THE PERCEPTION OF NURSING, PHARMACY TECHNICIAN, AND PARAMEDIC STUDENTS PARTICIPATING IN INTERPROFESSIONAL SIMULATION: A MIXED METHODS STUDY

A DISSERTATION

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DEDICATION

To my husband, Steve, for his unconditional love, encouragement,
and support as we journeyed together down this incredible path.
We finally arrived at our destination!

To my parents, who supported me in every phase of my life. To my mother,
while you may not be here to celebrate with me, your influence will forever
guide me. I could not have done this without you.
Thanks for always believing in me.

To my children and grandchildren, thanks for understanding the
countless times I had to study and miss special events.
To my late son, Richard, your presence in my heart
gave me the strength to carry on when the path
was challenging. I miss you dearly.

To everyone…Gigi's back!

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ABSTRACT

RHONDA BELL

THE PERCEPTION OF NURSING, PHARMACY TECHNICIAN, AND PARAMEDIC STUDENTS PARTICIPATING IN INTERPROFESSIONAL SIMULATION: A MIXED METHODS STUDY

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The purpose of this study was to understand the effectiveness of IPE-Sim as a learning methodology. Interprofessional education (IPE) provides a collaborative approach to educating students from different health-related programs. However, rigorous studies are limited about the effectiveness of simulation-enhanced IPE (IPE-Sim) as an educational methodology supporting interprofessional teams, role recognition, and collaborative practice.

A mixed methods design was used to study the complex phenomenon of the effectiveness of IPE-Sim in promoting interprofessional teams, role recognition, and collaborative practice. The quantitative investigation was conducted using a randomized, two-group experimental design with repeated measures while the qualitative exploration was based on hermeneutic phenomenology of interpreting the meaning of the lived experience by interviewing participants. To better understand this phenomenon, the datasets were collected simultaneously, analyzed, and converged to determine congruencies, or incongruences, associated with the phenomenon. A total of 60 students participated in the study. The hypothesis indicated the experimental group would score

higher on the SPICE-R2 scores than the attention control group at both time two (T2) and time three (T3). The significance occurred at T2 between the treatment group (M = 44.23, SD 4.36) and the attention control group (M = 41.27, SD 5.70) and not at T3. Therefore, the hypothesis was partially met. Overall, a significant effect was noted for time in both groups. Ten students participated in the individual interviews following the second simulation. The structural analysis as proposed by Lindseth and Norberg (2004) guided the interpretation of the qualitative data as the meaning units and themes yielded a comprehensive understanding of the phenomenon. Congruency was noted as both datasets confirmed the participants valued collaboration, learning about each other's roles, and appreciated working in an interprofessional team.

Nurses are an integral member of the healthcare team. The National League for Nursing (2016) encouraged nurse educators to develop meaningful IPE strategies to help students from different professions collaborate effectively, while providing team-based care to improve patient outcomes. This study supports the importance of providing opportunities for students in healthcare fields to learn with one another, as they learn about one another in collaborative practice.

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CHAPTER I

INTRODUCTION

The evolution of the 21st century healthcare system began as a result of the Institute of Medicine's (IOM, 2001) report indicating the nation's healthcare system was uncoordinated, complex, and failed to provide high-quality care to the population. These findings were partly due to disciplines operating in silos and the lack of coordination of care across health disciplines. According to this report, patients should be able to receive the type of care they need based on scientific evidence. However, a chasm existed between the type of healthcare the nation deserved, and the type of healthcare being delivered. These facts became the catalyst that began the transformation of the healthcare system from the 20th to the 21st century.

To address the shortfalls noted in the healthcare system regarding health care professions operating in silos without active collaboration, and to improve patient outcomes, the IOM (2003) and the World Health Organization (2013) encouraged academic programs to remove barriers and create opportunities for students to learn as they will ultimately practice, within interdisciplinary teams. Interprofessional education (IPE), involving two or more disciplines, provides an educational framework to guide the transformation of educational programs to allow students to learn together, while they also learn about each other's health care roles.

Problem of Study

Currently, the nation employs nearly 12 million people within the healthcare industry and that number is expected to grow a further 19% by the year 2024 (United States Department of Labor, 2015). The Centers for Disease Control and Prevention (CDC) reported that in 2016, 84.6% of adults and 92.7% of children had contact with a healthcare provider. The report also indicated that there were 125.7 million visits to hospital outpatient centers and 136.9 million visits to an emergency department (CDC, 2016). The number of people accessing healthcare continues to rise as does the number of healthcare professionals. One of the rules governing change as recommended in the IOM (2001) report was the importance of having clinicians communicate and collaborate in the coordination of health care for patients. To date, many healthcare professionals do not have opportunity to practice communication and collaboration until they are employed in the healthcare field, which may have a direct negative impact on patient outcomes. The goal of IPE is to improve health outcomes by creating a healthcare workforce capable of collaborating in a manner to positively impact the health of individuals and communities (National Academies of Sciences, Engineering, & Medicine, 2016). Healthcare educators acknowledge that graduates often enter the workforce without having practiced in healthcare teams and that these discipline-silos have been globally recognized as detrimental to patient outcomes (Palaganas, Epps, & Raemer, 2014).

Simulation, as a teaching methodology, is changing the face of nursing and healthcare pedagogy by bridging the gap between theory and practice (Jeffries, 2014; Butler, Veltre, & Brady, 2009; Robertson & Bandali, 2008; Rothgeb, 2008). Interprofessional simulation (IPE-Sim) is an educational methodology that adds simulation to the interprofessional learning experience and that requires students to apply higher order cognitive skills (Jeffries, 2014; Rothgeb, 2008). Furthermore, Jeffries and Rothgeb posit simulation allows students the opportunity to be immersed within a patient-care scenario while practicing (a) problem solving, (b) clinical reasoning, (c) collaboration, and (d) tactile skills. This learning environment affords opportunities for students to collaborate in a controlled environment designed to mirror reality; and thus, allows students to be immersed in an active, experiential learning environment (Gallo & Smith, 2014; Jeffries, 2007; Jeffries, 2014; Soeren, et al., 2011). The need to understand the effectiveness of IPE-Sim as a learning methodology to promote and reinforce role recognition, team learning, and collaborative practice guided this mixed methods study.

Rationale for the Study

Benner, Sutphen, Leonard, and Day (2010) called for a transformation in how nurses are educated. Furthermore, they surmised that opportunities to communicate within interprofessional teams was imperative in this increasingly complex healthcare arena. Based on a meta-analysis conducted by Guraya and Barr (2018), even though positive outcomes are associated with IPE, additional evidence supporting the effectiveness of this learning strategy in meeting specified outcomes is needed.

Rutherford-Hemming and Lioce (2018) discovered only one study comparing student outcomes between traditional lectures and simulation, concluding that experimental studies were needed using a control group to evaluate the effectiveness of IPE. The National Academies of Sciences, Engineering, and Medicine (2016) also identified the need to study IPE using mixed method approaches to better understand the complexity of this type of learning in meeting desired outcomes. To address this gap in the literature a mixed methods design, including a two-group experimental repeated measures design, allowed for a robust study using the quantitative inquiry process coupled with qualitative methods. The perceptions of interprofessional students learning together is foundational to the development of effective teaching strategies related to the phenomenon of IPE-Sim.

Theoretical Framework

Learning transpires as students interact with their environment and apply previous knowledge as they actively solve problems in the acquisition of new knowledge (Dewey, 1938). Dewey's philosophy of progressive education and problem-based learning is the theoretical framework that guided this mixed methods study. According to Dewey (1938), students learn as they experience the world around them by interacting with the environment and by combining previous knowledge with new experiences. Dewey posited learning does not occur by the experience alone, but rather, by the quality of the experience.

Dewey's (1938) philosophy, grounded in human experience, went beyond the prevalent theory of behaviorism that often guided educational philosophy in the early 20th century. Dewey proposed knowledge is not just handed down from teacher to student; but rather, knowledge occurs when the student interacts with the world around them. Simulation is a learning methodology intentionally created by educators to allow student immersion within a patient-care scenario mimicking reality (Jeffries, 2007; Nicely & Farra, 2015). Experiential learning focuses on the creation of a learner-centered environment and encourages social interactions, connection of old and new information, and continuous reflection to guide the learning process. These attributes are congruent, with Dewey's aspects of knowing and problem-based learning.

To Dewey, the social aspect of learning was extremely significant as learners interacted with each other and the world around them to actively engage in the creation of new knowledge. Dewey also placed significance on knowing, as opposed to knowledge, since knowing is constantly evolving and knowledge is static. IPE-Sim allows students to be fully immersed in case scenarios with students from other disciplines as they collaborate to solve problems while practicing clinical reasoning and thus, actively increasing their conceptual understanding.

The qualitative aspect of the study was grounded in hermeneutic phenomenology as interpretation of the lived experiences of individuals gives way to new meaning and understanding (Kafle, 2011; Lindseth & Norberg, 2004). Merleau-Ponty (1945/2012) described hermeneutic phenomenology as the intersection between previous and current

experiences, including other individuals' experiences, to consciously understand the world around them. Hermeneutic phenomenology focuses on the subjective experience of individuals, and groups of people, to unveil (and give meaning to by way of interpretation) the lived experience (Kafle, 2011).

While Merleau-Ponty was influenced by other hermeneutic philosophers such as Husserl and Heidegger, he also appreciated the empirical discoveries of the sciences (Taylor, 2014); thus, confirming the congruence between the quantitative and qualitative aspects of this study. Phenomenology is descriptive and is both subjective and intersubjective as present experiences collide with past experiences and with the experiences of others (Merleau-Ponty, 1945/2014). By understanding the perceptions of the lived experiences of students participating in IPE-Sim, educators may be better equipped to plan learning activities to actively engage students in the learning process.

A mixed method study design allowed for a more thorough understanding of this complex learning methodology (National Academy of Sciences, Engineering, and Medicine, 2016). By applying Dewey's progressive learning theoretical framework with Merleau-Ponty's hermeneutic influence, the exploration of both quantitative and qualitative aspects of IPE-Sim enhanced understanding of the phenomenon due to the triangulation and merging of data (Fetters, Curry, & Creswell, 2013; Polit & Beck, 2017).

Assumptions

1. IPE-Sim, based on Dewey's progressive learning philosophy, is an active learning methodology, where students learn by doing.
2. Students have previous experiences in laboratory practice, clinical, and simulation to add to the IPE-Sim learning environment.
3. The students will actively participate in the research study and answer quantitative and qualitative questions in a sincere manner since confidentiality will be preserved.

Hypothesis and Research Question

The aim of this study was to understand the effectiveness of IPE-Sim as a learning methodology that promotes and reinforces role recognition, team learning, and collaborative practice among associate degree nursing, pharmacy technician, and paramedic students.

Hypothesis: Healthcare professional students who participate in two, 2-hour interprofessional simulations will score higher on the Student Perceptions of Interprofessional Clinical Education (SPICE-R2) immediately following the second simulation and at four weeks than students who participate in two, 2-hour interprofessional traditional lectures.

Qualitative Research Question: What is the lived experience of healthcare professional students, who participate in interprofessional simulation?

Definition of Terms

The following definitions were used in this study.

1. Healthcare professions students: Theoretical definition – a person who is enrolled in an educational program to become a health professional. Operationally, in this study, healthcare professional students included students enrolled in the nursing, pharmacy technician, and paramedic educational programs in an urban community college in southeast Texas.
2. Interprofessional education (IPE): Theoretical definition – occurs when students from two or more disciplines "learn about, from, and with each other in promoting active collaboration and improved health outcomes" (World Health Organization, 2010, p.13). Operationally, in this study, IPE included health professions students who learn about, from, and with each other as they participate in simulation and lecture learning opportunities together.
3. Interprofessional simulation (IPE-Sim): Theoretical definition – an educational methodology that allows students from two or more disciplines to learn together in a simulated environment that resembles reality by replicating essential components of a clinical case scenario to allow students to actively learn and practice clinical reasoning in a controlled environment (Jeffries, 2014; Rothgeb, 2008). Operationally, in this study, IPE-Sim is a teaching methodology combining the use of standardized patients and high-fidelity simulators to

replicate a clinical scenario with students enrolled in nursing, pharmacy technician, and paramedic educational programs.

4. Interprofessional lectures (IPE-Lecture): Theoretical definition – a teaching methodology whereby educators present educational material to a group of students enrolled in two or more healthcare educational programs (Benner, Sutphen, & Day, 2010; WHO, 2010). Operationally, in this study, IPE-Lecture involved a faculty member presenting content to a group of healthcare professional students from nursing, pharmacy, and paramedic programs using lecture notes, PowerPoint presentations, videos, and group discussions.
5. Student Perceptions of interprofessional clinical education: Theoretical definition – the lived experience of students participating in interprofessional learning methodologies involving patient care scenarios. Operationally, in this study, the perceptions of interprofessional clinical education included the measurement of perceptions based on the scores on the student perceptions of interprofessional clinical education instrument (SPICE-R2) and on participant interviews with use of a semi-structured guide.

Strength and Limitations

The strength of this study was the two group repeated measures experimental design that allows determination of a causal relationship and the triangulation of data through simultaneous collection of qualitative and quantitative data. A limitation of this study was the inability to generalize results. In addition, the participants in this study

were enrolled in varying levels of education and the results cannot be generalized to advanced levels of education.

Summary

To address the complex needs of patients and communities within a complex healthcare system, modification to educational programs for health professions is essential. Due to the number of health care professionals and people accessing the complex healthcare system, providers of care can no longer practice in silos. Interprofessional simulation allows for participant cognitive and experiential growth while enhancing communication, collaboration, and team building skillsets. IPE-Sim provides opportunity for students to be educated as they will practice – in interprofessional teams, with the aim of improving the quality of healthcare provided by members of the healthcare team.

CHAPTER II

REVIEW OF LITERATURE

CHAPTER ACCEPTED FOR PUBLICATION

A Paper Accepted for Publication in the

Nurse Education Perspectives Journal

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Abstract

AIM The aim of the review was to describe and summarize the use of theoretical premises noted in published studies on the implementation of interprofessional simulation (IPE-Sim).

BACKGROUND IPE-Sim is an educational methodology being used throughout nursing, allied health, and health science programs of study. Understanding frameworks currently used in IPE-Sim is essential in advancing the knowledge of this type of educational methodology.

METHOD Integrative literature review on the use of theories and models guiding IPE-Sim.

RESULTS Ten studies meeting the inclusion criteria were categorized into theoretical frameworks (n = 4) or competency frameworks (n = 6) guiding the development and implementation of IPE-Sim and included in the review. The literature review revealed

the lack of consistent theoretical and competency-based frameworks guiding the development, implementation, assessment, and research of IPE-Sim.

CONCLUSION

The integrative literature review describes specific theoretical and competency frameworks currently used in the literature on IPE-Sim.

