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EFFECT OF METACOGNITIVE STRATEGY ON NURSING STUDENTS' ACHIEVEMENT AND ENGAGEMENT IN AN ACTIVE LEARNING EXERCISE

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EFFECT OF METACOGNITIVE STRATEGY ON NURSING STUDENTS' ACHIEVEMENT AND ENGAGEMENT IN AN ACTIVE LEARNING EXERCISE

by

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Dedication

I dedicate this dissertation to my family who have sacrificed just as much as I have. Their patience, support, love, and forgiveness are irreplaceable and truly exemplify unconditional love.

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Table of Contents

List of Tables

List of Figures

Abstract

EFFECT OF METACOGNITIVE STRATEGY ON NURSING STUDENTS' ACHIEVEMENT AND ENGAGEMENT IN AN ACTIVE LEARNING EXERCISE

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Nurse educators are responsible for producing nurse graduates that are competent, safe, and prepared to manage the complex clinical situations they will face. These graduates must possess sound clinical judgment skills that ensure safe and effective delivery of patient care. The decreasing capacity of clinical placements available for students to acquire hands-on experience presents an additional challenge. Educators must develop and implement innovative, effective teaching strategies to address these issues. An initial comparative concept analysis of engagement and reciprocity focused on the educator-student relationship as one in which all members contribute to the learning atmosphere is included in Chapter 2. Subsequently, a study aimed at investigating how a metacognitive strategy employed in an active learning exercise influenced student achievement and engagement was conducted. A parallel explanatory, mixed methods design in a sample of nursing students (N=124) was employed. Ultimately, all participants experienced a significant increase in learning ($p < .01$). There was a

nonsignificant increased interaction effect between the intervention and control group in the pre- versus post-test repeated measure ($p = .085$). The metacognitive strategy was found to be nonsignificant ($p = .625$) in impacting student scores. The intervention group did exhibit a larger increase in learning from pre to post-test than the control group. Fifty-two of the 63 participants in the intervention group reported an increase in engagement with the content at hand while using the metacognitive strategy.

Chapter 1

Overview of the Program of Research

Acting as a nurse is much more complex than performing a specific set of rote tasks. A nurse must have a foundational set of knowledge and skills and possess the ability to adapt instantaneously to unique patient circumstances. To be most effective, a nurse must engage metacognitively. Nurse educators are responsible for preparing future nurses with the necessary skills through engaging, innovative teaching strategies that inspire a spirit of inquiry and metacognitive thinking.

Historically, students in higher education have been the passive recipients of teacher-centered instruction. Faculty must consider flexible teaching designs to meet the ever-changing needs of students and society (McGarry, Theobald, Lewis, & Coyer, 2015). A paradigm shift in higher education is occurring moving from passive to active learning. As institutions of higher education strive to promote student engagement, active learning, and student inquiry, they are moving towards flexible learning, virtual interaction, and student-centered curriculum (McGarry et al., 2015). This paradigm shift that supports active learning is necessary if institutions are to produce innovative, creative, and adaptive graduates that are prepared to handle dynamic, complex patient populations. Student-centered instruction with a focus on active learning is a solution for the growing need to engage students as drivers of their own learning (Hudson, 2014). With a student-centered approach that fosters engagement as well as active and flexible learning, educators are provided an opportunity to promote the growth of a necessary

skill set in students that are beneficial to the development of metacognition (McGarry et al., 2015). Through active learning, students are being shaped into metacognitive learners (Hsu & Hsieh, 2011) who ultimately achieve better academic outcomes (Owston, York, & Murtha, 2013).

The education and experience students receive in their nursing program helps to shape their professional identity as a nurse. Nurse educators are in a prime position to influence this role development. Nursing graduates must possess a fundamental set of knowledge and skills to ensure safe patient care. Hence, it is imperative to identify the best pedagogical practices that foster sound clinical decision making in novice nurses. This is especially important considering that clinical placement for nursing programs is becoming more difficult to attain. Until now, the relationship of metacognition and student engagement have not been explored in a population of nursing students.

Metacognition

Metacognition can be defined as "higher-order thinking that enables understanding, analysis, and control of one's cognitive processes, especially when engaged in learning" ("Metacognition", 2018). Metacognition should be embedded and adapted to the content and activities for students' participation. It is most effective when it is adapted for a specific topic, course, or discipline (Zohar & Ben-David, 2009). When explicitly connecting a learning situation to its relevant processes, learners will be more able to adapt strategies to new situations, rather than assume that learning is the same every time (Chick, 2018). Metacognition engages the learner differently than traditional teaching/learning strategies to increase learning and student understanding. It is essential

that nursing students possess the ability to be metacognitive about their thinking to effectively problem solve unfamiliar situations.

Engagement in Education

Student engagement has been widely recognized as an important influence on achievement, satisfaction, and learning at all levels of education (Lam et al., 2014; Gerber, Mans-Kemp, & Schlechter, 2013; McCormick, Gonyea, & Kinzie, 2013; Reeve & Lee, 2014). Additionally, engagement is a measure of institutional quality and a reflection of its educators (National Survey of Student Engagement, 2018). Educators should not expect students to engage themselves, but rather facilitate engagement through guidance, intentional activities, and relationships (Hsu & Hsieh, 2011). Educators must foster an engaging learning environment in which the students are challenged by educators that possess the are willing and able to adjust their teaching strategies to meet the needs of the learner. Student engagement is supported by pedagogical practices that foster experiential learning, forming of connections, and student inquiry (D'Souza, Venkatesapeurmal, Radhakrishnan, & Balachandran, 2013). To stimulate engagement and higher levels of learning, nurse educators are using innovative teaching strategies in the classroom and clinical settings.

Purpose of the Study

Nursing students tend to be preoccupied with what nurses 'do' rather than truly understanding the provision of patient care (Currie et al., 2015). Engagement and metacognition in the learning environment are vital to the development of the cognitive and psychomotor skills nursing students need to assimilate into the professional role (McGarry et al., 2015). The engagement and metacognition of nursing students during an

active learning exercise was explored to better understand *what* and *how* students approach thinking and learning.

Introduction to the Program of Research

Two articles are included that address the program of research. The first article is *Engagement & Reciprocity: A Comparative Concept Analysis to Enhance the Culture of Learning*. Walker and Avant's (2011) concept analysis methodology was used to examine the central relationship of engagement and reciprocity. The results of the concept analysis are found in Chapter Two. The second article, *Effect of Metacognitive Strategy on Nursing Students' Achievement and Engagement in an Active Learning Exercise* describes a parallel explanatory, mixed methods study. The purpose of the study was to determine how metacognition impacts student achievement and engagement in an active learning exercise in a convenience sample of nursing students. Randomized groups of students participated in either a routine active learning exercise or a routine active learning exercise with a metacognitive intervention. Although the metacognitive strategy itself failed to significantly ($p = .625$) impact student learning, overall all students significantly ($p = .0005$) increased their learning from pre to post-test. A larger increase in learning was found in the intervention groups compared to the control groups. The results of this research are reported in Chapter Three. Chapter Four provides a summary of the program of research.

Chapter 2

Engagement & Reciprocity: A Comparative Concept Analysis to Enhance the Culture of Learning

Abstract

The purpose of this paper was to conduct a comparative concept analysis of engagement and reciprocity. Engagement as a reciprocal process is introduced by employing a hybrid form of Walker and Avant's (2011) method. The results provide a basis for strategies to improve faculty teaching outcomes. Effective learning requires faculty and student engagement to complement reciprocal relationships that enhance the teaching-learning process. For faculty to generate student interest and engagement, it is recommended that faculty exhibit reciprocal responses to strengthen the learning environment. Reciprocity allows both the educator and student to achieve mutually and individually defined goals resulting in satisfaction in the learning process for both. If faculty and students direct energy in a reciprocal fashion, then the teaching-learning environment becomes an engaging one where successful learning occurs.

