-moderate importance

4-high importance

37. How important is teamwork, including interdisciplinary collaboration to improving patient outcomes? 1 2 3 4

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

Your level of agreement with the following statement:

Strongly

Disagree Disagree Neutral Agree Strongly

1 2 3 4 5

38. Making errors in healthcare is inevitable 1 2 3 4 5

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

39. Competent healthcare professionals do not make medical errors that lead to patient harm

1 2 3 4 5

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

40. Healthcare professionals should routinely spend part of their professional time working to improve patient care. 1 2 3 4 5

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

41. Only physicians can determine the cause of a medical error. 1 2 3 4 5

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

42. Healthcare professionals should not tolerate uncertainty in patient care 1 2 3 4 5

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

43. The culture of healthcare makes it easy for healthcare professionals to deal constructively with errors. 1 2 3 4 5

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

44. Learning how to improve patient safety is an appropriate use of time in health programs in school. 1 2 3 4 5

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

45. Healthcare professionals routinely share information about medical errors and what caused them. 1 2 3 4 5

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

46. In my clinical experiences so far, faculty and staff communicate to me that patient safety is a high priority. 1 2 3 4 5

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

47. Healthcare professionals routinely report medical errors. 1 2 3 4 5
Not Relevant **Somewhat Relevant** **Quite Relevant** **Highly Relevant**
1 **2** **3** **4**

48. Reporting systems do little to reduce future errors. 1 2 3 4 5
Not Relevant **Somewhat Relevant** **Quite Relevant** **Highly Relevant**
1 **2** **3** **4**

49. Physicians should be the healthcare professionals that report errors to an affected patient and their family. 1 2 3 4 5
Not Relevant **Somewhat Relevant** **Quite Relevant** **Highly Relevant**
1 **2** **3** **4**

50. Effective response to errors focus primarily on the healthcare professional involved. 1 2 3 4 5
Not Relevant **Somewhat Relevant** **Quite Relevant** **Highly Relevant**
1 **2** **3** **4**

51. If there is no harm to a patient, there is no need to address an error 1 2 3 4 5
Not Relevant **Somewhat Relevant** **Quite Relevant** **Highly Relevant**
1 **2** **3** **4**

52. If I saw a medical error, I would keep it to myself. 1 2 3 4 5
Not Relevant **Somewhat Relevant** **Quite Relevant** **Highly Relevant**
1 **2** **3** **4**

53. Most errors are due to things that healthcare professional can't do anything about. 1 2 3 4 5
Not Relevant **Somewhat Relevant** **Quite Relevant** **Highly Relevant**
1 **2** **3** **4**

54. After an error occurs, an effective strategy is to work harder to be more careful. 1 2 3 4 5
Not Relevant **Somewhat Relevant** **Quite Relevant** **Highly Relevant**
1 **2** **3** **4**

55. There is a gap between what we know as "best care" and what we provide on a day to day basis. 1 2 3 4 5

Not Relevant	Somewhat Relevant	Quite Relevant	Highly Relevant
1	2	3	4

Appendix N

Recruitment Letter

Dear Nursing Student,

Hello, my name is Karen Maxwell and I am a doctoral candidate at The University of Alabama, under the direction of Dr. Vivian Wright. I am also an Assistant Professor at Georgia Baptist College of Nursing of Mercer University. To complete my doctoral studies at The University of Alabama, I am conducting a research study to evaluate the effectiveness of two teaching strategies on pre-licensure baccalaureate nursing student's knowledge, skills, and attitudes about quality improvement and patient safety. You are being invited to participate in this study because you are a senior pre-licensure baccalaureate nursing student that will be enrolled in NUR 404: Leadership and Role Practicum course during the spring semester 2014. Your participation in this study is completely voluntary. Your confidentiality will be protected, as no names, or any other information that would reveal your identity will be published and only aggregate data will be reported. All research materials will be kept in a secure file.