Currently, the nation employs nearly 12 million people within the healthcare industry and that number is projected to grow a further 19% by the year 2024 (United States Department of Labor, 2015). Many of these healthcare professionals are educated in discipline-silos and lack opportunity to learn with, and about each other in collaborative, interprofessional teams (World Health Organization, 2013). In response to the Institute of Medicine's report (2003) encouraging educational leaders to create opportunities for students to learn and practice within interdisciplinary teams, six national health professions school associations (American Association of Colleges of Nursing, American Association of Colleges of Osteopathic Medicine, American Association of Colleges of Pharmacy, American Dental Education Association, American Association of Medical Colleges, and Association of Schools and Programs of Public Health) created the Interprofessional Education Collaborative in 2009 to promote interprofessional learning opportunities for students enrolled in educational programs for the health professional. IPE occurs when two or more disciplines are educated about, with, and from each other (World Health Organization, 2013).

Collaborative learning, among health professions, continues to be in the forefront of educational experiences as students address the social determinants of health together (National Academies of Sciences, Engineering, & Medicine, 2016). IPE has gained significance within healthcare educational programs and serves as the overarching theme, whereby interprofessional simulation (IPE-Sim) has been developed (Baker et al., 2008; Reeves & Schaik, 2012). Decker et al. (2015) discussed the importance of changing pedagogical methodologies to allow education across disciplines and address competencies of students learning within interprofessional teams. IPE-Sim, an educational methodology involving students from two or more disciplines, is an experiential, team-based learning opportunity that allows students to apply higher order cognitive skills (Jeffries, 2014; Rothgeb, 2008). This learning environment affords opportunities for students to collaborate in a controlled, imitative representation of reality, thus allowing students to be immersed in an active, experiential learning environment (Gallo & Smith, 2014; Jeffries, 2007; Jeffries, 2014; Soeren et al., 2011). IPE-Sim is designed to increase student confidence and improve team communication and performance in an effort to positively impact patient outcomes (Brown & Bostic, 2016). The aim of this review is to identify, describe, and summarize the use of theoretical frameworks found in peer-reviewed articles on IPE-SIM using the Whittemore and Knafl (2005) integrative literature review framework.

Method

Two authors collaborated on this integrative literature review. One of the authors holds a PhD in nursing and has participated in IPE at the university level. The other author holds a MS in nursing education and has led simulation-enhanced IPE for over five years. This integrative literature review was conducted following the Whittemore and Knafl (2005) method of ensuring rigor when conducting integrative reviews. This framework allows researchers to include diverse theoretical, philosophical, and empirical data along with information from experimental, quasi-experimental, and non-experimental research studies when performing a broad search on a phenomenon of interest. Table 1 is an overview of the Whittemore and Knafl process for conducting the integrative literature review of the theoretical frameworks guiding IPE-Sim. A discussion of this framework will be woven throughout this literature review.

Problem Identification

Healthcare educators acknowledge that graduates often enter the workforce without having practiced in healthcare teams and that these discipline-practice-silos have been globally recognized as detrimental to patient outcomes (Palaganas, Epps, & Raemer, 2014). IPE is being incorporated within curricula of nursing, allied health, and health sciences educational programs to address this issue (Gough, Hellaby, Jones, MacKinnon, 2012; Robertson & Bandali, 2008; Soeren et al., 2011). IPE-Sim promotes collaborative care and allows students to learn as they will practice, within teams. While the use of IPE-Sim is growing, many educators may not be aware about the theoretical premises

guiding the implementation of IPE-Sim (Abu-Rish et al., 2012; Palaganas, Brunette, & Winslow, 2016).

A universal theory on simulation-enhanced education does not exist; therefore, educators typically choose a theory congruent with their world view, if a theory is selected at all (Nestel & Bearman, 2015). The NLN Jeffries simulation theory (2016) is the first theory specifically developed to guide the development, implementation, and evaluation of simulation. Examining the literature about IPE-Sim allows for an improved understanding of the frameworks currently used in IPE-Sim and is essential in advancing the knowledge of this type of educational methodology.

The Literature Search

The literature search was performed using the Cumulative Index to Nursing and Allied Health Literature Database (CINAHL) and Medline with Full Text (EBSCO). The decision to exclude other databases was determined since the CINAHL database was inclusive to nursing and allied health and EBSCO indexed journals for preclinical sciences. The primary inclusion criteria were 1) simulation involving two or more healthcare disciplines in pre-licensure programs, with nursing as one of the disciplines; and 2) the use of a theoretical or competency framework guiding the development of the IPE-Sim. The review included articles that were peer-reviewed, English language, and published 2001 – 2018. The date limitation was established to mirror the IPE-Sim events occurring after the initial reports by the Institute of Medicine (2001). The review excluded papers that involved a single discipline, were community or hospital-based,

involved primarily graduate programs, did not include simulation, lacked theoretical frameworks, were literature reviews, or discussed only instruments involved in IPE-Sim.

The MeSH terms of *interprofessional* and *simulation* and *education* were used to guide the initial data review, that yielded 174 records. To further explore theoretical associations with IPE-Sim, a secondary literature review was conducted with MeSH terms of *interprofessional* and *simulation* and *education* and *theory*. Truncation (*) was added to the keyword *theory* to ensure a wider collection of literature. A total of 44 records were retrieved during the second search, with 33 records being duplicates from the initial search. The two searches retrieved with the MeSH terms, excluding duplications, yielded 185 records. During this preliminary review of the records, two additional journal articles were reviewed by purposive sampling based on information found within a couple of the articles. A total of 187 records were reviewed (see Figure 1).

The literature search stage should be well-defined and illustrated using two or more search strategies (Whittemore & Knafl, 2005). In addition to index searching, purposive sampling may also be utilized with clear justification and documentation. The two purposive articles, upon further review, were deemed inappropriate for this literature review since one of the articles was focusing on a specific skill set (hand washing) as opposed to IPE-Sim and the other article, while mentioning interprofessional simulation in the title, was about a pilot study involving pharmacy students who role-played other

health professions' roles. After applying the inclusion and exclusion criteria, a total of 10 records remained for further consideration.

Data Evaluation

Evaluating diverse primary sources is complex when evaluating overall quality and inclusion of the articles within an integrative review (Whittemore & Knafl, 2005). In reviews with strict guidelines of including primary sources with similar research designs, a scoring mechanism may be used to assist in evaluating the overall quality of the article. However, integrative reviews, such as this one, that includes diverse primary articles, evaluating for quality and inclusion is more complex. Further complicating the integrative review of theoretical or competency frameworks guiding IPE-Sim, was the lack of consistency in integrating the framework throughout the study. Some studies mentioned a framework, such as social cognitivism, but did not specify how this framework guided the development and implementation of IPE-Sim. Competency-based frameworks were noted in the literature and describe broad, general attributes associated with various healthcare providers (Cate & Scheele, 2007). According to the Interprofessional Education Collaborative (IPEC), interprofessional competency is the integration of attitudes, knowledge, skills, and values relating to working together as a team to improve health outcomes (IPEC, 2018). Since the articles were diverse, with emphasis on either educational, research, or practice modalities and to facilitate analysis, the decision was made to further prioritize the articles into a) theoretical frameworks

(n = 4) and b) competency frameworks (n = 6) guiding IPE-Sim. Theoretical frameworks included specific references as to the use of the framework, or model, while the competency frameworks described attributes relating to IPE-Sim.

Data Analysis

To better understand the theoretical and competency-based frameworks currently supporting IPE-Sim education and research, each of the peer-reviewed articles were further analyzed to draw conclusions and verify data (see Table 2). Upon primary analysis of the data, competency-based frameworks (n = 6) were cited more often than theoretical frameworks (n = 4). Competency-based education was introduced in medical education in the early 2000s and includes the development of competencies to measure specific skills, knowledge, and professional characteristics (Cate, 2005). While IPE-Sim is founded in experiential learning philosophies (Jeffries, 2005, 2014, 2016; Pinar, 2015), few articles applied the use of theoretical underpinnings beyond the initial development stage of IPE-Sim to the actual implementation and assessment of outcomes. This information is consistent with Murdoch, Bottorff, and McCullough (2013) who conducted a best practices review of simulation as a means to enhance collaborative healthcare and found that while the expectation is that educational learning theories guide teaching and learning approaches, the majority of the literature reviewed for best practices lacked theoretical frameworks to guide the educational modality of simulation. The theories/models supporting IPE-Sim include (a) Benner's novice to expert (1982); (b) readiness to practice model developed by the Michener Institute for Applied Health

Sciences (Bandali, Parker, Mummery, & Preece, 2008); (c) practice theory (Nystrom, Dahlberg, Hult, & Dahlgren, 2016); and (d) transformational learning theory (Mezirow, 1991).

Theoretical Framework Discussion

Titzer, Swenty, and Hoehn (2011) cited Benner's (1982) novice to expert theory as the framework for the IPE-Sim event that included four disciplines (nursing, radiologic technology, respiratory, and occupational therapy). Their belief was that students started a simulation event as a novice learner and that as the students progressed through the interprofessional simulation, their competencies improved along the novice to expert continuum. The authors also surmised that limiting exposure to interprofessional experiences delays the progression of novice to expert healthcare providers, which could ultimately compromise patient outcomes. While Benner's novice to expert model is at times referred to as a theory (Titzer et al, 2011), the concept lacks the components often associated with a theory. Theories include several components such as purpose, concepts, definitions, assumptions, and may also include the development of a conceptual model to further explain the theory (McEwen & Wills, 2011). The novice to expert model is based on the Dreyfus model of skill acquisition (Benner, 1982). The authors used the model as a framework to allow students from multiple disciplines to collaborate together in a simulated environment; thus, giving the students the opportunity to begin the transition from novice to expert healthcare provider.

The Michener readiness-to-practice model was developed to provide a pedagogical framework to guide the development of a new curricula that included interprofessional education with simulation (Bandali, Parker, Mummery, & Preece, 2008). This framework allowed for the progression of exposure to IPE as students progressed from developing clinical skills to clinical readiness by participating in IPE learning opportunities over five semesters with simulation being at the core of all learning modules. The authors did not share data related to the student or program outcomes associated with this model and acknowledged that this framework required further validation.

Mezirow's (1991) transformational learning theory was used by King, Drummond, Hughes, Bookhalter, Huffman, and Ansell (2013) to guide interprofessional simulations across institutions. The authors shared a conceptual model that reflected institutional and instructional reforms for IPE-Sim. While the authors briefly discussed the inter-institutional approach to developing transformative learning through IPE-Sim, the authors did not provide detailed information about how the transformational learning theory guided the development and implementation of IPE-Sim or share outcome data related to the model.

Nystrom, Dahlberg, Hult, and Dahlgren (2016) utilized a practice theory from IPE planning to implementation. The practice theory, as proposed by Nystrom et al., is based on a socio-material perspective whereby the material aspects of a practice is integrated with human activities, thus producing a certain outcome. Ultimately, different material

arrangements in the environment create different learning opportunities for students. Nystrom et al. integrated the practice theory perspective throughout the entire discussion and offered a solid foundation explaining the theoretical premise based on a set of actions performed by students. The practice theory framework focuses on both the social and material aspects of learning whereby practicing is the unfolding of specific actions, language, and a sense of doing. The knowledge of knowing a practice, including affective attributes, guides the use of acceptable behavior as this knowledge is applied in related situations. Nystrom et al. used an ethnographic manner to observe IPE-Sim while applying the practice theory. The authors clearly explained the interactions of students within their social and material arrangements that led to the fluid movement and understanding of working within teams. As Nystrom et al. pointed out, most of the literature about IPE-Sim is protocol and evaluative in nature and more studies using theoretical frameworks are needed.

Competency Framework Discussion

Competency frameworks were noted in six of the articles associated with this review. Competency frameworks provide for consistent practice standards and can be used to measure knowledge, understanding, and competence (King, J. et al., 2016). The Interprofessional Education Collaborative [IPEC] (2018) was first organized in 2011 to develop specific competencies associated with interprofessional education. These competencies noted within four domains of collaborative practice (values/ethics, roles/responsibilities, interprofessional communication, and teams/teamwork). Behan

and Like (2017) and King, J. et al. (2016) discussed the use of the IPEC competency framework to guide the development and implementation of IPE-Sim. Behan and Like conducted a study among nursing and clinical laboratory students using the IPEC competencies as a framework. The authors discussed the internalization of competencies tends to occur in clinical settings that does not always promote collaborative care among students from multiple disciplines. The authors concluded, developing simulations using the IPEC competencies is an important educational methodology to promote collaborative learning and may improve patient outcomes.

Baker et al. (2008) and Brashers et al. (2016) discussed author-developed competencies to guide IPE-Sim. These authors described the development of IPE-Sim involving nursing and medical students. Another similarity associated with these two articles is the use of specific modules to base the competencies associated with the simulation experience. The competency framework associated with Baker et al. included shared, complementary, and profession-specific competencies and were influenced by Durkheim's work on the cohesions in complex societies that creates an interdependence between the societal members. Brashers et al. developed the collaborative care best practice models (CCBPMs) to create simulation experiences by developing discipline-specific behaviors necessary for collaborative patient care. These steps were scenario-specific and were developed by expert panels. The limitation, as discussed by Brashers et al., is the time intensiveness approach to developing individual CCBPMs for each scenario. Baker et al. modified the *Interdisciplinary Education Perception Scale,* to

capture the outcomes while Brashers et al. used an instrument created by the author to assess the simulation along with the team skills scale (TSS) to evaluate teamwork.

The team strategies and tools to enhance performance and patient safety (TeamSTEPPS) competency curricula was discussed by Zhang, Miller, Volkman, Meza, and Jones, (2015) and Liaw, Siau, Chua, and Klainin-yobas (2012) as guiding IPE-Sim. TeamSTEPPS is a curriculum-based method allowing participants the opportunity to learn in a team-based environment to promote quality, safety, and efficiency in healthcare outcomes (Agency for Healthcare Research and Quality, 2018). Liaw et al. discussed the 20-minute simulation scenarios among medical and nursing students using a pre- post-test design. The article did specify how the TeamSTEPPS curricula was used in guiding the development and implementation of IPE-Sim. In contrast, Zhang et al. discussed the theoretical framework guiding TeamSTEPPS and developed targeted behavioral markers (TBM) to decrease the subjectivity of the team performance observation tool (TPOT) associated with TeamSTEPPS. Furthermore, Zhang et al. included the diagram of TeamSTEPPS to allow for a visual representation of the framework guiding IPE-Sim.

Strength and Limitations

The authors used only two database search engines and reviewed two additional resources beyond the database to include in this integrative analysis. Additional information may be found in other health-related databases. However, these two databases were deemed most important and appropriate for a review of IPE-Sim in educational programs of study. The fact that more disciplines are open to IPE-Sim is a

clear indication of how professional healthcare education is evolving, preserving unique discipline features while introducing collaborative approaches. The major limitation of this review is the lack of clearly articulated theoretical or competency frameworks guiding the implementation and evaluation of IPE-Sim, as evidenced by only ten articles describing these types of frameworks in detail.