Key words: reciprocity, engagement, teaching-learning

Engagement & Reciprocity: A Comparative Concept Analysis to Enhance the Culture of Learning

Traditionally educators have delivered knowledge and information while the student was a passive recipient of that knowledge. The traditional education model poses a significant challenge to contemporary education, one that failed to recognize that the learner possesses unique qualities that can enhance the learning environment if the student is engaged. Engagement enables the learner to experience and grasp meaningful information (Bargagliotti, 2012). However, engaging the multi-tasking, tech-savvy student in a reciprocal learning experience often proves challenging to educators who have been taught in the traditional, teacher-centered approach (Fischler & Zachary, 2009). Student engagement is a multi-dimensional concept (Lam et al., 2014) that contains aspects of behavior, emotion, and cognition (Reeve & Lee, 2014). Faculty customarily serve as mentors to their students. Mentoring at its best represents a reciprocal learning relationship in which both mentor and mentee consent to a partnership and collaboration on mutually defined goals (Fischler & Zachary, 2009). In this mentoring relationship, faculty are constantly challenged by the difficult task of engaging their students. Engagement as a reciprocal process is introduced by employing a hybrid form of Walker and Avant's (2011) method of concept analysis. A comparative concept analysis was conducted exploring the concepts of engagement and reciprocity to distinguish the central relationships that are present and to clarify the feelings, values, mental processes, and attitudes that accompany these concepts. Professional nursing consists of an expanding body of knowledge that is critical to the student's nursing

education. For this information to be useful and for the education effort to be successful, students benefit if the educator views engagement as a reciprocal process.

Concept of Engagement

Engagement can be defined as the act of engaging, emotional involvement or commitment, or something that holds one's attention ("Engagement," 2014). Engage and engaging are similar terms indicating that attention is required ("Engage," 2014; "Engaging," 2014). There are several uses of the term engagement in modern vernacular. A less familiar denotation of the word engagement is the sensation a pregnant woman feels when the presenting part of the fetus descends and is engaged in the mother's pelvis ("Engagement," 2003). According to the Collins Dictionary of Law ("Engagement," 2006), engagement is an agreement to marry that is traditionally marked with an engagement ring. Engagement has also been used to illustrate an individual's emotional attachment to an organization (Gray, 2012). In fact, much of the most recent interest has been studies of the employee/employer relationship to engagement with one's work.

Work engagement can be defined as the encouraging, satisfying work-related state of mind and well-being (Bargagliotti, 2012). Research suggests that an individual's values have great influence on work engagement (Binsiddiq & Alzahmi, 2013). As it relates to nursing, work engagement has been described as searching for, experiencing, and holding onto the significance in which work allows one to live one's values (Bargagliotti, 2012).

Engagement with work has been the focus of extensive study in the field of psychology. Simbula and Guglielmi (2013) studied the relationship between work engagement and the psychological state of the employee. Organizational citizenship

behavior, which connotes a reciprocal relationship between employer and worker, was correlated with work engagement (r=.31, p = 0.01). Job satisfaction was also related to work engagement (r=.56, p = 0.001). It was determined that a reciprocal relationship existed among work engagement, mental health, and job satisfaction. Excessive work engagement, sometimes referred to a "being married to the job," has been found to result in negative consequences of an employee's well-being (Simbula & Guglielmi, 2013).

In nursing, the nurse manager impacts staff engagement. A nurse manager's engagement is linked to the outcomes of: staff nurse engagement and retention, productivity, goal achievement, and profitability (Gray, 2012). Engagement is characterized by energy, involvement, and positive interaction in the workplace and is negatively impacted by increased workload and overtime (Tillott, 2013). Before entering into the workforce, engagement begins in the learning environment.

Learner engagement is an internal state where the individual is involved in learning (Harcourt & Keen, 2012). Harris (2010) implies that engagement is an indicator of a positive, successful, and meaningful teacher-learner relationship. Krause (2005) specifies that engagement is "the amount of time, energy and resources students dedicate to activities intended to enhance learning" (p. 3). The National Survey of Student Engagement (NSSE) distinguishes that engagement is the "level of participation in a variety of activities that have been shown to relate to academic and personal development" (Belcheir, 2004, p. 1).

In general, most students expect faculty to engage them and to engage with them. Students also believe that there is something about a professor's presence that creates an engaging environment. Understanding content delivered in the course, interest in the

topic, the pedagogical approach, and the enthusiasm of the faculty member all contribute to making a course engaging (Heller, Beil, Dam, & Haerum, 2010).

Defining Attributes

Defining attributes are characteristics that describe a concept (Walker & Avant, 2011). After a thorough literature review, the following defining attributes of engagement were selected: *voluntary involvement, attention, directed energy*, and *interaction*. These attributes are expected to be present to have a model case of "engagement."

For individuals to be engaged, they must be voluntarily *involved*, showing that they are invested. In addition, those of authority must be involved for the employee to feel that engagement is a mutual process (Gray, 2012). In education, engagement indicates that a student is actively involved in learning (Reeve, 2013) and is increasingly recognized as a prerequisite for effective learning (Pittaway, 2012). Engagement also denotes that one's *attention* is held. Educators must be attentive to needs students and be willingly responsive to their learning needs and preferences. *Energy* must be expended on both the part of the educator and the student for engagement to occur. This energy is directed toward the learning process and learner achievement. When faculty put forth energy and effort, students perceive this as faculty showing interest in the information (Heller, Beil, Dam, & Hareum, 2010). Engagement refers to the actions one takes, or the energy expended, to attain knowledge (Reeve, 2013). A faculty's interest in the topic inspires student engagement. When faculty show interest in the information, meaning is produced for both the faculty and student (Heller, Beil, Dam, & Hareum, 2010). Learning must be meaningful for the learner to be engaged. Nurses are often "called" to

their work, thus producing a meaning to the care they provide (Vinje & Mittelmark, 2008). Subsequent *interactions* within the learning environment produce an emotional connection, a sense of belonging (Lam et al., 2014), interest (Reeve & Lee, 2014), and a relationship the student develops with the content (Solomonides, 2012).

Model Case

A model case demonstrates all the defining attributes (voluntary involvement, attention, directed energy, and interaction) of the concept (Walker & Avant, 2011). The following model case was developed.

The nurse educator presented a lecture about chronic renal disease. The lecture was followed by group high-fidelity simulation in which the faculty member and students participated in a learning case study process involving online videos and a visit from a renal patient. The students were captivated (attention) through dialogue (interaction) with a patient and the ability to ask questions regarding the disease process. The faculty planned an engaging activity (directed energy) and stayed after class with the excited students (voluntary involvement).

This scenario is a model case of student engagement. The students' attention was captured through open dialogue, exerting personal energy and becoming excited when they were able to correctly analyze the situation and question the patient. An emotional connection to the material was developed, resulting in enhanced learning. Throughout the process, the educator was attentive to student questions which further reinforced their sense of mastery of the situation. The students' attention was captivated with the interesting topic area and the simple fact that the educator also showed interest in the topic by providing an enhanced opportunity for them to learn. The emotional connection

the students made between the educator, the topic, and personal accomplishments was meaningful. The students became excited as they engaged in meaningful interaction with the patient. Students demonstrated engaged learning and were supported by an involved faculty.

Antecedents and Consequences

Antecedents facilitate the occurrence of a concept (Kottler & Hunter, 2010). For engagement to occur, a connection must be in place. This may refer to a connection with the content or faculty member. This connection can be in the form of a behavior or cognition (Reeve, 2013). According to the Psychological Engagement Theory, meaningfulness, safety, and availability must be present for the learner to be engaged (Noe, Tews, & Dachner, 2010). Interest is another antecedent. One must be interested in the subject matter at hand, whether it is the content being delivered or the educator delivering the content. If one is interested in what is being said or taught, then attention is easier to maintain.

Consequences of engagement between faculty and students are positive. Engaged students are energized to become involved in self-initiated learning. Studies have confirmed that engagement facilitates a motivational environment in the classroom (Reeve & Lee, 2014). For students, it is important to walk away from a learning activity feeling satisfied that natural curiosity was met and that an understanding of the topic area was attained. Another consequence of engagement for faculty is job satisfaction. Job satisfaction is the extent to which an employee likes work (Abraham, 2012). Work engagement ensures high performance, learning, and productivity (Macey & Schneider, 2008) as well as increased levels of initiative and higher quality work.

Concept of Reciprocity

Reciprocity is the quality or state of being reciprocal ("Reciprocity," 2012) or the equal granting of benefits or concessions to another in exchange for the same ("Reciprocity," 2011). In sociology, "reciprocity is an exchange between two or more parties, rooted in mutuality" ("Reciprocity," 2009). In the study of languages, a reciprocal situation contains two or more participants performing the same role (Curl & Frajzyngier, 1999). Reciprocation is accomplished when the goals of the educator and students are identified, and every effort is made to attain these goals (Meleis, 1996). All the definitions of reciprocity relate to some type of mutual interaction on the part of the actor and the recipient of the action.