All students in the NUR 404: Leadership and Role Practicum course will be randomly assigned to one of two groups, groups 1 or groups 2, regardless of their participation in the study. Students in groups one will be considered the experimental group. Group one will complete 10 online modules on quality improvement and patient safety and participate in a two hour flipped classroom discussion during the first half of the spring 2014 semester. Students in group two will be considered the control group. Group two will complete 10 online modules on quality improvement and patient safety only, over the first half of the spring 2014 semester. Each online module will take approximately one hour to complete. Modules will be completed outside of class time. Students in both groups who have consented to participate in the study will be asked to complete a pretest prior to beginning the online modules or discussion seminar class. After the first eight weeks of the semester, students in both groups who have consented to be in the study will be given a posttest. The pretest and the posttest will be administered through an online link embedded on the NUR 404: Leadership and Role Practicum Moodle website. The pretest and posttest consists of 64 questions. Your score on the pretest and posttest will not affect your grade in the NUR 404 either positively or negatively. Once the posttest is completed, students in group 2 will participate in the two hour flipped classroom discussion.

Regardless of your choice to participate in this study, all students in NUR 404: Leadership and Role Practicum will complete the 10 online modules on quality improvement and patient safety, as this is part of the curriculum. All students in NUR 404: Leadership and Role Practicum will participate in a two hour flipped classroom discussion seminar either during the first or second eight weeks of the semester. The only difference will be that if you volunteer to participate you will be asked to complete the pretest and the posttest.

If you are willing to participate please sign the provided consent form. You will be asked to use a unique 4 digit ID number, the last four digits of your student ID, for purposes of comparing pretest and posttest scores. If you choose to participate you will receive a small flashlight with light up pen at the completion of the study.

If you have question concerning your participation in the study please feel free to contact me, Karen Maxwell, at 404-310-1228. You may also contact my dissertation chair, Dr. Vivian Wright, at (205) 348-1401.

Appendix O

Recruitment Script

You are being invited to participate in a research study being conducted by Karen Maxwell, a doctoral student at The University of Alabama, under the direction of Dr. Vivian Wright. Ms. Maxwell is also an Assistant Professor at Georgia Baptist College of Nursing of Mercer University. Ms. Maxwell is conducting a research study to evaluate the effectiveness of two teaching strategies on pre-licensure baccalaureate nursing student's knowledge, skills, and attitudes about quality improvement and patient safety

You are being invited to participate in this study because you are a senior pre-licensure baccalaureate nursing student that will be enrolled in NUR 404: Leadership and Role Practicum course during the spring semester 2014. Your participation in this study is completely voluntary. You have been given a letter from Ms. Maxwell that explains the study. I will read a copy of this letter, and answer any questions you might have.

If you are willing to participate in the study please sign the provided consent form. You will be asked to use a unique 4 digit ID number, the last four digits of your student ID, for purposes of comparing pretest and posttest scores. Your confidentiality will be protected, as no names, or any other information that would reveal your identity will be published and only aggregate data will be reported. All research materials will be kept in a secure file.

If you have question concerning your participation in the study please feel free to contact me, Karen Maxwell, at 404-310-1228. You may also contact my dissertation chair, Dr. Vivian Wright, at (205) 348-1401.

Appendix P

IRB Permission

Informed Consent

Evaluating the Effectiveness of Two Teaching Strategies to Improve Nursing Students Knowledge, Skills and Attitudes in Quality Improvement and Patient Safety

You are being asked to participate in a research study. Before you give your consent to volunteer, it is important that you read the following information and ask as many questions as necessary to be sure you understand what you will be asked to do.

Investigator

Karen Maxwell, MSN, RN-BC
Clinical Assistant Professor
Georgia Baptist College of Nursing of Mercer University
3001 Mercer University Drive
Atlanta, GA 30341
Office 267
678-547-6771

Doctoral Student
The University of Alabama
Tuscaloosa, Alabama, 35487
Dissertation Committee Chair: Dr. Vivian Wright
Professor
College of Education
The University of Alabama

Purpose of the Research

This research study is designed to evaluate the effectiveness of two teaching strategies, online modules in conjunction with a flipped classroom discussion seminar versus online modules only, on pre-licensure baccalaureate nursing student's knowledge, skills, and attitudes of quality improvement and patient safety. The data from this research will be used to determine if online modules are an effective learning method for pre-licensure baccalaureate nursing students. The findings from the study have the potential to inform nurse educators about effective teaching strategies to incorporate Quality and Safety Education for Nurses (QSEN) competencies into nursing curricula.