Conclusion

Today's healthcare system is complex and requires professionalism from multiple disciplines to promote team learning, collaboration, and communication. Yet, this professionalism has evolved within uniprofessional silos (Benner, Sutphen, Leonard, & Day, 2010). To assist in breaking down the professional silos, interdependence on each of the healthcare professions is required to enhance collaboration and communication. IPE-Sim may be the bridge that can bring these disciplines together as a means to practice collaborative care in a controlled environment and may ultimately enhance patient safety.

The primary conclusion drawn from this literature review is the lack of theoretical and competency-based frameworks guiding the development, implementation, and assessment of IPE-Sim. While some researchers briefly discussed the theoretical and competency premises associated with the study, only three (King, J. et al, 2016; Nystrom et al., 2016; Zhang et al., 2015) gave conclusive descriptions of the full integration of the theoretical and competency frameworks. The use of theoretical or competency frameworks in the implementation of IPE-Sim may promote a consistent manner to report

outcomes associated with this educational methodology. By understanding current literature available, educators may elect to use certain frameworks to guide the development, implementation, and assessment of IPE-Sim as a learning methodology.

Table 1

Integrative Review on Theoretical Premises Relating to IPE-Sim

Stage of Review	Illustration of decisions and issues
Problem identification	The use of IPE-Sim within healthcare programs of study has grown since the Institute of Medicine and World Health Organization's initial reports in the early 2000s. However, it is unclear if theoretical premises are used for the development and implementation of IPE-Sim. Therefore, the purpose of this integrative review was to explore and analyze the use of theoretical foundations as related to IPE-Sim.
Literature search	The research purpose guiding the integrative literature review was to consider articles with 1) simulation involving two or more healthcare disciplines in a pre-licensure program of study with nursing being one of the disciplines; and 2) the use of a theoretical premise to guide the development of the IPE-Sim. The initial searches yielded 187 unduplicated items. Additional limiters included full-text/open access, peer-reviewed, English language, 2001-2018. The date limitation was established to mirror the IPE-Sim events occurring after the initial reports by the Institute of Medicine. After considering the inclusions/exclusions, 10 records mentioned the use of a theoretical or competency framework.
Data evaluation	The 10 records were further reviewed to determine if the theoretical or competency framework guided the development of the IPE-Sim. Diverse sampling frames create complexity when determining literature to include in integrative reviews. Since the articles were diverse with emphasis on either educational, research, or practice, the decision was made to further prioritize the articles by use of a theory (n = 4) or competency framework (n = 6) to guide the development of IPE-Sim.
Data analysis	The four theories mentioned include Transformation learning theory (King, S. et al, 2013); Practice theory (Nystrom et al., 2016); Michener model: Readiness to

	practice (Bandali et al., 2008); and Benner novice to expert (Titzer et al., 2011). The competency frameworks included TeamSTEPPS (Liaw et al., 2012 & Zhang, 2015); IPEC Competencies (Behan & Like, 2017; Brashers et al., 2016); and researcher-developed (Baker et al., 2008; King, J. et al., 2016).
Presentation	The theories are founded in experiential, transformative learning grounded in the practice of simulation as an individual progress from novice to expert. The competencies are derived from simulation being a practice, or a state of doing with specific competencies for outcomes.

Table 2

Competency and Theoretical Frameworks Guiding IPE-Sim Education and Research

Author, Year	Category	Name of Framework	Interprofessional Disciplines - Students	Discussion
Titzer et al., (2011)	Theory/Model	Benner's novice to expert	Nursing (79); Occupational Therapy (27); Radiology (15); Respiratory (10)	Simulation provides beginning transition from novice to expert. Theoretical framework presented at beginning and in the conclusion.
Bandali et al., (2008)	Theory/Model	Michener model of readiness to practice	Respiratory; Medical laboratory; Nuclear Medicine; Radiation; Radiological Technology; Chiropody; Cytology; Genetics; Cardiovascular perfusion; Anesthesia Assistant; Ultrasound; MRI. Numbers not given	This is a discussion of curricula redesign for IPE-Sim imbedded into the readiness to practice model over several semesters and simulation experiences. Outcomes were not shared.
King, S. et al., (2013)	Theory/Model	Mezirow's transformational learning theory	Four post-secondary institutions collaborating in the development of inter-	The authors mentioned Mezirow's theory and depicted a conceptual model of the application

			institutional simulations. Disciplines not shared.	of the framework. Outcomes were not shared
Nystrom et al., (2016)	Theory/Model	Practice theory	Medical students (40); Nursing students (66)	The theoretical framework was integrated throughout the entire paper. Outcomes were based on student observations.
Brashers et al., (2016); Baker et al., (2008)	Competency	Author-Developed	Nursing (163); Medical (295) Nursing (101); Medical (42); Jr. Medical (70)	Developed a competency models (CCBPMs) based on discipline-specific expectations for each simulation. Outcomes were measured using team skills scale (TSS) and author-developed checklist. Combined various competencies such as shared, profession-specific, and complementary to guide the development of IPE-Sim. Outcomes were

				measured using a modified version of the interdisciplinary education perception scale.
Zhang et al., (2015); Liaw et al., (2012)	Competency	TeamSTEPPS	Physical Therapy - DPT (47); BSN (25) Nursing (18); Medical (32)	The purpose was to improve the reliability of the Team Performance Observation Tool. The TeamSTEPPS framework was used to guide the development of targeted behaviors for IPE-Sim and was integrated throughout the article. The authors stated the TeamSTEPPS curriculum was used to develop the IPE-Sim but did not elaborate to the overall development and use. The authors modified a self-reporting questionnaire on IPE.

Behan & Like, (2017); King, J. et al. (2016)	Competency	Interprofessional Education Collaborative (IPEC)	Nursing students (BSN); Clinical Laboratory Students Participant numbers were not given. Respiratory therapist (4); nursing (5); Physical therapy (4)	The authors discussed the use of the Interprofessional Education Collaborative (IPEC) competencies in a simulated environment. Outcomes were not reported. The IPEC competencies were integrated throughout the article and in the discussion of the development, implementation, and assessment of IPE-Sim. The authors used the Collaborative Competencies Attainment Survey (ICCAS) to assess outcomes.

Search Terms: interprofessional AND simulation AND education AND theory*

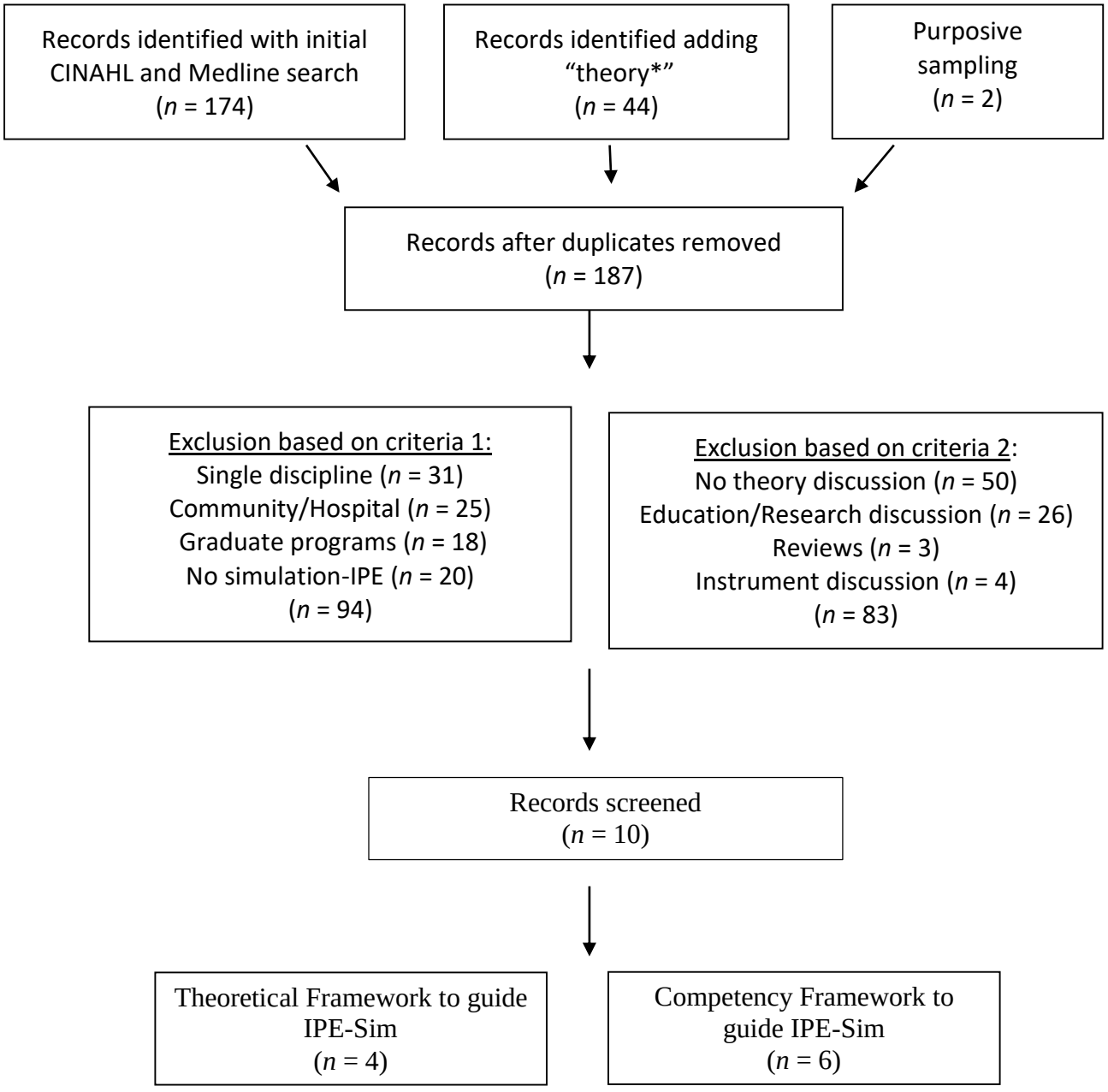

Figure 1. Graphic Display of Search.

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CHAPTER III

PROCEDURE FOR COLLECTION AND TREATMENT OF DATA

The aim of this convergent mixed methods study was to explore and investigate the effectiveness of interprofessional simulation (IPE-Sim) as a learning methodology to promote and reinforce role recognition, team learning, and collaborative practice. The quantitative investigation was conducted using a randomized, two-group experimental design with repeated measures. The dependent variable were the perceptions of students, as measured by the scores on the Student Perceptions of Interprofessional Clinical Education (SPICE-R2). The independent variable for the study was IPE-Sim. The experimental group participated in two, two-hour IPE-Sim classes while the attention control group participated in two, two-hour lectures (IPE-Lecture). The lectures covered the same foundational case scenarios as the IPE-Sim.

The qualitative research design was based on Merleau-Ponty's hermeneutic phenomenological perspective seeking to understand the world, as lived by the students, to provide a thoughtful interpretation as they participated in IPE-Sim. Data collection for the study included observation of students immersed in IPE-SIM and personal interviews with the students electing to participate in the interviews. The convergent mixed method approach guided understanding and interpretation of the phenomenon as data from both methods were collected and analyzed at the same time. This chapter includes the

research methodology, data collection, analysis, and will include a summary of the pilot study conducted in the fall of 2018.

Setting

The setting for the study was an urban community college in southeast Texas. The learning spaces consisted of simulation labs, debriefing classroom, and traditional classrooms. The simulations occurred on the first floor using common spaces and laboratories. The simulation labs for each of the disciplines included state-of-the art equipment to closely resemble the clinical setting. The traditional classroom consisted of standard electronic capabilities to display videos and PowerPoint presentations.

Population and Sample

The population for the study were students enrolled in the associate degree nursing, pharmacy technician, and paramedic programs at an urban community college. Four nursing faculty, two pharmacy technician faculty, two paramedic faculty, and one simulation coordinator also participated in the IPE-Sim. The simulation coordinator met with content experts to ensure the case scenarios included unfolding scenarios appropriate for all disciplines.

Power Analysis and Sample Size

Only two articles that discussed power analysis for interprofessional simulation were noted in the literature. Simko, Rhodes, and Fiedor (2017) reported an effect size of 0.35, while Smith (2014) reported an effect size of 0.5. Rutherford-Hemming and Lioce (2018) conducted a systematic review of interprofessional education and found sample

sizes for quantitative designs ranged from $N = 19$ to $N = 480$ while samples for qualitative studies ranged from $N = 11$ to $N = 361$, with the average sample size equal to 55.

Education interventions tend to yield small effect sizes (Spurlock, 2017). A priori power analysis was conducted using G*Power version 3.1.10 to determine the minimum sample size required to find significance with interactions between and within groups (ANOVA). A minimum of 44 participants were required to find significance with a desired level of power set at 0.8 and an α-level of $p = .05$, and small to moderate effect size of 0.25 (Cohen, 1988; Erdfelder, Faul, & Buchner, 1996).

Protection of Human Subjects

Institutional Review Board (IRB) approval was obtained from the institutions involved in the research study (see Appendix A). During recruitment, all participants were informed of the study and the need to (a) attend two IPE classes, (b) complete a data collection form on one occasion, and (c) complete a paper survey prior to the first IPE class, immediately following the second IPE class, and again four weeks later. The participants were reminded that participation was voluntary and that they may cease their involvement at any time during the study.

The participants were given the informed consent form (see Appendix B) prior to the first IPE class. No identifiable data were collected for this study. Audio recordings were used for personal interviews. The tape transcriptions and coding are maintained in

the researcher's office on the researcher's password protected computer in a password protected file. The audio tapes and all forms are maintained in the researcher's locked office and locked filing cabinet. All documents and tapes will be retained for a period of five years and will be physically destroyed at the end of the five years. Remuneration for participation was given at the completion of the study when the final data point was collected and included a pizza party and $15 gift card for participation.

Instrument(s)

The Student Perceptions of Interprofessional Clinical Education (SPICE-R2) was the instrument used for this study. Anonymity was maintained using the subject-generated code (Damrosch, 1986). A demographic form was also used to capture data about each participant. An interview schedule and unstructured observational field note guide was also used during the qualitative exploration of the phenomenon.

Subject-Generated Code Form

Once the participants signed the informed consent form, they then completed the subject-generated code (see Appendix C), which was used on all forms to protect the identity of the participants and allow for anonymous linking of data. The form included eight unique questions to generate a code to be used on all documents to link the data at different time points. The interview participants also used the code as their participant-identifier to further link the quantitative and qualitative data.

Demographic Form

To gather specific information about each participant, once the consent form was signed, the participants then completed a demographic form (see Appendix D). The data collected included information regarding (1) program of study, (2) number of simulations attended, (3) number of IPE-Sims attended, (4) age, and (5) ethnicity.