Reciprocal teaching (RT) strategies are essentially a discussion between teachers and students to come to a shared understanding (Williams, 2010). The RT strategies allow the teacher and student to take turns dialoguing to construct meaning (Ghorbani, Gangeraj, & Alavi, 2013). The teacher role models the strategies of predicting, questioning, clarification, and summarizing, and these strategies are then reciprocated or mimicked by the student (Williams, 2010).

In the field of technology, learning by explanation and reciprocal teaching methods is valuable for learning performance and may lead to additional knowledge. This also facilitates student, peer, and faculty interaction. Students can work cooperatively on complex assignments and improve their critical thinking abilities (Shadiev et al., 2014).

Reciprocity is the mutual engagement of the mentor and mentee. Both participants have something to gain from the relationship. If the mentee's self-perception

is only as the recipient of knowledge, there may be hesitation to ask for what is needed (Fischler & Zachary, 2009). The close relationships developed with those who are being assisted results in reciprocal influence (Kottler & Hunter, 2010).

In nursing, the most extensive description of *reciprocity* comes from the work of Martha Rogers (1970) who identifies reciprocity as one of her original Principles of Hemodynamics. Her Theory of Unitary Human Beings postulates that energy fields are present in all human interactions. These fields have reciprocal relationships or interactions with each other (Kim & Kollack, 2006). A person is an energy field in constant interaction with other energy fields and the environment (Dossey, Keegan, & Guzzetta, 2005). She negated the idea of adaptation, instead appealing to the creativity of life as a series of continuous, revisions called patterning (Rogers, 1970). The probabilistic nature of the interaction lends credence to the idea that there is an exchange of some type with the person and the environment (or someone in the environment) both giving and taking something from this exchange. Even though the energy fields are integrated, they remain unique. This principle was later renamed the Principle of Integrality (Phillips, 2000), but the reciprocal nature of human relationships remained. This reciprocal exchange of energy can be seen the first time a mother meets her newborn infant, when a physician delivers catastrophic news to an anxious family, or when a student finally understands a complex concept. A reciprocal exchange of energy occurs which may escalate or decelerate the communication, but both sides are involved, focused, and reacting.

Defining Attributes

After a thorough literature review, the following defining attributes of reciprocity were selected: *mutuality, interaction, self-interest, and exchange*.

The *mutual* nature of reciprocity implies that more than one person or entity is involved in an exchange of some type. This action presupposes that both parties have something of similar value to bring to the situation; it also connotes a situation of voluntariness in the exchange. There must be *interaction* between the parties for a reciprocal activity to take place. This interaction is viewed as meeting the *self-interest* or personal goals of both agents. It is further strengthened by the agreement on the exchange of energy, commodities, or information. Since this interaction or exchange of information can occur in both directions, there is some sort of equivalency expected which presupposes some sort of influence, making the exchange one of mutuality. Finally, the act of *exchange* is the culmination of the reciprocal arrangement. Giving and receiving benefits of equal value is the optimal reciprocal exchange.

Model Case

Tim has been working at the clinic for five years. He believes he should receive a raise. The boss wants to integrate a new electronic documentation system into the clinic which will make data collection and retrieval of records much easier. He needs someone to spearhead the project. Tim volunteers to lead the new documentation project and has it up and running in three months. Tim's boss rewards him with a bonus and a raise.

This model case demonstrates all the defining attributes of reciprocity. There were two parties interacting to achieve mutually desirable goals. Both parties had a self-

interest in this exchange, and both perceived that their self-interest was served. The exchange of information and rewards benefitted all parties involved.

Antecedents & Consequences

Antecedents to reciprocity include two or more participants with some type of connection. In an educational setting, the connection can be an emotional, cognitive, or behavioral to the educator or subject matter at hand (Lam et al., 2014). In addition, the faculty member must exhibit a connection with the content to serve as an effective mentor. Multiple interactions, in multiple directions occur in a reciprocal relationship. A collaborative interaction further strengthens the reciprocal relationship (Fischler & Zachary, 2009).

Consequences of reciprocity include: a relationship, engagement, and direction. A relationship implies that a stronger connection has been established. A relationship constitutes a connectedness emphasizing a holistic relationship rather than the space between the participants (Giles, Smythe, & Spence, 2012). Relationships are the core of meaningful encounters in which reciprocity occurs. A positive relationship signifies that value is placed in one another. Meaningfulness is enhanced when individuals feel valued and capable of giving and receiving something valuable (Kahn, 1990). This further demonstrates a reciprocal relationship. If value is placed in a situation, content, or person, then engagement will naturally follow. Because of this reciprocal relationship, the participants travel in equal directions. Learning may be the product of this relationship (Fischler & Zachary, 2009).

Relating Engagement and Reciprocity to Nursing Education

Through conducting concept analyses on engagement and reciprocity, similarities occur (See Table 1). The question of relevance is whether engagement in an activity, such as work or education, requires or is promoted by the presence of reciprocity. Of interest is whether a student can be truly engaged in a course or clinical experience if the faculty person is not engaged. Can reciprocity be considered an antecedent to engagement in an educational endeavor?

Table 1 Congruence of Defining Attributes of Engagement and Reciprocity

ENGAGEMENT	RECIPROCITY
Voluntary involvement	Mutuality
Interaction	Interaction
Attention	Self-interest
Directed energy	Exchange

The defining attributes for engagement and reciprocity share similarities. The voluntary involvement of engagement in a nursing program is not conditional on whether the faculty from the program exhibit excellence, knowledge, or even interest in the student. Evidence of this can be seen in the popularity of Massive Open Online Courses (MOOCs). Clará and Barberá (2013) argue that learners have problems finding ways to establish an adequate sense of dialogue with others negating the sense of reciprocity. It seems reasonable to opine that having a faculty who reciprocates during a course would boost engagement; it is unclear that lack thereof would necessarily negate engagement. Many persons become truly engaged in MOOCs regardless of the level of interest shown by the teacher.

Since interaction was noted as a defining attribute of both concepts, its importance in determining student engagement based on reciprocal interactions with the faculty seems assured. Quality interaction with faculty members is associated with learner engagement (Abu, Adera, Kamsani, & Ametepee, 2012). Faculty define engagement as the interaction between faculty and students, not a one-sided discussion or instruction (Heller, Beil, Dam, & Haerum, 2010). This implies that a reciprocal relationship is central to both faculty and student engagement as both participants consider this interaction valuable.

Attention is a defining attribute of engagement. It is loosely equated to the idea of self-interest which defines reciprocity. To be engaged in a learning scenario, the student must be attentive to the content, expectations, and follow-up. The reason for this attention is probably one of self-interest, i.e. the student wants to pass or feels an interest in the content or simply wants to know what to do if asked to avoid embarrassment. All of these motives speak to the student's self-interest or intrinsic motivation. It is difficult to imagine a situation where the attentiveness of engagement would not be in the student's self-interest.

Finally, the last defining attribute of engagement is directed energy which is being compared with the notion of exchange as a defining attribute of reciprocity. The *Law of the Conservation of Energy* states that the total energy in a system is constant; energy can be transferred from one object to another but cannot be created or destroyed. Taking this into consideration, energy exhibits a reciprocal relationship. Faculty and students exchange energy in a learning environment in a reciprocal fashion. If both faculty and

students possess substantial amounts of energy, the engaging relationship is stronger as there is more energy present in the system.

Based on the similarities between the defining attributes of engagement and reciprocity, there does seem to be a basis for concluding some relationship. The dynamic nature of engagement lends credibility to the idea of energy exchange, especially if the directed energy is seen as involved in an exchange with other persons, namely the instructor. If the instructor is not engaged or energized to teach the subject, the student's success will likely depend on their innate ability to generate enough energy to meet the student's self-interest. This still seems to bolster the idea that engagement is enhanced when reciprocal interaction takes place between the student and either the faculty or the course content itself. Faculty who seek to be successful in sparking the student's interest and enhancing engagement would be well advised to attend to the reciprocal aspects of the class which allow them to capture the learner's attention and direct their energy toward the learning objectives.