The results of this study will also contribute as partial fulfillment of my requirements for the degree of Doctor of Education from the Department of Educational Leadership, Policy, and Technology Studies in the Graduate School of The University of Alabama

Mercer University IRB
Approval Date: 2/1/2014
Protocol
Expiration Date: 12/01/2014

UNIVERSITY OF ALABAMA IRB
CONSENT FORM APPROVED: 12/10/2013
EXPIRATION DATE: 12/19/2014

Procedures

If you volunteer to participate in this study, you will be asked to:

- Take a pretest to assess your current knowledge, skills, and attitudes about quality improvement and patient safety.
- At midterm of the semester complete a posttest to assess your knowledge, skills and attitudes about quality improvement and patient safety.
- Each test consists of 64 questions and should take less than 60 minutes to complete.

Potential Risks or Discomforts

"There are no foreseeable risks associated with the study." You will be asked to complete a pretest at the beginning of the semester and a posttest after the first eight weeks of the semester. The score on the pretest and posttest will not affect your grade in NUR 404: Leadership and Role Practicum either positively or negatively.

Potential Benefits of the Research There are no potential benefits to students who participate in the study over any other student enrolled in NUR 404: Leadership and Role Practicum. There is a potential benefit to nursing education and future students enrolled in NUR 404: Leadership and Role Practicum. The findings from this study will help to identify if the use of online modules alone is an effective strategy to increase pre-licensure baccalaureate nursing student's knowledge, skills, and attitudes on quality improvement and patient safety. Results from the study also have the potential to demonstrate effective teaching strategies to incorporate Quality and Safety Education for Nurses (QSEN) into the nursing curriculum.

Confidentiality and Data Storage

No names will be recorded on the pretest or the post-test. All participants will be asked to use a unique 4 digit ID number, the last 4 digits of their student number. Names and ID numbers will not be connected. All information obtained will be held in strict confidentiality and will only be released with your permission. The results of this study may be published but your information such as your name and other demographic information will not be revealed. The results of this study will be kept in a locked file within Georgia Baptist College of Nursing, office 267, for 3 years.

Privacy

The pretest and post-test will be administered through the use of an online survey, using survey monkey. A link to the survey will be embedded onto the course web-site. Participant's privacy will be protected as students will be allowed to complete the pretest and post-test in a private setting of their choice.

Researcher: University IRB
Approval Date: 11/22/2013
Principal Investigator:
Expiration Date: 12/31/2014

UNIVERSITY OF ALABAMA IRB
CONSENT FORM APPROVED: 12/10/2013
EXPIRATION DATE: 12/9/2014

Incentives to Participate

If you choose to participate you will receive a small flashlight with a light up pen valued at approximately \$1.50.

Participation and Withdrawal

Your participation in this research study is voluntary. As a research subject you may refuse to participate at anytime. To withdraw from the study please contact Karen Maxwell at Maxwell_kl@mercer.edu or 678-547-6771.

Questions about the Research

If you have any questions about the research, please speak with Karen Maxwell. Karen Maxwell can be reached by phone at 678-547-6771, e-mail at Maxwell_kl@mercer.edu, or in her office in Georgia Baptist College of Nursing in office 267. You may also contact my dissertation chair, Dr. Vivian Wright at 205-348-1401.

This project has been reviewed and approved by Mercer University's IRB. If you believe there is any infringement upon your rights as a research subject, you may contact the IRB Chair, at (478) 301-4101.

This research study has been approved by the University of Alabama Institutional Review Board. If you have questions, concerns, or complaints about your rights as a participant in this research study, you may contact Ms. Tanta Myles, the Research Compliance Officer at the University of Alabama, at 204-348-8461 or toll-free at 1-877-820-3066.

You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach website at http://osp.ua.edu/site/PRCO_Welcome.html or email participantoutreach@bama.ua.edu. After you participate, you are encouraged to complete the survey for research participants, which is available online at the outreach website.

I have been given the opportunity to ask questions and these have been answered to my satisfaction.

Signature of Participant _____ Date _____

Signature of Investigator _____ Date _____

Rev. 04/19/2010

Merced University IRB
Approval Date 2/10/2013
Protocol #
Expiration Date 12/05/2014

UNIVERSITY OF ALABAMA IRB
CONSENT FORM APPROVED 12/10/2013
EXPIRATION DATE 12/9/2014