Student Perceptions of Interprofessional Clinical Education (SPICE-R2)

Fike, Zorek, MacLaughlin, Samiuddin, Young, and MacLaughlin (2013) developed The Student Perceptions of Interprofessional Clinical Education (SPICE) instrument to measure medical and pharmacy student perceptions about IPE and collaborative practice. The instrument was later revised (SPICE-R2) to remove discipline-specific language to allow for a broad use across all health professions and to balance the number of items within the subscales (Zorek, et al., 2016). This 10-item scale has three subscales including (a) team learning, (b) roles/responsibilities for collaborative practice, and (c) patient outcomes associated with collaborative practice. The SPICE-R2 is a 5-point Likert Scale ranging from *strongly disagree* to *strongly agree*. The instrument is congruent with experiential and problem-based learning and is a good fit for the research study. See Appendix E for a description of the SPICE-R2 instrument and the ten items noted on the instrument.

Validity and Reliability

The SPICE-R2 measures students' perceptions regarding collaborative practice with students from other disciplines. The 10-item instrument is reliable, with Cronbach

alpha scores ranging from 0.837 – 0.86 across studies. Validity/CFI scores also was demonstrated with scores ranging from 0.946 to 0.98. The subscales had Cronbach alpha scores ranging from .58 to .86 (Fike et al., 2013; Zorek et al., 2016). Zorek, Lockeman, Eickhoff, and Gunaldo (2018) conducted another study to confirm the SPICE-R2 is a good model for use in educational settings for multiple healthcare disciplines. The instrument was adopted by three large universities and was used during an IPE among medicine (N = 383), nursing (N = 270), and physical therapy (N = 157) students. The instrument demonstrated an acceptable fit to all disciplines (SRMR 0.05, CFI 0.96, and RMSEA 0.09). The 10-item instrument was noted as reliable, with Cronbach alpha scores of 0.83 for total scale, 0.74 for subscale teams/teamwork, 0.72 for subscale roles/responsibilities, and 0.83 for patient outcomes. Program-specific reliability for the instrument was good across disciplines with medicine (0.82), nursing (0.86), and physical therapy (0.86).

Semi-Structured Interview Schedule

A semi-structured interview guide (see Appendix F) was used to guide the researcher during personal interviews as students discuss the lived experience of participating in IPE-Sim. The semi-structured interview schedule included nine questions that focus on the perception of the participant relating to the overall experience, communication, collaboration, understanding of other health professions roles, and connection of IPE-Sim to patient outcomes.

Observational Field Notes

To guide the collection of data through observation, unstructured observational field notes (see Appendix G) were taken to record items such as setting, participants, interactions, and intangible factors. Observation of the setting involved noticing environmental contexts that led to specific behaviors. Participant observations included noticing verbal and non-verbal communication between participants and the relationship of these interactions to patient outcomes. Interactions included behavioral aspects as students interacted with each other while coordinating care. Intangible factors included observing congruence between verbal and non-verbal communications and the types of behaviors that were helpful, or disruptive, to the learning environment. These items were used as prompts to assist in recording field notes and transcribing interviews.

Data Collection

Recruitment of participants occurred from the accessible population of students enrolled in the associate degree nursing, pharmacy technician, and paramedic programs of study. The principal investigator (PI) attended the classes to inform the students of the IPE research study. On day one, the PI discussed the study, obtained informed consents, and explained the various forms associated with the study. Upon completion of the informed consents, the participants were then randomized into the experimental and attention control groups and completed a unique subject-generated code, demographic form, and SPICE-R2 instrument prior to attending the first IPE class.

Randomization into the experimental and attention control groups occurred as students drew numbers within their disciplines. Numbers were placed in three different hats, one for each discipline. Participants then drew numbers to ensure equal representation of participants from each discipline to the experimental and attention control groups. Students drawing even numbers were assigned to the experimental group while students drawing odd numbers were assigned to the attention control group. The students remained in these groups for the duration of the study.

The SPICE-R2 instrument was collected at three time points. The first time point was after the participants were randomly assigned into the experimental and attention control groups. The second time point occurred immediately following the second IPE class and the third time point occurred four weeks later. The participants used their unique codes on all SPICE-R2 forms to allow for linking of data.

The qualitative observations occurred during both IPE-Sim classes with the PI following the case scenarios as they unfolded. The observations followed the scenarios from the paramedic simulation lab using standardized patients to the nursing simulation lab using high-fidelity simulators and standardized patients. The pharmacy technician students were observed as they communicated with members of the healthcare team in all simulation laboratories.

The IPE-Sim and IPE-Lecture used the same foundational scenarios. The scenarios were used during each IPE session, forming a consistent element within both educational environments. Prior to the beginning of the study, the faculty and simulation

coordinator modified the case scenarios to ensure opportunities for communication, collaboration, and coordination of care among the three disciplines. The IPE-Lecture included instructor-led activities such as lectures, PowerPoint presentations, videos, and group discussions. The primary difference between the treatment and control group was the method of instructional delivery.

Pilot Study

A pilot study was conducted in the fall of 2018 to test the feasibility of this study. IRB approval was obtained from the institutions prior to the recruitment and start of the pilot study. The PI collaborated with key stakeholders (simulation coordinator and lead faculty from each disciplines) to plan the IPE event and conduct the research study. The planning phase included (see Appendix H for additional steps associated with planning the IPE-Sim):

- Determining skill competencies and level of simulation appropriate for all disciplines.
- Determining date and time for the three IPE classes.
- Developing IPE-Sim and discipline-specific outcomes.
- Planning foundational scenarios that included unfolding case studies for all disciplines.

The simulation coordinator and faculty developed the primary case scenarios to be used with IPE-Sim and IPE-Lectures. The IPE-Sim scenarios were adapted from the NLN Simulation Scenarios available through Laerdal Corporation to ensure intentional opportunities for the students to collaborate and communicate while providing care in the

simulated environment. Content experts used the foundational scenarios to teach the IPE-lecture material. The simulation coordinator and faculty developed the IPE-Sim timeline for the unfolding scenarios. The first IPE lesson plan, case scenarios, and timeline is noted in Appendix I.

A total of 20 participants were recruited for the pilot study. While establishing a sample size for a pilot study is dynamic to ensure adequate effect size for smaller sample sizes (Polit & Beck, 2017; Hertzog, 2008), Connelly (2008) suggests 10% of the projected sample is sufficient for a pilot study. The number of participants for the IPE-Sim pilot study was above the required threshold of five participants, based on a projected sample size of 44. The sample included ten associate degree nursing students (50%), four paramedic students (20%), and six pharmacy technician students (30%). The participants were randomly assigned, by drawing numbers, to either the experimental (n = 10) or the attention control group (n = 10).

Once the students were divided into experimental and attention control groups, the SPICE-R2 survey was collected at three time points: (1) prior to the first IPE class(T1), (2) two weeks later and immediately following the second IPE class (T2), and (3) four weeks later (T3). At the start of the second IPE-Sim class, the researcher recruited four students from the experimental group to participate in personal interviews. These interviews occurred within 48 hours of the second IPE-Sim. Limited observation notes were taken during the first IPE-Sim due to technical issues at the start of the scenario. More complete observation field notes were taken during the second IPE-Sim

session. Students received a pizza party and $15 gift card upon submitting the final SPICE-R2 form.

The purpose of the pilot study was to test the feasibility of conducting the mixed method educational study involving two groups, and a repeated measures design. Feasibility was assessed by examining the process associated with dividing the participants into groups, conducting the IPE classes, managing the timeline for the IPE-Sim, and the process of the collection and linking of data points. The commitment of the simulation coordinator and faculty in developing unfolding case scenarios, appropriate for each discipline, strengthened the study. The smaller sample size allowed opportunity for the PI and simulation coordinator to determine changes required for the IPE-Sim timeline when conducting the larger study.

Treatment of Data

Descriptive statistics were used to analyze demographic data. A repeated measures ANOVA was used to determine if a causal relationship existed between and within the groups in relation to IPE. The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 25. To examine differences between and within groups, a mixed ANOVA with repeated measures was conducted to assess student perceptions on IPE. The assumptions were examined to ensure the parametric test was suitable for the pilot study. The Levene's test for equality of error variances and the Box's test of equality of covariance matrices were examined and met the homogeneity assumption.

To examine the phenomenological components of the study, naïve readings of the transcripts and field notes occurred, followed by a structural analysis to determine meaningful units and themes, in order to determine a comprehensive understanding of IPE-Sim (Lindseth and Norberg, 2004). The interviews were conducted by the PI who also transcribed the tapes to ensure gathering of complete data.

A convergent mixed method design, as employed in this study, allowed for an extensive analysis as both data forms (quantitative and qualitative) were collected, analyzed, and interpreted simultaneously to understand and identify congruent or incongruent themes associated with the phenomenon (Creswell & Creswell, 2018). All electronic information was saved on a password protected file located on a password protected computer. The paper forms were stored in a locked file cabinet in the locked office of the PI.

Findings.

The reliability of the SPICE-R2 was examined for the pilot study. The Cronbach alpha scores ranged from 0.658 to 0.821 across the three time periods. The reliability scores were acceptable for this small population. With power set at 0.8, and an α-level at 0.05, a mixed between-within subject's analysis of variance (ANOVA) was conducted to assess student perceptions on IPE based on the SPICE-R2 scores across three time periods. There was no significant interaction between group and time with a Wilks' Lambda = 0.80, $F(2,17)$, $p = .15$, partial eta squared = .20. There was substantial main effect for time with a Wilks' Lambda = 0.30, $F(2,17)$, $p = .000$, partial eta squared = .70.

The main effect comparing the experimental group with the control group was not significant, $F(1,18) = 0.232$, $p = 0.636$) in this pilot study.

The hypothesis postulated that the students assigned to the experimental group would score higher on the SPICE-R2 instrument than students who participated in the IPE-Sim lecture. While the interaction between group and time was not significant, the effect of time was noteworthy. The mean scores for students assigned to the experimental group were higher at T3 ($M = 46.4$) than the attention control group ($M = 43.3$). The mean scores decreased for the attention control group between T2 ($M = 45.1$) and T3 ($M = 43.3$).

The four participants for the interviews included two nursing, one paramedic, and one pharmacy technician student. The audio recordings were transcribed and analyzed according to the Lindseth and Norberg (2004) structural analysis method. The transcripts were read to obtain a naive understanding of the phenomenon. After several readings, each transcript was further analyzed by recording meaning units, derived by quotes of passages to determine common themes noted throughout the interviews. These common themes included communication, collaboration, role appreciation, and role recognition. These themes led to an enhanced understanding of IPE-Sim. Students appreciated the realistic environment created to allow opportunities to learn with other students while applying communication and collaborative skills during the coordination of care. IPE-Sim also allowed participants the opportunities to appreciate and recognize not only how

their role functions within the healthcare team but, also the role of the other disciplines as all students work together to coordinate care.

Summary

Even though simulation is widely used in many healthcare educational programs, the literature is lacking in the overall effectiveness of IPE-Sim as a teaching methodology. While this pilot study did not yield significant results between the groups over time, the effect of time was noteworthy for students participating in IPE-Sim. IPE-Sim promotes active learning by allowing students to interact with their environment, and others, to gain new understanding of the world. The students who interacted together through simulation, had mean scores that increased over time, indicating that the perception of learning together was solidified for a longer time period as compared to students who participated in traditional lectures. This finding supports Dewey's philosophy that students learn as a result of exposure to problems within a social context. The IPE-Sim afforded students the opportunity to learn experientially, which contributed to their overall perceptions about interprofessional teams, role recognition, and collaborative practice in caring for patients.

CHAPTER IV

ANALYSIS OF DATA

CHAPTER SUBMITTED FOR PUBLICATION

A Paper Submitted to Publication in the

Nurse Education Perspectives Journal

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TITLE: The Perceptions of Nursing and Allied Health Students Participating in Interprofessional Simulation: A Mixed Methods Study

Abstract

AIM: The aim of this study was to understand the effectiveness of simulation-enhanced interprofessional education (IPE-Sim) as a learning methodology.

BACKGROUND: Interprofessional education (IPE) provides a collaborative approach to educating students from different health-related programs. However, rigorous studies are limited about the effectiveness of IPE-Sim as an educational methodology that supports interprofessional teams, role recognition, and collaborative practice.

METHOD: This convergent mixed methods design focused on the complex phenomenon of IPE-Sim. The quantitative investigation was conducted using a randomized, two-group experimental design with repeated measures while the qualitative exploration was based on hermeneutic phenomenology of interpreting the meaning of the lived experience of participating in IPE-Sim.

RESULTS: A total of 60 students participated in the study. Congruence was noted between the quantitative and qualitative findings with significant interactions noted in the quantitative data.

CONCLUSION: Study results supported the effectiveness of IPE as a learning methodology.

Key Words: interprofessional; education; simulation; nursing; allied health

The concept of interprofessional education (IPE) has been around for decades as the Institute of Medicine (IOM) published several reports specifically addressing education for health care professions (Gough, Hellaby, Jones, & Mackinnon, 2012; Zhang, Thompson, & Miller, 2017). The first IOM report was released in 1972, *Educating for the Health Team*, followed by the 2003 report, *Health Professions Education: A Bridge to Quality*, and the 2010 report on *The Future of Nursing: Leading Change, Advancing Health*. In 2011, in response to the call for the transformation of educational programs preparing future health care providers, the Interprofessional Education Collaborative Expert Panel (IPECEP) developed core competencies specifically for interprofessional collaborative practice. The core competencies were updated in 2016 to include interprofessional collaboration as an over-arching domain for the four primary competencies (1) values and ethics for interprofessional practice; (2) roles/responsibilities; (3) interprofessional communication; and (4) teams and teamwork (IPEC, 2018).

Interprofessional simulation (IPE-Sim) combines the realism offered by simulation with well-designed scenarios to promote collaboration among students from two or more disciplines (Jeffries, 2014). Health care professionals must be able to work in health care teams to ensure quality patient outcomes (Kaiser, Bartz, Neugebauer, Pietsch, & Pieper, 2018; Thibault, 2013). To respond to this concern, the National League for Nursing (2016) released a vision about interprofessional collaboration in education and encouraged nursing education programs to broaden their interprofessional collaboration by including students from many different professions. While simulations are becoming commonplace in training health professionals, research is needed regarding the overall effectiveness of IPE and IPE-Sim (Nystrom, Dahlberg, Hult, & Dahlgren, 2016). Rigorous evaluations are needed to determine IPE effectiveness in teaching collaborative practice in the clinical setting and in measuring higher-level outcomes such as changes in behavior, performance, and stereotypical mindsets (Labrague, McEnroe-Petitte, Fronda, Obeidat, 2018; Lockeman et al., 2017; INACSL, 2016). The interprofessional simulation integrative review conducted by Labrague et al. (2018) concluded only four percent of the studies utilized a randomized control trial (RCT) design and none of the studies included a power analysis to ensure adequate sample size for the study. In addition, Labrague et al. noted that many studies failed to discuss the validity and reliability of the instruments chosen for the quantitative investigation and recommended the use of rigorous research methods to provide high level evidence to inform various administrators in policy development.

The aim of this mixed methods study was to incorporate the use of rigorous research methods to better understand the effectiveness of IPE-Sim as a learning methodology for nursing and two allied health professions by understanding student perceptions about interprofessional role recognition, team learning, and collaborative practice.