Conclusion

This is the first comparative concept analysis conducted between engagement and reciprocity. The concept of engagement has been defined and measured throughout various disciplines, especially in nursing. As faculty, it is important to understand what engages the learner. In addition, if the learner is engaged, then effective learning occurs. Reciprocity is another concept that seems related to engagement. In a reciprocal relationship, both parties have something to gain, making it a personal investment. In a reciprocal engaging relationship, both faculty and students benefit. The collective presence of these concepts strengthens the learning environment. Faculty evaluation and

development programs could benefit from a focus on the personal gains to the faculty when students are engaged instead of simply dwelling on the challenges and barriers to maintaining an engaged learning environment. If faculty self-interest can be conceptualized as being enhanced by having motivated, engaged learners, the optimal outcome is a win-win for both the faculty and the student.

It would be valuable to conduct further research to compare faculty and student perceptions of levels of engagement to find connection to learner outcomes. In addition, it would be significant to compare student perceptions of faculty's level of reciprocity with student engagement and satisfaction. The benefits of a reciprocal relationship between student and teacher can sculpt the education environment into a mutually beneficial interaction that fosters engagement in learning and achievement. Perpetuating this kind of positive learning experience will truly benefit many future generations of nurses.

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Chapter 3

Abstract

Problem: Most metacognitive research focuses on learning outcomes and measuring metacognitive abilities. Research has failed to explore the processes involved in student learning and the use of metacognitive strategies (MS) as a means for nurse educators to better understand student thinking and engagement with the content to ultimately shape clinical reasoning. The purpose of this study was to investigate the effect metacognition has on nursing student achievement and engagement with gastrointestinal (GI) content.

Theory: Engagement Theory served as the foundation for this study. MS was used to enhance student learning and engagement with hands-on active learning activities.

Research questions: What effect does requiring nursing students to be metacognitive about their thinking have on their understanding of GI content? What effect does metacognitive questioning have on nursing students' engagement with the content? How do students engage with content to inform decision making during hands-on activities?

Design/Methods: A parallel explanatory, mixed methods design was used to determine how metacognition impacts student understanding and engagement in a convenience sample of 124 students. Data collection consisted of student responses to four metacognitive and one engagement question, researcher field notes, and pre and post-test results.

Analysis: Qualitative data analysis was conducted using a constant comparative approach. Quantitative data from the pre and post-tests was analyzed using independent samples t-tests and paired samples t-tests.

Keywords: nursing student, metacognition, academic achievement, engagement, understanding

Effect of Metacognitive Strategy on Nursing Students' Achievement and Engagement in an Active Learning Exercise

Educators must make a strong effort to understand how students learn. Evidence demonstrates the necessity of using teaching strategies that provide opportunities for students to actively reason their way through concepts, scenarios, and difficult tasks (Chartier, 2001). Active learning supports learners in developing a deeper understanding (August-Brady, 2005; Bran, 2008) to transfer knowledge to new situations (Kane, Lear, & Dube, 2014; Pearson & Harvey, 2013; Scharff, et al., 2017). The sole use of a single form of instruction, particularly lecture, to convey knowledge has been criticized. Lecture is a passive learning method (Bhagat, Vyas, & Singh, 2015; Crookes, Crookes, & Walsh, 2013; Lumpkin, Achen, & Dodd, 2015) in which knowledge acquisition is superficial (Yusoff, Karim, Othman, Mohin, & Rahman, 2013) and as a result disengagement ensues (Gasiewski, Eagan, Garcia, Hurtado, & Chang, 2012; Lashari, Alias, Kesot, & Akasah, 2013). Studies have shown that lectures are less effective and less engaging than a wide range of other instructional methods. Additionally, learning is not immediately visible with the sole use of lecture (Hattie, 2015). The Institute of Medicine (IOM; 2011) called for instructional redesign as nursing education in its current state is inadequate in dealing with the realities of todays' healthcare problems. Metacognitive strategies (MS) offer a possible solution to the IOMs' call for change. Instruction with metacognitive exercises allows for faculty to continually monitor instructional effectiveness and learner engagement (Wilson & Conyers, 2016). Developing metacognitive skills in nursing students may prepare the next generation of

nurses to effectively manage the complex demands in health care (Kuiper, 2002) and provide the basis for sound clinical reasoning and decision making (Banning, 2008).

Metacognition is an understanding or awareness of one's own thought processes ("Metacognition", 2017). Metacognition may create cognitive dissonance between schemas in which students find new knowledge conflicting with previous knowledge. It may also create cognitive consonance in which new knowledge is found to be consistent with previous knowledge. In the last decade, research has proven that metacognition is important for successful learning (Jiang, Ma, & Gao, 2016) and teaching (Ben-David & Orion, 2013; Fathima, Sasikumar, & Rojar, 2014). Most research focuses on learning outcomes and measuring metacognitive abilities. Researchers have failed to explore the processes involved in student learning and the use of MS as a means for nurse educators to better understand student thinking and engagement with the content at hand.

Review of literature

The concept of metacognition gained recognition in the 1970s with John Flavell. Flavell (1979) defined metacognition as the "regulation of cognitive processes" or "an awareness of the learning process." Metacognition has two main principles: *metacognitive knowledge* and *metacognitive regulation* (Onyekuru & Njoku, 2017). *Metacognitive knowledge* is the information consulted with when thinking about an idea; it includes basic facts and concepts. According to Pierce (2003), there are three components of *metacognitive knowledge*: declarative knowledge, procedural knowledge, and conditional knowledge. Declarative knowledge is the facts known to an individual. Procedural or methodological knowledge means knowing "how" to perform a task. It is the knowledge or awareness about different learning strategies or procedures that work

best for that person. Conditional knowledge is the ability to know when or why; it is the knowledge of when to use and not to use a skill or strategy (Onyekuru & Njoku, 2017; Schleifer & Dull, 2009).

Metacognitive regulation is the ability to regulate cognitive activity. Metacognitive regulation was defined by Schraw (1994) as the actual activities used to facilitate learning and memory function. It involves planning, monitoring and evaluating one's learning to determine goal attainment (Kane et al., 2014).

Metacognition is valuable to the nursing profession as a discipline that is grounded in its practice; nurse educators must utilize evidence-based teaching strategies to promote safe, high quality practice. Metacognition serves as a guide that directs learners to determine what is known and unknown. The ability to make this distinction helps the learner to focus on acquiring the knowledge they are lacking (Kane et al., 2014; Medina, Castleberry, & Persky, 2017). The evidence suggests that a lecturers' metacognition influences their ability to promote metacognition in the classroom. This illustrates the importance of metacognition for both students and teachers alike (Kane et al., 2014).

Metacognitive Strategies for Teaching/Learning

A primary benefit of MS is a heightened awareness of one's own learning to improve learning outcomes (Callan, Marchant, Finch, & German, 2016). Students with higher levels of metacognitive knowledge and regulation are expected to perform better on exams because they understand the known and unknown and they effectively manage study time. (Onyekuru & Njoku, 2017). The use of MS to enhance learning has been widely researched (Cummings, 2015) in education (De Backer, Van Keer, Moerkerke, &

Valcke, 2016). Palennari (2016) found a significant relationship between metacognitive skills and cognitive retention of biology students. In addition, a nonsignificant relationship between metacognitive awareness and cognition was observed, implying that use of MS in teaching/learning is stronger than one's innate metacognitive awareness (Palennari, 2016).

MS are those tactics learners use to control cognitive activities to ensure learning goals are met (Bruning, Schraw, & Norby, 2011). Promoting metacognition can be accomplished by creating and fostering a supportive and learner-centered environment. Activating prior knowledge is essential because for learning to occur, new knowledge must be assimilated with previous knowledge to form novel connections (Kane et al., 2014).

Reflective activities encourage metacognition (Johnson, 2013; Kane et al., 2014; Medina et al., 2017). By allowing learners to reflect, they think about their actions, ability, and knowledge to identify areas of deficiency and how to move forward (Medina et al., 2017). Concept mapping is a metacognitive tool designed to help learners explore their knowledge and understanding (Kane et al., 2014). The use of formative assessments during teaching also improves metacognition. This allows for a more relaxed evaluation of oneself to determine knowledge deficits. A simple exam review can be considered a MS. Reviewing exam content with learners can be a powerful way to motivate students to examine their thinking processes (Medina et al, 2017). Thinking out loud allows for learners to compare their thinking to that of the educator to identify gaps, errors, or similarities. Questioning and immediate feedback with the goal of connecting new knowledge to existing knowledge uses probing or leading questions to improve learning

(Medina et al., 2017). Metacognitive prompts during instruction can result in students' increase in knowledge and problem solving (Peters & Kitsantas, 2010). Discussion between peers plays a significant role in the development of metacognition (Bonnett, Yuill, & Carr, 2016). Brown, (1988) proposed that learning is solidified when one is required to explain their choices.