Method

Design

A mixed methods approach was used to explore the effectiveness of IPE-Sim as a learning methodology to promote interprofessional role recognition, team learning, and collaborative practice by exploring student perceptions. Using a convergent, mixed methods approach enabled the investigator to collect and analyze the quantitative and qualitative data simultaneously to determine congruencies, incongruences, associated with the phenomenon. The quantitative data are based on a randomized, two-group experimental design with repeated measures using the scores associated with the SPICE-R2 instrument while the qualitative data is derived from participant interview responses about their lived experiences of participating in IPE-Sim.

The hypothesis for the quantitative study: Healthcare professional students who participate in two, 2-hour IPE-Sim will score higher on the SPICE-R2 immediately following the second simulation and at four weeks than students who participate in two, 2-hour IPE-Lectures. The research question guiding the hermeneutic phenomenological

exploration: What is the lived experience of healthcare professional students who participate in IPE-Sim?

Theoretical and Philosophical Framework

Determining the overarching worldview is important when conducting mixed methods research to ensure congruency throughout the study (Creswell, 2009). The primary investigator's world view is based on constructivism, whereby, learners construct their own meaning as they link new information with their prior knowledge. The meanings are subjective, based on the individual's perception and interaction in the environment. The quantitative study was based on Dewey's (1938) problem-based learning framework. Dewey posited students learn as they interact in, and with the environment, bridging former knowledge with the current experiences. Additionally, Dewey believed learning does not occur by the experience alone, rather, by the quality of the experience. The researcher worked with the faculty team to ensure quality scenarios were created to maximize learning and relevance for the participants.

A hermeneutical phenomenological approach was used to explore the lived experience of nursing and allied health students participating in IPE-Sim. Merleau-Ponty (1945/2014) believed experience is made up of multiple meanings and these meanings influence the overall perception of the experience. Hermeneutic phenomenology is the intersection between previous and current experiences, including other individuals' experiences, to consciously understand and interpret the world. The hermeneutic circle of understanding the whole by considering the parts aids in the interpretation and

understanding of the phenomenon. By applying Dewey's progressive learning theoretical framework with Merleau-Ponty's hermeneutic influence, the exploration of both quantitative and qualitative aspects of IPE-Sim allowed for enhanced understanding of the phenomenon due to the triangulation and merging of data (Fetters, Curry, & Creswell, 2013; Polit & Beck, 2017).

Sample

Institutional Review Board (IRB) approval was obtained from the institutions involved in the research study. The students were recruited from the associate degree nursing, pharmacy technician, and paramedic programs of study in an urban community college in the Texas Gulf Coast region and completed the informed consent form prior to the systematic randomization into the experimental or attention control groups. The participants completed a data collection form to describe the student participants. Additionally, the participants used a subject-generated identifier on all documents for anonymous linking of data. The repeated measures, experimental quantitative aspect of the study was based on students attending two IPE events (IPE-Sim/lecture) and submitting three SPICE-R2 instruments: pre-IPE-Sim/lecture, immediately post the second IPE-Sim/lecture, and again at four weeks. The final data analysis was based on complete data sets from the students participating in both IPE events and completing all three SPICE-R2 forms.

Seventy students agreed to participate in the study. However, ten participants (14%) did not complete all three surveys due to absenteeism at either the second or third

data point. A total of 60 participants ($N = 60$) completed all data sets, which exceeds the minimum sample size of 44 required to find significance based on a priori power analysis conducted using G*Power version 3.1.10. The analysis was based on the desired level of power set at 0.8, an α-level at .05, and a small to moderate effect size of 0.25 for a repeated measures ANOVA examining interactions between and within groups. The nursing students represented 55% ($n = 33$) of the population, the pharmacy technician students represented 28.3% ($n = 17$), and the paramedic students represented 16.7% ($n = 10$) of the population.

A purposeful sampling method was used to ensure interview participants would have rich information to share about their experiences with the phenomenon. Ten students ($N = 10$) agreed to the participate in the qualitative study. The programs were well represented with four nursing (40%), three pharmacy technician (30%), and three paramedic (30%) students agreeing to participate in the personal interviews. Participants used their subject-generated code to maintain anonymity and link their interview responses to their SPICE-R2 scores.

Data Collection and Measurement – Quantitative Lens

The *Student Perceptions of Interprofessional Clinical Education* (SPICE-R2) was used for this study. The instrument consists of three subscales and ten items that measure students' perceptions regarding role recognition, team learning, and collaborative practice on a 5-point Likert Scale ranging from strongly disagree to strongly agree (Zorek, 2016). Dominquez, Fike, MacLaughlin, and Zorek (2015) conducted a

study to confirm the SPICE-R2 is a good model for use in educational settings for multiple healthcare disciplines as they revised the initial instrument. Their sample included 221 students enrolled in nursing, optometry, pharmacy, physical therapy, and health administration programs. The 10-item instrument demonstrated an acceptable fit to all disciplines (SRMR 0.05, CFI 0.946, and RMSEA 0.09) and was reliable with Cronbach alpha score of 0.86.

For this study, students were randomly assigned to participate in either the (1) IPE-Sim (experimental group; n = 30) or (2) IPE-Lecture (attention control group; n = 30). Students completed the SPICE-R2 instrument on three occasions: (1) prior to the first simulation (T1), (2) two weeks later and immediately following the second simulation (T2), and (3) four weeks later (T3). The participants received a $15 gift card and a pizza party at the last data collection point. The SPICE-R2 10-item instrument was subjected to an inter-item reliability analysis with this sample to determine the reliability of the overall instrument. The scale demonstrated an acceptable inter-item reliability with a Cronbach's alpha of .779.

Preliminary Analysis

The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 25. In reviewing the initial frequency and distribution associated with the categorical demographic data of (1) program, (2) ethnicity, (3) age, and (4) number of simulations, the decision was made to dichotomize these variables. A series of independent *t*-tests were then conducted to determine if these dichotomized variables

made a difference in the total scores for T1. As seen in Table 4.1, there were no significant difference in scores between the variables T1 total scores, $p > .05$, indicating relatively equivalent scores across all categories.

To further examine the variables, cross tabulations using Pearson's chi-square and Cramer's V tests were conducted to examine the relationship between participants in groups and (1) program, (2) ethnicity, (3) age, and (4) number of simulations. As shown in Table 4.2, there was not a significant relationship between groups and any of the independent variables, with $p > .05$ for all categories, indicating an equivalent number of observations across all levels by group. Therefore, the decision was made to not include these variables as a covariate in the repeated measures ANOVA.

Results

The SPICE-R2 measures were examined for changes over time and differences between groups, as well as interactions between time and group with a repeated measures ANOVA. The primary assumptions associated with a repeated measures ANOVA were met as normal distributions (with no significant outliers) and sphericity, were confirmed. The 3 (time) X 2 (Group) ANOVA revealed a statistically significant main effect for group at the $p < .05$ level: $F(1, 58) = 5.06$, $p = .028$. The effect size, calculated using partial eta squared was .08, indicating a medium effect size. The significant difference occurred at T2 between the means of the experimental group ($M = 44.23$, SD 4.36) and the means of the control group ($M = 41.27$, SD 5.70) indicating students participating in

the IPE-Sim (experimental group) had a significantly higher mean score on the SPICE-R2 at T2 than students participating in the IPE-Lecture (control group).

Additionally, there was a statistically significant main effect for time, $F(2, 58) = 35.932$, $p < .001$, $n^2 = .383$, indicating that regardless of group, the Mean scores significantly changed over time. The experimental group scores changed significantly between T1 and T2 ($p = .000$) and between T1 and T3 ($p = .000$) but did not change significantly between T2 and T3 ($p = .248$). The attention control group scores changed significantly at each time point, T1 and T2 ($p = .001$), T2 and T3 ($p = .021$), and T1 and T3 ($p = .000$). These results indicate that student perceptions relating to interprofessional role recognition, team learning, and collaborative practice improved with both IPE activities.

Summary of Quantitative Data Findings

The hypothesis indicated that the experimental group would score higher on the SPICE-R2 scores than the attention control group at both T2 and T3. However, the significance only occurred at T2 between the means of the experimental group and the attention control group and not at T3. Therefore, the hypothesis was only partially met. A statistically significant effect was noted for time for both groups, indicating the means increased over time for participants regardless of group assignment. In addition to the statistically significant findings for time, the effect sizes were medium to large; thus, supporting the use of IPE within healthcare educational programs.

Data Collection and Interpretation - Qualitative Lens

A hermeneutical phenomenological approach was used to explore the lived experience of nursing and allied health students participating in IPE-Sim. Data collection consisted primarily of personal interviews using a semi-structured interview guide and was supplemented by field observation notes. The interviews were tape recorded and then transcribed by the researcher in order to dwell with the data. The structural analysis as proposed by Lindseth and Norberg (2004) guided the analysis and interpretation of the qualitative data and followed the pattern associated with the hermeneutic circle; whereby, the researcher seeks to understand the whole, as conceptualized to the parts, while seeking to understand the parts, de-conceptualized from the whole, in order to understand and interpret the phenomenon.

Rigor

To establish reliability for the qualitative aspect of this mixed methods study, the researcher sought volunteers from each of the disciplines who had a genuine interest in participating in the personal interviews and could offer different representations to contribute to the whole (Wallengren, Segesten, & Friberg, 2009). The hermeneutic principles and analysis method guided the entire process from developing the research question, to designing the study, and completing the analysis. The structural analysis validates the naïve interpretation and directs the comprehensive understanding (Lindseth & Norberg, 2004).

Results

The Lindseth and Norberg (2004) hermeneutical method of analysis was used to capture the meaning of the lived experience of participating in IPE-Sim in order to give way to the interpretation of that experience. The three-step method includes (1) naïve interpretation, (2) structural analysis, and (3) comprehensive understanding. However, these steps are not necessarily linear or methodic and researchers must use imagination as they become close with the text in order to feel like they are in the experience, or living-in-the-world of the text, as they develop a comprehensive understanding of the phenomenon. Munhall (2012) discusses this phenomenological contemplation as being circular, and not linear, as researchers use experiential inquiry as they interact in the world of the phenomenon.

In order to be in-the-world of the participants, researchers must decenter and take on a state of unknowing (Munhall, 2012). This researcher actively practiced the concepts of decentering and unknowing to eliminate preconceptions of knowledge about the phenomenon while interviewing the participants and during the reading, and rereading, of the text. This process allowed the researcher time to dwell with, and in, the data; as participants spoke, their words were transcribed, and the naïve interpretation of the texts unfolded.

Naïve Reading. Each transcript was read several times to develop a naïve understanding of the phenomenon. Most naïve descriptions included similar emotions of fear, anxiousness, and excitement while recognizing various roles of students, and

understanding the connection between previous and new knowledge. This naïve reading provided the direction for the structural analysis. A consolidated naïve interpretation from the interviews:

> Participating in IPE-Sim feels realistic, yet strange, like being out-of-place because of not knowing anyone or what to expect. The experience is exciting as everyone communicates to take care of patients within their own role. While the experience is scary at first, the comfort level increase as the simulation unfolds.

Structural Analysis. In order to gain a richer understanding of the phenomenon, structural analysis began as the texts were re-read and organized into meaning units, which were either full or partial sentences. The researcher aimed to de-conceptualize each of the meaning units from the whole in order to capture the meaning of the sentence, or statement. The meaning units were further condensed until a theme emerged. The researcher was immersed in the text as the meaning units and themes were discovered for each of the ten interviews and a comprehensive understanding of the phenomenon of IPE-Sim emerged. An abbreviated example of the steps used during the structural analysis phase is presented in Table 4.3. The structural analysis of all transcripts were then reviewed to understand the major themes emerging from the data that may answer the research question. Five major themes arose from the interviews.

Realistic Learning Environment. Every participant discussed the realistic environment and interaction with other students. They enjoyed participating in "somewhat real-life" scenario's in the simulated hospital and how they were able to see

"first-hand" how everyone worked together. Participants valued the practice in their own labs but believed practicing with other students enabled them to understand how their specific skills impacted patients and other members of the team. A nursing participant noted they watch nurses transfer patients from one unit to another at clinical however, being the "nurse" to handle those activities made her feel she understood the process much better than by observation alone or discussion in post conferences. Most of the participants commented on being able to make the decisions in the simulation and not relying on their instructors to guide their thoughts or actions. Many found this a little "scary" but valued the opportunity to learn. Many participants commented on how "busy" everyone appeared and appreciated the unfolding case studies that enabled students from different disciplines to have a role in taking care of the simulated patient(s). Due to the realism, the students were able to practice time management and communication with students in other disciplines. As one nursing participant stated, "…we weren't ready. We may be on the phone with pharmacy and then here the paramedics are, with a patient…it was so like the real thing…we really got to talk and do more since it was a simulation." A paramedic participant commented the experience is "exposure to the working environment" and liked the interaction with different healthcare students in the simulated Emergency Department (ED).

Interconnectedness. The theme of interconnectedness was woven throughout the interviews and went beyond the concept of role recognition and appreciation, which is another theme noted. One nursing participant referred to this concept as "it works

together as a circle…you have to know correct information…and you have to be able to tell someone else." The interconnectedness was also referred to as learning together as a team by being in the same space, taking care of the same patients, and talking to students they would normally not speak to. One nursing participant stated, "…once someone took control…it was like all hands-on-deck…and the nursing students helped the paramedic students transfer the patient to the bed…it took all of us." Many of the participants appreciated the scenarios unfolding for each of their respective disciplines and how this process augmented their understanding of the role each discipline has in health care. Some participants described interconnectedness as building relationships with other students. One participant noted, "…it was good seeing all of the students…I would never talk to them…but we have to talk to take care of patients someday." A paramedic participant stated, "…the questions they don't ask us while we are there won't be answered….and, they [nursing student] asked me a question and I thought 'that is something I need to remember to find out when I am in the field'...this really puts it together." One of the pharmacy technician participants commented, "Seeing how what we do does matter to someone. We never see that part."

Personal Growth. Many participants discussed their own growth, along with growth they witnessed in other individuals. One nursing participant commented they noticed the pharmacy technician student looked nervous coming into the lab at first but, later, the same student walked into the lab and "did not look scared at all." A pharmacy participant commented, "We prepare medicine…so going to the rooms [hospital labs]

shows us something else…I see more of it now…how it all works together. I can do this." The participants discussed feeling "better" as they participated in the scenarios. Communication between the students also improved as the scenarios unfolded. The participants felt like the scenarios provided opportunity to critically think as they were discussing care about a patient together and were not able to rely on faculty to help them through their thought processes. One nursing participant commented, "…you're exposed…people are uncomfortable…nervous…but that's how it's going to be in the real world. We can learn that now."

Role Recognition and Appreciation. Every participant discussed recognizing the role of another student, another discipline. Many participants acknowledged they had very little knowledge of what the other students did in their programs before the simulations. The participants acknowledged the different "jobs" and how these "roles" work together to take care of patients. The nursing and paramedic participants also noticed the differences in their own roles. The nursing participants appreciated how paramedics "think on their feet…they have no time to waste…they are by themselves" while a paramedic participant noted "we fix the patient…we have the least contact…they care for the patient longer…treat the underlying problem." The nursing participants were unaware of the vast information the pharmacy technician students knew about medications. A pharmacy technician participant acknowledged how busy the nursing department appeared in the lab and they now understood "why they needed the medicine so fast." The participants seemed to appreciate the various roles and one acknowledged

everyone has a "special" role in caring for patients. One participant referred to the separate roles as "territories." The paramedics have their own "territory [the field]" while nurses have their own "territory [the hospital]." The participants recognized the knowledge each discipline possesses in caring for the patients.

Fear of the Unknown. Most participants discussed fear in some manner. Other adjectives mentioned by participants included anxious, awkward, nervous, and strange. The fear of the unknown really stood out as participants from all disciplines stated they did not know what to expect, especially with the first simulation. One nursing participant stated when the paramedics brought the first patient in and started giving report, she just stood there, not knowing what to say or do. Some participants discussed the fear of going into unknown labs. The pharmacy technician participants were afraid to go to the nursing labs "I really didn't want to go to that hallway;" while the nursing students were fearful of going into the ED, "…it felt awkward going in there [paramedic lab]." Fear in communicating with other students was discussed by most participants as they described how it felt to not know everyone yet, and still be responsible to care for the patient by communication and collaboration. As a paramedic participant noted, "…you have fears in class, but this brings it up another level…in the [simulated] hospital." In being-in-the-world, the researcher could feel the strong sense of fear in the participants at the beginning of the simulations but could also sense fear diminishing as the scenarios unfolded. The fear subsided with the second IPE-Sim as participants were able to apply

the knowledge gained from the first IPE-Sim in communication and collaboration to the scenarios in the second IPE-Sim.

Comprehensive Understanding. Once the naive interpretation and structural analysis were complete, the information was interpreted to determine a comprehensive understanding of the phenomenon of the experience of participating in IPE-Sim. The researcher interpreted the "lived experience of participating in IPE-Sim" as generating many emotions, including fear, as students participated in the active and realistic learning environment. The participants experienced personal growth as they participated in the IPE-Sim and became aware of the interconnectedness with the students from the other disciplines. Through collaborative team learning, the participants were able to recognize and appreciate the unique roles of each discipline and how these roles directly impact the care being provided to the simulated patient.

Summary of Qualitative Analysis

The aim of this hermeneutic phenomenological study was to understand the meaning of IPE-Sim by exploring the lived experiences of students participating in this type of learning methodology. Merleau-Ponty (1945/2014) believed experiences are layered with multiple meanings as the body and mind unite. These meanings are not permanent; rather, meanings are fluid and change over time (Munhall, 2012). IPE-Sim is realistic, fosters new knowledge by problem-solving together, promotes recognition and valuing of healthcare provider interconnectivity, and helps overcome the fear of the unknown through collaboration and simulated practice.

Mixed Methods Comparison and Discussion

Mixed methods research allows for a more thorough understanding of a complex research problem and integrates quantitative and qualitative designs (Creswell, 2009). This method is also known as concurrent triangulation since the databases, once analyzed separately, are compared in order to determine congruence, incongruence, or a combination of both (Creswell, 2009).

In this study, both the quantitative and qualitative data were collected concurrently, and equal weight was placed on both methods to develop a comprehensive understanding of the phenomenon of IPE-Sim. The quantitative and qualitative databases were congruent as both datasets confirmed the participants valued collaborative practice while working in an interprofessional team and learning about the roles of one other. The mean scores on the SPICE-R2 increased over time for both groups and measured interprofessional teamwork, role recognition, and collaborative practice. The themes emerging from the qualitative findings included 1) realistic environment; 2) interconnectedness; 3) personal growth; 4) role recognition; and 5) fear of unknown. These themes demonstrated that learning occurred as participants worked together through collaboration to solve problems and care for simulated patients. The researcher reviewed the mean scores for the ten interview participants, which also increased over time: T1, (M = 40.60); T2, (M = 43.60); and T3, (M = 44.90). The congruency of the data indicates IPE is an effective learning methodology for promoting collaborative practice, teamwork, and role recognition among students from different disciplines.

Strength and Limitations

A major strength of this study is the mixed methods design with convergence of quantitative and qualitative data used to understand the phenomenon of IPE-Sim. The experimental, two group repeated measures design also allowed determination of a causal relationship. Another strength is the dedication of faculty to providing optimal learning opportunities while ensuring research rigor. To reduce variability of educational content between the two groups, the content experts for each program reviewed the foundational scenarios. Nursing faculty led the IPE-Lecture class and taught, in lecture format, the case studies being acted out in the IPE-Sim group. Limitations of this study include: (1) the inability to generalize the results of the study to other settings and (2) participants in this study were enrolled in varying levels of education and the results cannot be generalized to advanced levels of education.

Conclusion and Implication for Nursing Practice

In 2016, the National League for Nursing, in a vision for interprofessional collaboration to improve patient outcomes, recommended that nurse educators develop meaningful IPE strategies to provide opportunity for students from different professions to communicate while providing team-based care. This study provides high level evidence of the effectiveness of IPE as a learning methodology in promoting interprofessional role recognition, team learning, and collaborative practice among nursing and allied health students. While the hypothesis was only partially met, the findings did support students participating in IPE-Sim scored significantly higher on the

SPICE-R2 immediately after the second simulation than the students attending IPE-Lecture. Since all scores increased over time for both groups, an important finding from this study is IPE does make a difference with either IPE-Sim or IPE-Lectures and time solidifies the perceptions relating to role recognition, team learning, and collaborative practice. The effect sizes associated with time also supported the use of IPE in educational programs. which is consistent with the themes noted in the Labrague et al. integrative review on interprofessional simulation

According to Sullivan, Kiovsky, Mason, Hill, and Dukes (2015), a primary focus for IPE is to allow students the opportunity to fully practice within their own scope while recognizing the scope of practice for other professions as they develop collaborative skills including communication, assertiveness, and mutual trust. The themes noted through qualitative exploration were consistent with the themes of interprofessional communication, interprofessional collaboration, and appreciation of health care roles (Labrague et al., 2018). Both methodologies supported the effectiveness of IPE, as a learning methodology, as students learn together about their roles through collaborative practice in caring for simulated patients.

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Table 4.1

Means and Standard Deviations for Dichotomized Variables and Scores on SPICE for Time One

Dependent Variable Spice_1Tot	n	M	SD	t	*p**
Group				1.552	.275
Experiment	30	40.13	4.208		
Attention Control	30	38.27	5.071		
Program				.525	.602
Nursing	33	38.91	4.103		
Allied Health	27	39.56	5.430		
Ethnicity				1.058	.294
Hispanic/Latino	38	38.71	4.809		
Non-Hispanic/Latino	22	40.05	4.530		
Age				.337	.737
24 and Younger	49	39.10	4.758		
25 and Older	11	39.64	4.717		
Number of Simulations				.854	.396
2 or fewer	32	39.69	4.321		
3 or more	28	38.64	5.151		

*Represents 2-tailed

Table 4.2

Participant Demographic Frequencies and Percentages

	Experiment		Control				Cramer's
Variable	n	%	n	%	X^2	*p*	V
Program Type					.06	.795	.034
Nursing	16[a]	48.5	17[a]	51.5			
Allied Health	14[a]	51.9	13[a]	48.1			
Ethnicity					.00	1.000	.000
Hispanic/Latino	19[a]	50.0	19[a]	50.0			
Non-Hispanic	11[a]	50.0	11[a]	50.0			
Age					2.86	.090	.215
≤ 24 years	27[a]	55.1	22[a]	44.9			
≥ 25 years	3[a]	27.3	8[a]	72.7			
Number of Simulations					2.42	.119	.200
≤ 2	19[a]	59.4	13[a]	40.6			
≥ 3	11[a]	39.3	17[a]	60.7			

Note. The same subscript letter indicates proportions that do not differ significantly from each other at the .05 level.

Table 4.3

Abbreviated example of structural analysis from an interview.

Meaning Unit	Condensed Meaning Unit	Theme(s)
But after the first or second time, I got better at getting information about patients and talking to paramedics… I knew what questions to ask…I knew how to call about medicine…I was able to follow other people.	Unfolding scenarios enhance learning and may improve confidence as improvement in communication occurs.	Acquisition of new knowledge enhances confidence.
We were all taking care of the patients…that is what was so neat….we all had a role…	Recognition of other students taking care of patients.	Role recognition and appreciation.

CHAPTER V

SUMMARY OF THE STUDY

The primary goal of IPE should be to facilitate patient safety through collaborative practice by creating intentional opportunities for students to work together in interprofessional teams (Brashers et al., 2016; IPECEP, 2011). Historically, students enrolled in healthcare programs have been taught in discipline silos and knew very little about other healthcare disciplines (Clark, 2018; Proch, 2012). This study explored the effectiveness of IPE-Sim as an educational strategy promoting interprofessional role recognition, team learning, and collaborative practice for nursing and allied health students. This chapter presents a brief summary, a discussion of the findings, conclusions and implications, and recommendations for further study.

Summary

This was convergent mixed method research on effectiveness of IPE-Sim. The quantitative investigation consisted of a randomized, two-group experimental design with repeated measures. The hypothesis was: Healthcare professional students who participate in two, 2-hour IPE-Sims will score higher on the SPICE-R2 immediately following the second simulation and at four weeks post simulation than students who participate in two, 2-hour traditional IPE-Lectures. The qualitative exploration was based on hermeneutic phenomenology and participant interviews to discover the meaning of the lived experience. The research question was: What is the lived experience of healthcare

professional students who participate in IPE-Sim? The quantitative and qualitative data were collected and analyzed simultaneously and then merged to determine congruencies, incongruences, associated with the phenomenon.

The data from the *Student Perceptions of Interprofessional Clinical Education* (SPICE-R2) were analyzed using descriptive and inferential statistics. A repeated measures ANOVA was used to investigate differences occurring over time, within and between groups. A significant interaction ($p = .028$) occurred with the IPE-Sim (experimental) group's mean score at time two (T2) compared to the IPE-Lecture (attention control) group. Additionally, a significant effect ($p < .001$) was noted for time which meant the scores improved for both groups over time. In addition to this significant finding, the partial eta-squared indicated a large effect size for time ($n^2 = .383$).

The qualitative analysis of personal interviews involved a three-part non-linear process. The transcripts were read to determine the naïve interpretation of the lived experience. Structural analysis followed to condense meaning units to find themes associated with the phenomenon. This process led to the identification of five themes woven throughout the data. The themes included: (a) realistic learning environment, (b) interconnectedness, (c) personal growth, (d) role recognition, and (e) fear of the unknown. These themes are consistent with data results obtained with the SPICE-R2 instrument as well as the core competencies associated with interprofessional collaboration (IPEC, 2018). The triangulation and merging of these data sets enriched

the understanding of the perceptions of students participating in IPE-Sim and the effectiveness of IPE as a teaching methodology to promote interprofessional team work, role recognition, and collaborative practice.

Discussion of the Findings

The mean scores for the experimental group (IPE-Sim) were significantly higher than for the attention control group (IPE-Lecture) at T2, but not at T3; therefore, the hypothesis was partially met. The use of simulation may have an immediate effect on student perceptions as evidenced by the significant effect at T2 for the experimental group. This finding is also consistent with the literature supporting simulation as an active and experiential learning methodology (Jeffries, 2016; Nicely & Farra, 2015; Jeffries, 2014; Rothgeb, 2008).

A significant finding was also noted for time within each group as both IPE-Sim and IPE-Lecture mean scores significantly increased over time. In this study, students exposed to any form (lecture or simulation) of IPE had an increased awareness of interprofessional teams, role recognition, and collaborative practice. Not only was statistical significance noted for time, the effect size was also large, which is an unusual finding for educational studies (Spurlock, 2017). The qualitative exploration also yielded a rich interpretation of IPE-Sim and support for the method's effectiveness. Students appreciated the realistic learning environment as they learned with, about, and from one another while being exposed to unfolding case studies that promoted opportunities to communicate and collaborate with students from different disciplines.

These findings are consistent with the literature about IPE-Sim. Rossler and Kimble (2016) conducted a mixed-methods study using experiential learning theory (Kolb, 1984) as the theoretical framework. The significant findings relating to student attitudes supported the use of simulation in reinforcing teamwork, collaboration, and professional identity. Additionally, the three themes noted in the Rossler and Kimbler study included experiential learning environment, interactional relationships, and role preparation, which are similar to the themes noted in this study. Further supporting the use of IPE-Sim as a problem-based and experiential learning methodology is the quasi-experimental post-test design study conducted by Arvin, Ehlman, McCullough, and Ramos (2016) that yielded a statistically significant increase in scores associated with communication, collaboration, roles and responsibilities, collaboration, conflict management, and team functioning. The students participated in unfolding problem-based case scenarios by practicing in collaborative teams and valued the opportunity to learn about their professional roles, along with the roles of other health care professionals.

While IPE opportunities for students enrolled in healthcare programs is increasing (Gunnell, Madsen, & Foley, 2016; Gough et al., 2012; Zhang et al., 2017), full implementation is still a challenge (Brashers et al., 2016). Furthermore, Brashers et al. also discussed the importance of providing more than an introductory class on IPE by designing meaningful sessions to address the education and practice gap that occurs when educating student in discipline silos. Jeffries (2014) posits interprofessional collaborative

activities provides optimum learning for students by creating intentional connections between all disciplines and was the intent in this study.

The same foundational scenarios were consistent with both the IPE-Sim and IPE-Lecture groups and for each discipline. However, to meet the dynamic environment of IPE-Sim, the scenarios unfolded allowing students within each discipline the opportunity to collaborate while problem solving. Additional scenarios were also woven throughout the simulation to create a realistic environment. To further ensure intentional connections between disciplines, the researcher, simulation coordinator, and lead faculty worked together to design case scenarios to maximize collaboration between students.

The themes noted from the qualitative exploration support the overarching domain of collaborative practice and address the core interprofessional competencies promoting quality healthcare (IPEC, 2018). The IPEC interprofessional competency domains include (a) values and ethics for interprofessional practice, (b) roles and responsibilities, (c) interprofessional communication, and (d) teams and teamwork. The participant interviews revealed an appreciation and respect for other team members by understanding their roles within healthcare as they communicated and practiced in a collaborative healthcare team.

Conclusions and Implications

Conclusions derived from the findings of this study are as follows.

1. IPE-Sim is an educational methodology that promotes interprofessional role recognition, team learning, and collaborative practice.
2. While simulation provides a richer learning experience, IPE in traditional modalities such as lectures and classroom discussions effectively increase interprofessional learning.
3. Students appreciate opportunity to learn with, and from, one another in an interprofessional educational environment.

Implications related to the findings of this study include the following.