Metacognition and Achievement

Successful learning and academic achievement are associated with intelligence, personality, and metacognitive skills (Callan et al., 2016; Kelly & Donaldson, 2016; Onyekuru & Njoku, 2017; Palennari, 2016). International research has demonstrated that MS correlates with academic achievement across many content areas, but especially reading, math, and science (Callan et al., 2016). MS has shown to be predictive for academic ability (Callan et al., 2016), and exam performance (Couchman, Miller, Zmuda, Feather & Schwartzmeyer, 2015; Kane et al., 2014). Students who exhibit low levels of metacognition perform at a lower level academically than their peers with high levels of metacognition (Onyekuru & Njoku, 2017). Interestingly, with extremely high levels of metacognitive regulation, metacognitive knowledge was less effective (Onyekuru & Njoku, 2017). It is understandable that one must first possess the knowledge and strategy to obtain information before metacognitive regulation can be beneficial. This is like relying primarily on test-taking strategies rather than knowledge to be successful on an exam.

In a study conducted by Callan et al., (2016), MS significantly predicted achievement for high and low socioeconomic statuses across 30 countries in math, reading, and science. Kelly and Donaldson (2016) also found that there was a significant

relationship between metacognition and academic performance as well as a relationship between the year of study the student was in and the level of metacognition. Similarly, Kuiper (2002) found that baccalaureate level nursing students were more metacognitively aware than associate degree nursing (ADN) students. However, the ADN students had greater gains in metacognitive process than did the baccalaureate nursing students when journaling was used as a MS (Kuiper, 2002).

Student engagement is one of many factors influencing academic achievement (Lam et al., 2014) and satisfaction with the learning process (Reeve & Tseng, 2011; Robb, 2013; Lam et al., 2014; Sagayadevan & Jeyaraj, 2012; Moyer, 2015). Classroom engagement has been shown to significantly predict achievement (B = .33, SE= .14, β = .25, t = 2.30, p< .05) (Reeve & Lee, 2014). Students that fully engaged in academic activities performed better academically (Gerber, Mans-Kemp, & Schlechter, 2013). This establishes the need for student engagement alongside metacognition to increase learning.

Metacognition and Exams

Couchman et al. (2016) incorporated metacognition measures into exams to help students determine when to and when not to revise one's answers. The results of this study indicated that both low and high performers were equally good at judging whether an answer selection was right or wrong (Couchman et al., 2016). Miller and Geraci (2011) found that not all students possess the ability to predict their performance. Low-performing students usually rated themselves higher than the actual grades achieved (Miller & Geraci, 2011).

Measuring Metacognition

There are several instruments available for measuring metacognition in students and teachers, but most research focuses on students' metacognition. Hsu and Hsieh (2011) used the Metacognition Scale to determine if blended learning (using two or more complementary approaches to teaching material) as opposed to sole lecture made a difference in students' learning in a nursing ethics course. Although this study had flaws and failed to find a significant difference in learning between the groups, it did register significant progress in the experimental group on the Metacognition Scale (Hsu & Hsieh, 2011). Using the Metacognitive Awareness Inventory (MAI), Kelly and Donaldson (2016) found a significant relationship between metacognition and academic performance in a sample of undergraduate students.

Metacognition and Clinical Reasoning

Effective clinical reasoning (CR) improves patient outcomes, while poor clinical reasoning skills often result in failure to detect impending patient deterioration (Croskerry, 2003; Levett-Jones et al., 2010; Trimble & Hamilton, 2016). CR is a learned skill that requires active engagement and reflection. It is closely intertwined with metacognition, a higher order thinking process, in that, nurses collect cues and process information to inform decision making. In the undergraduate setting, nursing students must be provided with opportunities to reflect on and question their thinking processes (Levett-Jones et al., 2010). Van Graan & Williams (2017) emphasized the need for integrating observation and questioning to stimulate students' reasoning skills as well as linking existing knowledge to new data to inform decision making.

Gaps in Literature

A growing body of research has established the importance of metacognition in the teaching and learning process for a variety of subject areas. However, researchers have yet to investigate how MS used with nursing students influence their achievement, decision making, and engagement. Therefore, the purpose of this study is to investigate the effect a metacognition strategy has on nursing student achievement and engagement with the content.

Theoretical Framework

Engagement Theory (ET; Schneiderman, 2002) served as the foundation for this research study (Appendix A, used with permission). This theory was selected based on the premise that active learning is any instructional strategy that engages students in the learning process. Essentially, active learning requires students to engage in meaningful activities and consider their actions (Prince, 2004). Active learning often occurs in collaboration with peers. This use of the ET supports the relationship between active learning activities, metacognition, and engagement as is it being investigated in this research study. The theory was originally intended as a framework for technology-based teaching and learning. It was developed by two educators from disciplines of psychology and computer science and was based on experiences with teaching in electronic and distance education environments (Kearsley & Schneiderman, 1999). The fundamental premise of ET is that a student must be meaningfully engaged in learning through social interaction and worthwhile tasks (Leonard, 2002). The three basic concepts of engaged learning are relate, create, and donate which together are believed to promote engagement.

The first concept of relate includes the belief that learning should occur through collaboration that emphasizes communication, management, and social skills (Schneiderman, 2002). Research findings indicate that the use of collaborative learning environments allows for peers to not only discuss what they learn, but *how* they learn (De Backer et al., 2016). The second concept of ET is create. Create implies that activities should be creative and purposeful so that students will develop a sense of ownership (Kearsley & Schneiderman, 1999). The last concept, donate suggests learning activities should be meaningful and realistic (Kearsley & Schneiderman, 1999).

For this study, learning was accomplished in small groups that required collaboration and communication amongst team members as well as faculty. Social learning supports metacognitive thinking as well as engagement and the development of a nurse's professional identity (Fitzgerald, 2016). All skills lab stations (Appendix B) employed real life scenarios and audiovisual aids to promote translation of theory into practice. Additionally, metacognitive and engagement questions posted at the selected skills lab station were meant to reinforce content for examination purposes. The inclusion of metacognitive questioning during skills lab was in an effort supplement the three principles of Engagement Theory to increase student learning and engagement with the content.

Conceptual and Operational Definitions

The following table presents the major concepts of the ET as it relates to this study. Operational definitions for measures of each concept are also included.

Table 2 Conceptual and Operational Definitions

Variable	**Conceptual definition**	**Operational definition**

Relate & create		
Metacognition **strategies (IV)**	The awareness or analysis of one's own learning or thinking processes ("Metacognition", 2017) Higher-order thinking that enables understanding, analysis, and control of one's cognitive processes, especially when engaged in learning" ("Metacognition", 2018)	Four metacognitive questions posed during hands-on activities for GI content: 1. What details lead you to this decision? 2. How does it fit with what you already know? 3. How does it conflict with what you thought you knew? 4. What questions does this make you have?
Donate		
Learning/academic **achievement (DV)**	Something that somebody has done successfully, especially using their own effort and skill ("Achievement," 2017).	Knowledge level pre and post-test over GI content (20 items). Pre-test to be given before intervention and post-test to be given three weeks after intervention using MS. Higher scores indicate an increased level of academic achievement. Possible range of 0-100.
Engagement		
Engagement (DV)	How actively involved is a student in the learning activity? Includes behavioral, emotional, cognitive, and agentic (personal contribution) aspects (Reeve & Lee, 2014). The level of attention and effort; the presence of emotions of interest; use of deep as opposed to superficial learning; and the extent to which the learner tries to enrich the learning experiences rather than be a passive recipient (Reeve, 2012; Reeve & Lee, 2014).	Question posed during hands-on activities for GI content: 1. Does this kind of questioning increase your engagement with the content? Please explain Behaviors observed while researcher is taking field notes.

Research Questions and hypothesis

Three research questions will be investigated.

1. What effect does requiring nursing students to be metacognitive about their thinking have on their understanding of GI content?
2. What effect does metacognitive questioning have on nursing students' engagement with the content?
3. How do students engage with content to inform decision making during hands-on activities?