1. Since both IPE-Sim or IPE-Lecture demonstrated positive interprofessional learning outcomes, educators now have the opportunity to develop intentional learning opportunities for interprofessional teams, based on the specific outcomes to be measured.
2. In order to combat the "fear of the unknown" expressed by students, educators planning to conduct an IPE-Sim event may determine the need for students to have exposure to learning labs associated with the planned IPE-Sim.
3. To develop more than an introductory session on IPE, educators may elect to use IPE-Lectures for students designated to participate in IPE to breakdown the discipline silos and augment an IPE-Sim experience.

Recommendations for Further Studies

The purpose of IPE is to prepare health care professionals to enter practice with the skill sets necessary to practice in collaborative healthcare teams. Based on the findings of this study, recommendations for further studies include the following:

1. Research to discover the connection between IPE provided in educational programs prior to entry into the workforce and the ability for new graduates to assimilate into the practice setting with the skill sets necessary for collaborative practice.
2. A follow-up to this research to assess the longitudinal impact (three months, six months, one year) of IPE-Sim compared to IPE-Lecture, using the SPICE-R2 instrument.
3. Replication of this research in a university or rural setting to determine the effectiveness of IPE as a learning methodology for other populations.
4. Research on how IPE directly impacts the quality of care provided to patients and communities.

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Appendix A

Institutional Review Board Approvals

Institutional Review Board
Office of Research
6700 Fannin, Houston, TX 77030
713-794-2480
irb-houston@twu.edu
https://www.twu.edu/institutional-review-board-irb/

DATE: August 20, 2018

TO: Ms. Rhonda Bell
Nursing - Houston

FROM: Institutional Review Board (IRB) - Houston

Re: Approval for The Perception of Nursing, Pharmacy Technician, and Paramedic Students Participating in Interprofessional Simulation: A Mixed Methods Study (Protocol #: 20199)

The above referenced study has been reviewed and approved by the Houston IRB (operating under FWA00000178) on 8/17/2018 using an expedited review procedure. This approval is valid for one year and expires on 8/17/2019. The IRB will send an email notification 45 days prior to the expiration date with instructions to extend or close the study. It is your responsibility to request an extension for the study if it is not yet complete, to close the protocol file when the study is complete, and to make certain that the study is not conducted beyond the expiration date.

If applicable, agency approval letters must be submitted to the IRB upon receipt prior to any data collection at that agency. A copy of the approved consent form with the IRB approval stamp is enclosed. Please use the consent form with the most recent approval date stamp when obtaining consent from your participants. A copy of the signed consent forms must be submitted with the request to close the study file at the completion of the study.

Any modifications to this study must be submitted for review to the IRB using the Modification Request Form. Additionally, the IRB must be notified immediately of any adverse events or unanticipated problems. All forms are located on the IRB website. If you have any questions, please contact the TWU IRB.

cc. Dr. Ainslie Nibert, Nursing - Houston
Dr. Nina Fredland, Nursing - Houston
Graduate School

Institutional Review Board Application

Recommendation for Approval

Dear Dr. Hellyer:

The San Jacinto College informal Institutional Review Board (George González and Kelly Simons) has reviewed the attached proposal titled __ The Perception of Nursing, Pharmacy Technician, and Paramedic Students Participating in Interprofessional Simulation: A Mixed Methods Study___ which was submitted by _Rhonda Bell____.

Upon review and discussion, it has been determined that the proposal will not pose any harm to students, faculty, staff, or members of the San Jacinto College community and that the College will benefit from the knowledge gained as a result of this research.

Therefore, the Institutional Review Board is recommending approval of the named and attached proposal. Please review the proposal and feel free to ask any questions you may have.

Thank you.

George F. González, Jr.

George F. González, Jr., M.S.

Director of Research and Institutional Effectiveness

August 29, 2018

Date

Kelly Simons

Dr. Kelly Chapman Simons, D.M.

Dean, Liberal Arts (Central Campus)

8-29-2018

Date

Institutional Review Board
Office of Research
6700 Fannin, Houston, TX 77030
713-794-2480
irb-houston@twu.edu
https://www.twu.edu/institutional-review-board-irb/

DATE: December 18, 2018

TO: Ms. Rhonda Bell
Nursing - Houston

FROM: Institutional Review Board - Houston

Re: *Notification of Approval for Modification for The Perception of Nursing, Pharmacy Technician, and Paramedic Students Participating in Interprofessional Simulation: A Mixed Methods Study (Protocol #: 20199)*

The following modification(s) have been approved by the IRB:

Based on a priori power analysis conducted using G*Power version 3.1.10 with the power set at 0.8, an α-level at .05, and a moderate effect size of 0.25, a minimum of 86 participants is needed to ensure adequate power for a repeated measures ANOVA model. As a result of this power analysis, the researcher is requesting an increase in number of participants from 48 to 86. Additionally, the researcher is requesting an increase in the number of individual interviews for qualitative analysis from three/four to ten, or until saturation is met. The increase in participant number will not impact the methodology for the study or the need for changes to any of the current supporting documents, including the consent form.

cc. Dr. Nina Fredland, Nursing - Houston

Appendix B

Informed Consent

TEXAS WOMAN'S UNIVERSITY
SAN JACINTO COLLEGE
CONSENT TO PARTICIPATE IN RESEARCH

Title: The Perception of Nursing, Pharmacy Technician, and Paramedic Students Participating in Interprofessional Simulation: A Mixed Methods Study.

Investigator: Rhonda Bell..... Rhonda.bell@sjcd.edu 281/459-7618
Advisor: Nina Fredland, PhD..... nfredland@twu.edu 713/794-2098

Explanation and Purpose of the Research

You are being asked to participate in a research study for Ms. Rhonda Bell's dissertation at Texas Woman's University. The purpose of this research is to explore interprofessional simulation among nursing, pharmacy technician, and paramedic students. You are eligible to participate in this study because you are currently enrolled in either a capstone clinical course or a clinical course located in the last two semesters of your program of study. The study will be conducted at San Jacinto College, North Campus.

Description of Procedures

As a participant in this study you will be randomly assigned to participate in either a traditional lecture or an interprofessional simulation with students from nursing, pharmacy technician, or paramedic programs of study. Both sessions will last for two hours. At the beginning of this learning opportunity, you will be asked to complete a consent and data form along with a 10-item survey.

Two weeks later, you will be asked to participate in a second educational event. If you were assigned to the simulation group, you will participate in a second simulation. If you were assigned to the lecture group, you will participate in a second lecture. These sessions will also last two hours. You will be asked to complete a survey following the second simulation/lecture.

If you are assigned to the simulation group, you may also be asked to participate in a one-hour focus group or one-hour individual interview to further explore student perceptions about interprofessional simulation. The focus group will be audio recorded and then written down so that the researcher can be accurate when studying what is said. The researcher will also write notes during both simulations.

Four weeks following the last simulation or lecture, you will be asked to complete a final survey and participate in a pizza party designed for all participants. You will receive a $15 Starbucks gift card at this time.

The total time commitment for participants not included in focus group/interviews is 5 hours, 45 minutes. Total time commitment for participants included in focus group/interviews is 6 hours, 45 minutes.

Initials

The interprofessional simulation and lectures will occur at San Jacinto College, north campus, building 17. The analysis of the data will occur at Texas Woman's University, Houston Center and San Jacinto College.

Potential Risks

The researcher has identified minimal potential risks associated with this study.

Students participating in focus group or individual interviews may be concerned about the confidentiality of the audio-recordings. The students will not be recognized by name. Students in the focus group will draw a number as they arrive to the debriefing room and will identify themselves by the number.

Students may be concerned that participation will either positively, or negatively impact course grades. Participation in the study will not impact grades. The investigator will not have access to grading criteria for courses and the instructors will not have access to the materials associated with the study.

Students may be concerned participation will be docked from normal class/lab times. Participation in the event will count towards meeting class/clinical hours associated with your program of study.

Students may experience embarrassment while participating. Embarrassment from participating is minimized since the simulated and classroom learning occurs in a safe, controlled environment. The investigator, faculty, and clinical coordinator will work together in the planning and delivery of the experience to minimize potential embarrassment from participation.

Students may be concerned about recognition of voice on audio recordings. The primary investigator will have sole access to the audio-recordings, which will be located in a locked filing cabinet. The tapes will be physically destroyed at the end of five years.

The results of the study could be reported in educational magazines or journals but your name or any other identifying information will not be included. There is a potential risk of loss of confidentiality in all email, downloading, electronic meetings and internet transactions. Confidentiality will be protected to the extent that is allowed by law.

The researcher will try to prevent any problem that could happen because of this research. You should let the researchers know at once if there is a problem and they will help you. However, TWU does not provide medical services or financial assistance for injuries that might happen because you are taking part in this research.

These sessions may be tape recorded to allow the researcher the opportunity to thoroughly review the information stated during the focus group meeting. Only the primary investigator will have access to the recordings. The recordings and documents associated with the study will be maintained in a locked filing cabinet, in a locked office, with only access by the primary investigator. All forms will be shredded within five years from the end of the study. The tape used during recorded will be physically destroyed within five years from the end of the study.

Participation and Benefits

Your involvement in this study is completely voluntary and you may withdraw from the study at any time. Following the completion of the study, a pizza party will be scheduled and you will receive a $15 gift card from Starbucks for your participation. If you would like to know the results of this study we will mail or email them to you.*

Questions Regarding the Study

You will be given a copy of this signed and dated consent form to keep. If you have any questions about the research study you should ask the researchers; their phone numbers and email addresses are at the top of this form. If you have questions about your rights as a participant in this research or the way this study has been conducted, you may contact the Texas Woman's University Office of Research at 713-794-2480 or via e-mail at IRB@twu.edu.

_____ _____

Signature of Participant Date

*If you would like to know the results of this study, please tell us where you want them to be sent:

Email:_____
or
Address: _____
_____
_____

Approved by the
Texas Woman's University
Institutional Review Board
Approved: August 17, 2018

TEXAS WOMAN'S UNIVERSITY
SAN JACINTO COLLEGE
CONSENT TO PARTICIPATE IN RESEARCH

Title: The Perception of Nursing, Pharmacy Technician, and Paramedic Students Participating in Interprofessional Simulation: A Mixed Methods Study.

Investigator: Rhonda Bell..... Rhonda.bell@sjcd.edu 281/459-7618
Advisor: Nina Fredland, PhD..... nfredland@twu.edu 713/794-2098

Summary and Key Information about the Study

You are being asked to participate in a research study for Ms. Rhonda Bell's dissertation at Texas Woman's University. The study will occur at San Jacinto College. The purpose of this research is to explore interprofessional simulation among nursing, pharmacy technician, and paramedic students. You have been invited to participate in the study because you are currently enrolled in a nursing, pharmacy technician, or paramedic program. As a participant, you will be randomly assigned to participate in either an interprofessional lecture or simulation with students from nursing, pharmacy technician, or paramedic programs of study. You may also be asked to participate in a face-to-face interview or focus group about your experience participating in the interprofessional simulation. This interview may be recorded. No personally identifiable information will be used for this study. You will use a unique code on all forms to protect your identity. Following the completion of the study, you will receive a $15 from Starbucks for your participation and will be invited to attend a pizza party. The total time commitment for participants not included in an interview/focus group is 5 hours 45-minutes. Total time commitment for participants included in an interview/focus group is 6 hours 45-minutes.

Your involvement in this study is completely voluntary and you may withdraw from the study at any time. Please feel free to ask the researcher any questions you may have about the study at any time.

Description of Procedures

As a participant in this study you will be randomly assigned to participate in either an interprofessional lecture or simulation with students from nursing, pharmacy technician, or paramedic programs of study. You will continue participating in your group for the duration of the study. Both sessions will last for two hours. At the beginning of this learning opportunity, you will be asked to complete a consent and data form along with a 10- item survey.

Two weeks later, you will be asked to participate in a second educational event. These sessions will also last two hours. You will be asked to complete a survey following the second simulation/lecture.

If you are assigned to the simulation group, you may also be asked to participate in a face-to-face interview/focus group to further explore your perception about interprofessional simulation. The researcher will take notes while you are speaking, and the interview/focus group will also be audio recorded. The researcher will also write notes during both simulations.

Four weeks following the last simulation or lecture, you will be asked to complete a final survey and participate in a pizza party designed for all participants. You will receive a $15 Starbucks gift card at this time.

Initials

Potential Risks

The researcher has identified minimal potential risks associated with this study. No personally identifiable information will be used for this study. You will use a unique code on all forms to protect your identity.

Face-to-face interviews and focus group sessions may be audio recorded to allow the researcher the opportunity to thoroughly review the information stated during these meetings. Only the primary investigator will have access to the recordings. The recordings and documents associated with the study will be maintained in a locked filing cabinet, in a locked office, with only access by the primary investigator. All forms will be shredded within five years from the end of the study. The tape used during recorded will be physically destroyed within five years from the end of the study.

Students participating in face-to-face interviews/focus groups may be concerned about the confidentiality of the audio-recordings. The students will not be recognized by name. Students in the focus group will draw a number as they arrive to the debriefing room and will identify themselves by the number. A unique subject-generated code will be used on all data forms to protect your identity.

Students may be concerned that participation will either positively, or negatively impact course grades. Participation in the study will not impact grades. The investigator will not have access to grading criteria for courses and the instructors will not have access to the materials associated with the study.

Students may be concerned participation will be docked from normal class/lab times. Participation in the event will count towards meeting class/clinical hours associated with your program of study.

Students may experience embarrassment while participating. Embarrassment from participating is minimized since the simulated and classroom learning occurs in a safe, controlled environment. The investigator, faculty, and simulation coordinator will work together in the planning and delivery of the experience to minimize potential embarrassment from participation.

Students may be concerned about recognition of voice on audio recordings. The primary investigator will have sole access to the audio-recordings, which will be in a locked filing cabinet. The tapes will be physically destroyed at the end of five years.

The results of the study could be reported in educational magazines or journals but your name or any other identifying information will not be included. There is a potential risk of loss of confidentiality in all email, downloading, electronic meetings and internet transactions. Confidentiality will be protected to the extent that is allowed by law.

Initials

Your audio recording and/or any personal information collected for this study will not be used or distributed for future research even after the researchers remove your personal or identifiable information.

The researcher will try to prevent any problem that could happen because of this research. You should let the researchers know at once if there is a problem and they will help you. However, TWU does not provide medical services or financial assistance for injuries that might happen because you are taking part in this research.

Participation and Benefits

Your involvement in this study is completely voluntary and you may withdraw from the study at any time. Following the completion of the study, a pizza party will be scheduled and you will receive a $15 gift card from Starbucks for your participation. If you would like to know the results of this study, we will mail or email them to you. *

Questions Regarding the Study

You will be given a copy of this signed and dated consent form to keep. If you have any questions about the research study you should ask the researchers; their contact information is at the top of this form. If you have questions about your rights as a participant in this research or the way this study has been conducted, you may contact the Texas Woman's University Office of Research at 713-794-2480 or via e-mail at IRB@twu.edu.

_____ _____
Signature of Participant Date

*If you would like to know the results of this study, please tell us where you want them to be sent:

Email:_____
or
Address: _____
_____
_____

Approved by the
Texas Woman's University
Institutional Review Board
Approved: August 17, 2018
Modifications Approved:
March 18, 2019

Appendix C

Subject-Generated Identification Code Form

Subject-Generated Identification Code (Damrosch, 1986)

CODE _____

The information that you will give on this page will create your own identification code. This will protect your privacy and keep your answers confidential. Your name will not be on any of the questionnaires that you will answer. So please be very careful when you answer the next eight questions.

1. **CIRCLE** the letter below that represents the first letter of your mother's first name.
   A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

2. **CIRCLE** the letter below that represents the first letter of your father's first name.
   A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

3. How many brothers do you have? _____

4. How many sisters do you have? _____

5. Does your first name begin with a letter in the FIRST half of the alphabet (A to M)?
   CIRCLE Y or N

6. Does your first name begin with a letter in the Second half of the alphabet (N to Z)?
   CIRCLE Y or N

7. **CIRCLE** the Month in which you were born. Write the first letter for your unique code:

January	**A**pril	**J**uly	**O**ctober
February	**M**ay	**A**ugust	**N**ovember
March	**J**une	**S**eptember	**D**ecember

8. CIRCLE the letter below that represent your middle initial. If you do not have a middle initial, CIRCLE the letter N.

   A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Appendix D

Demographic Form

Demographic Form

Please indicate which program you are currently enrolled in:

□ Nursing
□ Paramedic
□ Pharmacy Technician

Please indicate the number of simulations you have participated in:

□ 1-2 □ 3-4 □ >4

Have you participated in an *interprofessional* simulation before?

□ Yes □ No

What is your present age in years?

□ 17 – 24
□ 24 – 30
□ 31 – 40
□ 41+

What is your ethnic/racial background?

□ Asian/Pacific Islander
□ Black/non-Hispanic
□ Hispanic/Latino
□ White/non-Hispanic

Appendix E

SPICE-R2 Description

Description of the SPICE-R2 Instrument

The SPICE-R2 is practical (Dominiguez, Fike, MacLaughlin, & Zorek, 2015; Zorek, 2016). The instrument consists of 10-items using a 5-point Likert scale.

The instrument is available through a collaborative effort between Texas A&M and the Interprofessional Education Collaborative whereby several instruments are available to researchers interested in interprofessional education. Additionally, Joseph Zorek sent a pdf copy of the instrument for use in this proposed research study. According to the National Center for Interprofessional Practice and Education, there is no length specified for the completion of this instrument. However, a time period of twenty minutes immediately following the second simulation and again four weeks later should suffice.

The scale measures attitudes associated with interprofessional teams and has three factors (a) Interprofessional teamwork and team-based practice; (b) Roles/responsibilities for collaborative practice; and (c) patient outcomes from collaborative practice
The scale progresses from strongly disagree (1) to strongly agree (5). The questions are as follows:

1. Working with students from different disciplines enhances my education.
2. My role within an interprofessional team is clearly defined.
3. Patient/client satisfaction is improved when care is delivered by an interprofessional team.
4. Participating in educational experiences with students from different disciplines enhances my ability to work on an interprofessional team.
5. I have an understanding of the courses taken by, and training requirements of, other health professionals.
6. Healthcare costs are reduced when patients/clients are treated by an interprofessional team.
7. Health professional students from different disciplines should be educated to establish collaborative relationships with one another.
8. I understand the roles of other health professionals within an interprofessional team.
9. Patient/client-centeredness increases when care is delivered by an interprofessional team.
10. During their education, health professional students should be involved in teamwork with students from different disciplines in order to understand their respective roles.

Appendix F

Semi-Structured Interview Guide

Semi-Structured Interview Guide

Semi-Structured Interview Schedule: IPE-Sim

Facilitator of Interviews: The purpose of this interview is to learn more about your experience as you participated in the interprofessional simulation. You do not have to answer every question and can stop the interview at any time. There are no right or wrong answers. I will be taking notes as we talk.

1. How did you feel as you participated in the simulation experience?
    a. Prompt: What was your experience like as you participated in this simulation?

2. What did the team do well?
    a. Prompt: What specific tasks in the scenario did the team do well on?

3. What could the team have done differently?
    a. Prompt: Is there something you wished would have been done differently?

4. What did you notice about the roles of other students not in your discipline? Were there any similarities or differences?
    a. Prompt: Do the other students have the same roles and responsibilities as you?

5. How was the communication between team members?
    a. Prompt: Did everyone talk together while taking care of the patient?

6. How did the team working together enhance your knowledge and understanding of taking care of the patient(s)?
    a. Prompt: What did you learn that you did not already know? How did this information help you take care of the patient?

7. Does working with students from other disciplines help to prepare you for practice?
    a. Prompt: How do you think this experience helps you to be ready to go to work?

8. Is there anything else you would like to share?

Appendix G

Observational Field Notes

Observational Field Notes

Below is a guide to record the field notes taken during the unstructured observation of the interprofessional simulation event.

Setting: Is the setting prepared for the interprofessional simulation event? What are the environmental contexts leading to specific behaviors?

Participants: Are the participants talking with one another? What is the non-verbal communication among the participants? Is the behavior conducive to positive outcomes? Do the students appear to understand each other's roles?

Interactions: Is the behavior conducive to positive outcomes? Is there a discernible advancement of comfort level as students continue to work together to provide care? Was there any confusion noted during the simulation?

Intangible factors: What should have happened, but did not? Was incongruence noted between verbal and non-verbal communication? What types of behaviors/incidents was disruptive to the overall learning environment?

Appendix H

Steps Used to Plan IPE-Sim

Steps Used to Plan IPE-Sim

1. Identify disciplines to participate (two, or more) in IPE-Sim.
2. Meeting with stakeholders (simulation coordinator and faculty from each discipline) to coordinate semester calendars and discuss overall design.
3. Identify current skill competencies and level of simulation appropriate for all disciplines.
4. Develop IPE-Sim outcome(s).
5. Educational programs identify/develop discipline-specific outcomes, as appropriate.
6. Determine educational level, preparedness, and exposure to simulation to determine a) type and number of scenarios and b) length of simulation.
7. Develop or plan scenarios.
    a. Develop IPE objectives.
    b. Foundational scenarios include unfolding case scenarios that all disciplines will have exposure to while participating in IPE-Sim.
    c. Disciplines may elect to include additional scenarios to increase intentional communication opportunities and mimic reality.
8. Simulation coordinator and faculty determine final timeline for student movement as the cases unfold.
9. Faculty, in conjunction with simulation coordinator, develop student communication plan (pre-briefing, etc.)
10. Faculty develop semi-structured debriefing questions.
11. Simulation coordinator collaborates with all stakeholders as final preparations are made.

Appendix I

IPE, Day One Example

IPE, Day One Example

Outcome: Students participating in IPE-Sim will have an improved understanding of collaborative practice and the roles of health care professionals as they work together in teams to prioritize care for simulated patients.

Objectives. Discipline-specific; Communication, Collaboration, Prioritization of Care

Med-Surgical Case Scenario: Acute Sever Asthma, adapted from Laerdal NLN Scenarios

> Jennifer Hoffman is a 33-year old female whose family called 911 because she was having difficulty breathing. She presented with clinical signs of extreme anxiousness, diaphoretic, wheezing, using accessory muscles to breath. She has a history of asthma with multiple emergency visits within the last year. She appears to be in severe respiratory distress, struggling to breath. She is unable to speak other than simple one-word statements. She was brought to Emergency Department by ambulance.
>
> - Allergies: NKDA; Seasonal hay fever
> - Prior medical history: History of Asthma since childhood; multiple hospitalizations within past year
> - Recent medical history: Upper respiratory infection
> - Medications: Beclovent, Intal, Serevent, and Proventil Inhaler

Control Group Lesson Plan:

- Review of A&P of Lungs/Respiratory System (PowerPoint Presentation)
- Discussion of pathophysiology causing signs and symptoms.
- Discussion of acute care and medication treatment.
- Student group discussion about interprofessional care. (Group Discussion)

<u>Obstetrical Case Scenario: Postpartum Hemorrhage</u>

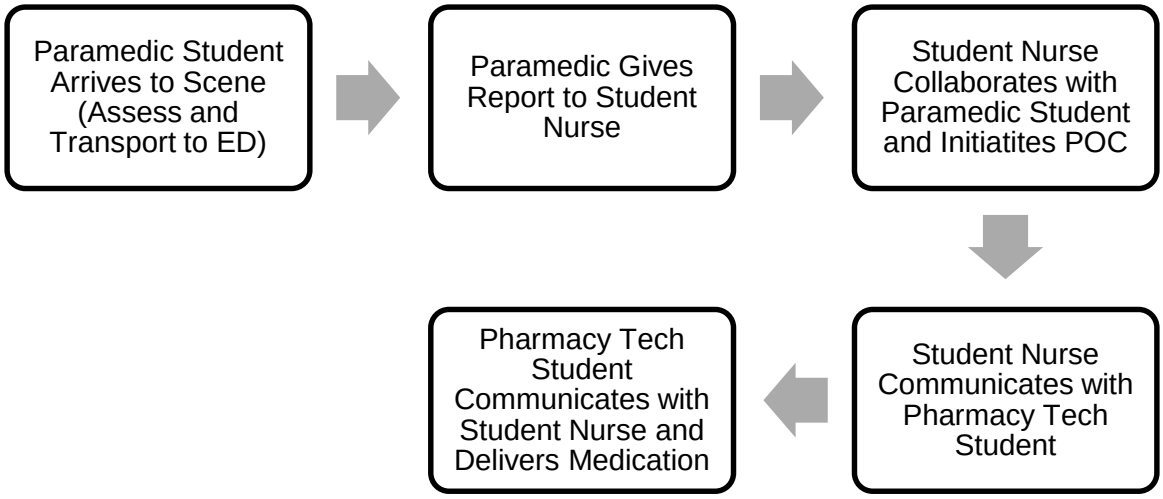
A 26-year-old female who is grocery shopping with her husband in a local store when her membranes rupture. Husband calls emergency services about his wife's ruptured membranes and states, "I don't know what to do." EMS arrive and determines to transport the mother to the hospital. The newborn infant is delivered in transit to the hospital. Wt. 8 lbs, 7 oz. Upon arrival to the hospital, vital signs of the mother were unstable – hypotensive and tachycardic. BP 90/58, HR 120, R 26, Temp 98.4. She is admitted to the emergency department for the stabilization of her vital signs. With administration of intravenous fluids and is transported to maternal unit for post-partum

care, one condition begins to stabilize. While in nursing unit, she begins to hemorrhage which requires additional treatment and care.
Clinical Signs in Nursing Unit:

- Alert, pale, extremely anxious, profusely diaphoretic, fundus 3+ boggy, perineal pad saturated with blood & clots.
- BP 98/60, HR 105, R 24, Temp 98.4
- Allergies: MKDA; NKFA
- Prior medical history: G3 P3 T3 A0 L3
- Medications: Prenatal vitamins

Control Group Lesson Plan
Review pathophysiology associated with postpartum hemorrhage. (PowerPoint Presentation)
Use critical thinking skills and a systematic problem-solving process in discussing the care to be provided for the patient.
Discuss disease management in interprofessional teams. (Group discussion).

Experiment (Simulation) Lesson Plan
Movement through healthcare disciplines and approximate timeline for foundation scenarios:



12:30: EMT/Paramedic students meet in EMT Skills Lab; Pharmacy Technician Students meet in PHRA Lab; nursing students meet in Sim Hospital. Pre-briefing of assignments begins, including discipline-specific simulations/assignments.
Timeline is tentative.

Time	Action	Patient	Sequence of Events	Disciplines
1:00	Telephone call to 911 from child "My mom can't breathe good. She uses something to help her breath sometimes, but I can't find it."	Jennifer Hoffman, Standardized patient	Paramedic dispatched to house. Paramedic arrives to location, assesses patient, and begins initial treatment. Scenario: Acute Asthma and Respiratory Infection.	Paramedic
1:15	Paramedic transports patient to San Jac ED.	Jennifer Hoffman, Standardized patient	Paramedic student gives report to nurse. Nurse begins assessment and treatment orders. Nurse calls pharmacy with needed medications, per orders. Nurse monitors condition until stable.	Paramedic Nursing Pharmacy Technician
1:25	Telephone call to 911 from man on cell phone "My wife is having the baby. It's happening quickly. I don't know what to do. I'm in Joe V's parking lot. Please help."	Camelia Hernandez, Standardized patient	Paramedic dispatched to location. Paramedic personnel arrives to location, assesses patient, and births baby. Scenario: postpartum hemorrhage.	Paramedic
1:40	Paramedic/EMT transports mother and baby to San Jac ED.	Camelia Hernandez, Standardized patient	Paramedic/EMT student gives report to nurse. Nurse begins assessment and treatment orders. Scenario: Patient does not stabilize quickly.	Paramedic Nursing Pharmacy Technician

			Remains in ED. On-staff paramedics work with ED nurses to stabilize patient. Medications ordered from pharmacy/clarification required by nursing and pharmacy staff.	
1:50	ED nurse calls M/S unit to give report on patient being transported to unit.	Jennifer Hoffman, High-fidelity simulator	ED Nurse gives report to M/S nurse. M/S nurse assesses patient and begins treatment orders. Communicates with pharmacy as needed.	Nursing Pharmacy Technician
2:00	ED nurse calls post-partum nurse with report. Prepares mother for transport to unit.	Camelia Hernandez, high-fidelity simulator	ED nurse transports patient to unit. PP nurse begins assessment and treatment orders. Orders meds, as appropriate.	Nursing Pharmacy Technician
2:20	Patients stabilize.			
2:20 – 2:30	Break.			
2:30 – 3:00*	Debriefing.			Paramedic Pharmacy Technician Nursing

*Debriefing may require additional time. However, due to the scope of this research project, debriefing was limited to 30 minutes.

Appendix J

Signature Page

TEXAS WOMAN'S UNIVERSITY

Certificate of Completion for Thesis/Dissertation

Date of final defense: 10/30/2019

Student: Rhonda Bell

Student ID#: 1676103

We, the undersigned, affirm that according to departmental records, this student has successfully completed all coursework and met all requirements for the degree listed below.

We are submitting herewith this student's ☐ Thesis ☑ Dissertation, entitled:
The Perception of Nursing, Pharmacy Technician, and Paramedic Students Participating in Interprofessional Simulation: A Mixed Methods Study.,
written by the aforementioned student. We affirm that we have examined this document for grammar, form, and content and recommend that it be accepted in partial fulfillment of the requirements for the following degree:

Doctor of Philosophy in Nursing Science,

with a minor in: _____.

Nina Fredland — Nina Fredland, PhD
Major Professor/Committee Chair

Anne Young — Anne Young, EdD
Committee Member

Leslie Nelson — Leslie Nelson, PhD
Committee Member

_____
Committee Member

Ainslie Nibert — Ainslie Nibert, PhD
Academic Component Administrator

_____
Graduate School Dean

In accordance with Leg. HB 1922, an individual is entitled to: request to be informed about the information collected about them; receive and review their information; and correct any incorrect information.

The Graduate School
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