Research design

A parallel explanatory, mixed methods design was used to determine how metacognition impacts student understanding and engagement with content. Metacognition was examined qualitatively and linked to nursing students' achievement and engagement over the same content. The study consisted of two groups, an intervention group and a control group. The intervention group answered four metacognitive questions and one engagement question during a faculty planned active learning exercise in the skills lab related to GI content. The control group participated in the faculty planned active learning exercise in the skills lab related to GI content without answering any questions.

Methods

Sample

A convenience sample of participants (N = 124) enrolled in a basic medical-surgical course were utilized at a mid-sized university in Texas. Eligibility criteria

included: (a) at least 18 years of age, (b) can read and speak English; and (c) enrolled in the prospective basic medical-surgical I course. On the day of the proposed study, participants were screened for eligibility by completing a paper demographic and consent questionnaire. The ability to opt out of the research study was given with post-hoc consent during the debriefing period.

A total of six groups of students rotated through the skills lab. Using an online randomizer, Groups 1, 3, and 6 (consisting of approximately 24 students each) that rotated through the skills lab were selected as the intervention groups. Groups 2, 4, and 5 served as the control groups.

To reduce the risk of type II error, a power analysis using G*Power (Faul, Erdfelder, Lang & Buchner, 2007) was performed to estimate the sample size. A sample size of 114 participants was needed to provide sufficient statistical power at .8, using a significance of .05, and a medium effect size (d = .53), based on findings from Hattie's (2016) meta-analysis over teaching practices related to achievement.

Protection of Human Subjects & Ethical Considerations

The proposed study was submitted to the Institutional Review Board (IRB) for approval. To further protect study participants, when obtaining post-hoc consent, they were informed of the: purpose of the study, data collection procedures, expectations of commitment, potential risks and benefits of participation, protection of participant's personal identifying information (confidentiality), right to opt out or withdraw from the study at any time without prejudice, and course grade would not be affected by participation or non-participation. Participants were provided with the primary

researcher's contact information on the post-hoc consent in the event students had any additional questions.

Once transcribed, data was stored on a password-protected computer owned by the researcher. Participants were assigned unique identifiers (last four digits of cell phone number) rather than using names.

Instruments

The instruments consisted of a questionnaire with four metacognitive questions and one engagement question (Appendix C) as well as pre and post-tests (Appendix D). A demographic questionnaire, collected at the time of consent, included age, race, gender, employment status, GPA, and lecture section the student was assigned (Appendix E). An option was provided for participants to list their contact information in the event the researcher had further questions. This demographic information was useful when analyzing and interpreting.

Procedures

This research study took place in a skills lab with hands on activities prepared by course faculty relating to the gastrointestinal (GI) content. Prior to the skills lab activities, students received GI content during their normally scheduled lecture period. The researcher prepared metacognitive and engagement questions for the faculty to use with the students at the end of lecture. This helped to familiarize the students with the questions before answering them in the skills lab. The following week, the students attended their regularly scheduled lecture and skills lab in which the research study took place. The skills lab(s) was set up with six stations with copies of customary faculty developed questions for students to answer at each station (Appendix B). Groups

(Groups 1-6) of approximately 24 students at a time (with four students at each station) rotated through the hands-on activities.

MS (Intervention) Group and Control Group

Using randomization, the first, third, and sixth group were selected as the intervention groups. The control group consisted of the second, fourth, and fifth groups of students entering the skills lab (see outline below).

Group 1: 24 students received the intervention on yellow paper.

Group 2: 24 students served as the control group and did not receive the intervention

Group 3: 24 students received the intervention on blue paper.

Group 4: 24 students served as the control group and did not receive the intervention

Group 5: 24 students served as the control group and did not receive the intervention

Group 6: 24 students received the intervention on green paper.

The intervention groups answered the metacognitive questions on colored sheets of paper that indicated to the researcher what rotation that participant belonged. The title of the station was Station #2: Patient is post-op day 2 after a Billroth 1 gastroduodenostomy) for Peptic Ulcer Disease and covered aspects of patient care with this disorder.

Students were allotted eight minutes at each skills station. Taking into consideration the additional time necessary to answer the metacognitive questions, an additional ten minutes was provided for the intervention groups at station #2. Course

faculty rotated through the skills lab the duration of the period to assist students with content questions. The primary researcher was seated near station #2 to observe students and take field notes. The researcher observed for specific behaviors that indicated engagement and disengagement behaviors in the intervention groups. The researcher remained in this location throughout the study even as the control groups rotated through the skills lab.

Immediately after each group of students had the opportunity to rotate through all six skill lab stations, course faculty led debriefing sessions. During the first five minutes of debriefing, the researcher obtained post-hoc consent (Appendix F), explained the research study, as well as discussed risks and benefits using a standard script (Appendix G).

Data Collection

The study spanned four weeks (Appendix H) and took place at a university campus in the skills/simulation lab during a medical-surgical I (level one) course. All participants completed an electronic pre-test through the learning management system consisting of 20 questions over the GI content being presented in the lab and didactic portion of the course. The students were divided into two lecture sections within the course. Each section received separate didactic instruction from one of two faculty members during the first half of the day. During the times they were not in lecture, they rotated through the skills stations. In addition to the usual questions/prompts at the stations, the four metacognitive and one engagement question were provided o at station #2. The questions included (Appendix C):

1. What details lead you to this decision?

2. How does it fit with what you already know?
3. How does it conflict with what you thought you knew?
4. What questions does this make you have?
5. Does this kind of questioning increase your engagement with the content? Please explain.

Post-hoc consent was obtained during debriefing and all participants (control and intervention group) completed a demographic questionnaire. Participants were asked to include his or her unique identifier (last four digits of cell phone number) on the consent form as well as the copies of metacognitive questionnaires.

Three weeks after the intervention using MS, all students completed the post-test, containing the same 20 questions given as the pre-test, through the learning management system. The results of the pre and post-tests were matched by the researcher with their demographic questionnaires, consent, and metacognitive questionnaire. Those that declined to participate were removed from the data analysis.

Analysis

Qualitative data consisted of participant responses to the printed metacognitive and engagement questionnaire and the researcher's field notes. Field notes were recorded by the researcher using an observation form (Appendix I) created from the Engagement Theory (Kearsley & Schneiderman, 1999) and after conducting a thorough literature review regarding behaviors of engagement and disengagement. All questionnaire responses and field notes were transcribed by the researcher. The constant comparative method (Glaser & Strauss, 1967) was used to analyze the data. This method of data

analysis is used to construct categories and themes that capture recurring patterns that emerge from the data (Glaser & Strauss, 1967).

After electronically transcribing all questionnaires, responses were analyzed individually. Data were reviewed line by line in detail until a concept became apparent and a code was assigned. The transcribed questionnaires were categorized using color coding and notations by the primary researcher. Each questionnaire was compared to the previous one within the same intervention group and then between intervention groups. This provided a within group and between group comparison. While conducting the line-by-line analysis, the researcher asked: "What is this sentence about?" and "How is it similar or different from the preceding or following statements?" This kept the researcher focused on the data rather than on erroneous details (Glaser, 1978; Strauss & Corbin, 1990). To ascertain whether a code was properly assigned, the researcher compared text segments from the questionnaires to segments previously assigned the same code to determine if the same concepts were reflected. As categories were identified, the researcher went back to the questionnaires to ensure that the appropriate category was selected. Using this constant comparison method, the researcher refined the dimensions of existing codes and identified new codes. It was through this process that the codes evolved inductively, reflecting the experience of the participants (Bradley, Curry, & Devers, 2007). After the coding and categorization processes were completed, themes were identified. The field notes were also compared to questionnaire responses, codes, categories, and themes to strengthen the data analysis.

Triangulation of qualitative data occurred to increase validity by having multiple groups (within the three intervention groups of 24 students each) answer the

metacognitive and engagement questionnaire. These data were compared and cross-checked for consistency derived at different times and from different sources (Patton, 2015). To enhance credibility and rigor, an expert qualitative researcher reviewed the findings.

The pre-test and post-tests were scored and paired with the survey questions appropriately using the unique identifiers. Independent samples t-tests were performed with the results of the pre and post-tests to determine if there is a difference between the two groups. Additionally, paired samples t-tests were conducted on the pre and post-tests to determine if there are differences within the control and intervention groups. Exploratory data analysis was performed following the guidelines of Field (2013) to evaluate parametric assumptions. Statistical analysis was conducted using SPSS, the Statistical Package for the Social Sciences, Version 20. A 95% confidence interval was used.

Research findings

Demographics

The total possible sample consisted of 139 students. Of these, eight students opted out, two students failed to turn in their consents, and five students did not complete the pre-test or the post-test. This yielded a final sample (N=124) of nursing students that consented to participate in the research study and completed the metacognitive and engagement questionnaire (for the intervention group), as well as the pre and post-tests. The intervention group consisted of 63 students while the control group consisted of 61 students. There was a mixture of students from both lecture sections in the intervention and control groups. The sample was predominantly female (N = 103) between 20-48

years of age with a mean age of 24. Seventy-five percent of the sample was White, 10.5% Black or African American, 8.9% Asian, 1.6% American Indian or Alaska Native, and 4% of the students did not report their race. Of the participants, 19.4% reported being of Hispanic or Latino decent. A chi-squared test found no significant differences in demographics between the intervention and control groups.

Table 3 Demographics by group

		Intervention Group Frequency/Percentage	Control Group
Gender	Male	13 20.6%	8 13.1%
	Female	50 79.4%	53 86.9%
Living Arrangement	Campus dorms	2 3.2%	1 1.6%
	Campus apartments	9 14.3%	7 11.5%
	Off campus (apt, condo, duplex)	26 41.3%	21 34.4%
	Off campus single house)	26 41.3%	32 52.5%
Hispanic/Latino		15 23.8%	9 14.8%
Race	White	44 69.8%	49 80.9%
	Black or African American	5 7.9%	8 13.1%
	Asian	9 14.3%	2 3.3%
	American Indian or Alaska Native	1 1.6%	1 1.6%
Employment	Full time (≥40 hours/week)	2 3.2%	9 14.8%
	Part-time (< 40 hours/week)	28 44.4%	21 34.4%
	Not employed	33 52.4%	31 50.8%
Current GPA	3.5-4.0	24 38.1%	28 45.9%
	3.0-3.49	37	30

		58.7%	49.2%
	2.55-2.99	2 3.2%	2 3.3%
Lecture section	Lecture section 1	27 42.9%	34 55.7%
	Lecture section 2	36 57.1%	27 44.3%

It is important to note the narrow range of GPA, this may be because a minimum GPA of 2.75 is required to enter into the nursing program.

Quantitative results

Only the students that completed both the pre and post-tests were included in the statistical data analysis. After confirming that the data met the assumptions for parametric testing, independent and paired samples t-tests were performed. Independent samples t-tests found that there were no significant differences in the pre-test ($t(125) = -1.146$, $p = .254$) and post-test ($t(124) - .610$, $p = .543$) between groups. Tests of between subjects effects were found to be nonsignificant ($F(1,122) = .24$, $p = .625$, $\eta^2 = .002$) indicating that the metacognitive and engagement questionnaire did not significantly impact student scores on the pre versus post-test. A paired samples t-test revealed significant increases in learning for all participants ($t(123) = -6.95$, $p = .0005$).

Table 4 Paired Samples T-test

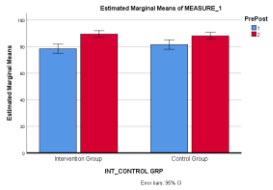
		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	PRE_TEST - POST_TEST	-8.815	14.129	1.269	-11.326	-6.303	-6.947	123	.000

Independent samples t-tests were performed to answer the first research question: What effect does requiring nursing students to be metacognitive about their thinking have on their understanding of GI content? There was a nonsignificant, increased interaction effect between intervention and control group in the pre- versus post-test repeated measure ($F(1,122) = 3.025$, $p = .085$, $\eta^2 = .024$). This trend can be seen in the larger increase (Figure 2) in the mean scores of the intervention group from pre-test ($M = 78.46$, $SE = 15.022$) to post-test ($M = 89.43$, $SE = 9.680$) than the control group from the pre-test ($M = 81.52$, $SE = 12.614$) to the post-test ($M = 88.11$, $SE = 10.633$; Table 5).

Table 5 Pre vs. post-test scores between groups

	INT_CONTROL GRP	Mean	Std. Deviation	N
PRE_TEST	Intervention Group	78.46	15.022	63
	Control Group	81.52	12.614	61
	Total	79.97	13.919	124
POST_TEST	Intervention Group	89.43	9.680	63
	Control Group	88.11	10.633	61
	Total	88.78	10.140	124

Figure 1 Change in scores between groups



These findings indicate that students in the intervention group that participated in the MS had greater improvement of knowledge when compared to the control group. There was a nonsignificant (p = .360) interaction effect found between pre and post-tests between lecture sections indicating that the lecture section had no effect on the results of the pre and post-tests.

Qualitative results

Question 1. What details lead you to this decision? Three themes were identified in the data: resources, analyzing, and collaboration. The first theme was student use of resources that included textbooks, internet, lecture, and instructors as a means for understanding the situation. Students were unable to obtain the necessary information through lecture and required readings, they searched the internet to gain a deeper understanding of the medical/nursing situation at hand.

The second theme was that of analyzing. Students reported that they arrived at their decision after thorough assessment, visual observation, and questioning of self. Field notes recording during the study, supported this finding. Students arrived for the activity prepared, yet with preconceived expectations. After being provided the questionnaire, students then began to reanalyze the patient at Station #2. Students that initially maintained a hands-off approach to the patient at this station, began to look further at the details provided to them. This is when the researcher observed students questioning "why" certain aspects at this station were the way they were. Students began to discuss previous experience in relation to Station #2 and accompanying questions in an effort to analyze what was being asked of them.

The third theme that emerged was that of collaboration. Students reported questioning each other and those with more experience with the content at hand. The researcher observed discussions amongst students when they were trying to distinguish normal from abnormal findings, choose an appropriate course of action, and sharing of relevant experiences.

Question 2. How does it fit with what you already know? Three themes were identified with this question: deeper understanding and confirmation, contrast, and realism. The first theme was that of a deeper understanding and confirmation. Students reported that the activity it "built upon previous knowledge, experience or understanding." This implied that students had a basic understanding, but through the active learning exercise and questioning, they were more cognizant of the content and details. For some students, this activity station and corresponding questioning confirmed what they thought to be true. In doing so, it "reinforced, strengthened, and solidified" their knowledge. Some students expressed that the experience in the skills lab made the content more real and gave them a new and different perspective.

The second theme identified was that of contrast. Students reported comparing the scenario to their current knowledge or what they thought to be correct. Students questioned what they knew and contrasted it to what they observed. Students discussed what they thought was correct and looked for reasons for why it confirmed or contradicted their expectations. The researcher observed students having difficulty with the patient scenario not looking exactly like they expected based on textbook readings and illustrations.

Question 3. How does it conflict with what you thought you knew? Two major themes were identified with this question: awareness and questioning. Students reported realizing that they "did not know as much as I thought", that they "weren't familiar with specifics", and that they now "understood the information/procedure better". It is interesting to note that students appeared to have to struggle with what they were taught and how to apply it to the current situation. For example, students knew how to insert and care for a nasogastric tube, yet had difficulty understanding why they could not reinsert or advance the nasogastric tube after a major abdominal surgery. As faculty answered students' questions, they began to grasp the rationale as to what made this scenario different.

Students reported questioning what they were previously taught as well as what they had read or learned to try and fit this new knowledge in with their current knowledge. When information conflicted, students reported trying to "make sense of it." One student reported having an "ah ha" moment because it contradicted what she knew, yet it suddenly all made sense. The researcher observed students questioning each other at this station to clarify the conflicting knowledge/information. After questioning and discussing with each other, the group mutually decided on the best answer and were able to move to the next station.

Question 4. What questions does this make you have? Three major themes were identified with this question: spirit of inquiry, incompetence, and identity. Students reported being curious, which caused deeper, critical thinking. It appeared that students had a basic idea of the patient scenario but wanted to truly understand the "why" behind what they were taught.

Some students reported feeling “overwhelmed”, “inadequately prepared”, and “not knowing enough”. One student stated a concern, “Do I actually know enough to be a good nurse” while several others were worried about the inability to memorize and know all the necessary details. Interestingly one student stated “it’s important to look at the big picture” in order apply and adapt new knowledge in the scenarios.

The participants were developing a sense of professional identity by developing their competence. According to the NLN, the use of professional clinician and faculty role models, experiential learning, and guided reflection all contribute to the formation of professional identity (NLN, 2010). Nursing school has been cited as a crucial period for the development of professional identity (Johnson, Cowin, Wilson, & Young, 2012).

Question 5. Does this kind of questioning increase your engagement with the content? Please explain. This question answered the research question: What effects does metacognitive questioning have on nursing students’ engagement with the content? Out of the 63 students completing the metacognitive and engagement questionnaire, 52 students answered yes to this question, seven students answered no, and the remaining 4 students either did not answer the question, were unsure, or answered the question with an erroneous response. Three prominent themes arose from this question: analytical thinking, forming connections, and increasing awareness. Students reported the need to analyze the scenario more than the other scenarios, think more deeply, and increase critical thinking. Students stated that new connections in knowledge were created, previous knowledge was built upon, and knowledge gaps were identified. Students reported being “acutely aware of lack of knowledge” and that working in groups highlighted previously overlooked details. Of the students that answered no, a few stated

that they perform better with actual patients or through simulation. One student discussed being exhausted and overwhelmed which made it difficult to be engaged intellectually. The irrelevant responses included confusion about the questionnaire relating to the skills station/scenario and additional questions about that particular station. Examples of irrelevant responses included: “Why does the drainage change colors?”; “I am not relating these questions to the lab scenario well”; and “Connecting with new situations”.

The researcher observed continued discussion amongst students in the control groups that answered the questionnaire. Students in the experimental groups seemed to maintain longer engagement with the content as opposed to those in the control groups. This may be because of the additional reflective questions. Students were observed engaging with the questions on an individual basis and thinking independently before discussing their ideas with the rest of their group.

Central Theme

The comprehensive message of the theme appears to be that students were developing a sense of ownership in their learning. As students became meaningfully engaged in their learning, they gained a better insight into their learning goals, how to assess and document their learning, and how to evaluate and clarify any additional learning needs (Chan, Graham-day, Ressa, Peters, & Konrad, 2014). In the study, students became consciously aware of their knowledge, knowledge deficits, and an innate desire to know more.

Discussion

The purpose of the study was to investigate the effect a metacognition strategy (MS) had on nursing student achievement and engagement with content. Although the use of the MS failed to yield significant results, the students that participated in the MS had a greater increase in knowledge than did the control group. This suggests that MS can be used to improve lower performing students' knowledge acquisition. Perhaps when provided with MS, the lower performing students were required to think metacognitively which may explain the larger increase in knowledge. This metacognitive thinking made students acutely aware of their knowledge or lack thereof to further regulate future studying. The control group of students were perhaps already thinking metacognitively, which is in alignment with the research by Onyekuru and Njoku (2017).

Considering that there was a statistically significant increase in learning for all students, this indicates that regardless of teaching strategies used, students improved their knowledge. This could possibly be because students were preparing for final exams at the time the post-test was administered and had continued to review previous content. Another explanation could be that the participants had high GPAs in general and therefore were perhaps already metacognitively skilled. This idea is supported by numerous studies that positively correlate academic performance and metacognition (Callan, Marchant, Finch, & German, 2016; Kelly & Donaldson, 2016; Onyekuru & Njoku, 2017). This could also be explained by the fact that the students were already participating in an active learning exercise for the content.

Students reported an increase in engagement with the GI content in the skills lab using the MS. It seems that when students began questioning what they knew and how that knowledge was attained, they desired a deeper understanding, further engaging with

the content at hand. These findings are consistent with previous studies in which MS were used to enhance student engagement (Afflerbach & Harrison, 2017; Lee & Hannafin, 2016). It is one thing to read about a disorder or procedure in a textbook and another to see and touch it in real life.

The first research question related to metacognitive thinking was illuminated by the qualitative findings. When the researcher's field notes were compiled together with the survey responses, it is evident that understanding was increased. Students were reflecting on their knowledge to truly understand. By answering the questionnaire, students were partaking in a variety of activities (reflection, questioning and feedback, thinking out loud, and experience) that have been shown increase metacognition or an awareness of their learning. Students were observed problem solving through social interaction to arrive at a deeper understanding.

A majority of the students were female which reflects current demographics trends in the nursing profession. The 16.9% of the sample that were male is consistent with the NLN (2014) findings on nursing demographics. The sample fell within the upper limits of GPA due to the minimum requirements for entering into the nursing program. This particular group was found to be primarily non-traditional students as can be seen in their living age, living accommodations, and employment status. This rise in non-traditional students is becoming the trend both state and nation-wide (American Nurses Association, 2015).

Qualitative Findings

Engagement Theory (ET; Schneiderman, 2002) served as the foundation for this research study (Appendix A, used with permission). It can be established from student

responses and researcher observation that the use of MS increased student engagement with the content, thus satisfying the tenants of the theory. The third research question related to engagement was answered with a combination of student responses on the metacognitive and engagement questionnaire and researcher observation. From the responses in the questionnaires and researcher observations, one can speculate that the socialization and communication during this active learning exercise was crucial for the students to create meaningful connections with the content at hand. The researcher observed students exchanging ideas and clarifying information with each other to arrive at a mutual decision. It is valuable to note that several groups within the three intervention groups who initially maintained a hands-off approach to the patient began to further investigate why they had answered the questionnaire the way they did. These students began pulling back the blankets, taking a closer look, and analyzing the patient at this station more thoroughly rather than making assumptions from their preconceived expectations. It appeared that the questionnaire sparked more questions in the students, as revealed in the student responses. The students expressed a desire to know more and were willing to ask and answer questions of each other and instructors to fully understand thus creating a sense of ownership in the students' own learning.

Throughout the data, it was evident that students possessed a basic understanding of the content but lacked the ability to adapt their knowledge to achieve a deeper understanding. It was not until students were questioned about their learning that they became consciously aware of their knowledge deficits and took the necessary steps to resolve the gaps. These findings support that metacognition encourages a deeper approach to learning (August-Brady, 2005; De Backer, et al., 2014; Pearson & Harvey,

2013; Van Keer, Moerkerke, &Valcke, 2016). Additionally, metacognition is vital for knowledge transfer (Burke & Mancuso, 2012; Chartier, 2001; Kane, Lear, & Dube, 2014; Scharff et al., 2017). It is the responsibility of faculty to help the students with this transition, to facilitate the transfer of students' textbook knowledge to clinical situations and be able to adapt it accordingly (Chartier, 2001).

Recommendations

Prior to this research study, no research existed that investigated metacognition in nursing students in relation to achievement and learner engagement. There is an abundance of research measuring metacognition in a variety of settings, yet it is also important to possess the ability to use metacognition effectively. It would be beneficial to take a smaller sample of nursing students in which the researcher and students engage in metacognitive thinking to foster learning that is flexible and prepared to tackle complex clinical situations. After doing so, it would be fascinating to investigate how these students would react to a new, more complex situation and arrive at their clinical decision making with the metacognitive strategies instilled in them.

To date, there has not been a metacognitive tool specifically designed for nursing education, one that could be employed throughout the curriculum to foster the transfer of knowledge from one course to another. This transfer of knowledge is vitally important in order facilitate knowledge mastery and critical thinking. It would be especially valuable to create and or adapt metacognitive tools to be employed in nursing education with along with faculty training in its use. Metacognition is a complex concept that is challenging to understand. Based on qualitative responses that indicated lack of understanding about the process of MS, Employing the MS repeatedly to familiarize the

participants with the questionnaire and concept would produce a stronger study and possibly one that would produce significant results.

Strengths and limitations

The strengths of this research study are the mixed methods approach using a parallel explanatory mixed methods approach (Creswell, 2014). The concepts of metacognition, student understanding/learning, and engagement were explored simultaneously. The qualitative exploration of metacognition, a complex concept, was explored in nursing students to achieve a deeper understanding of how they process information and their understanding of the content. The quantitative analysis provided data on student understanding and retention of the content.

Limitations of this study include threats to both internal and external validity. Threats to internal validity include that of history. The research study took place over a period of four weeks; therefore events could have occurred that influenced the outcome (Creswell, 2014). Social desirability was another possible threat to the external validity of the study. To address this threat, post-hoc consent was obtained and included a statement that answers provided during the study would have no effect on their course grades. Taking into consideration the intervention group will have an additional 10 minutes at one station also poses a threat.

Metacognition itself is a complex concept that requires an internalization of its constructs before one can facilitate metacognition in others. Considering that the primary researcher and the participants are relatively new to the concept presents a limitation. The participants in the study were exposed to the MS once before the research took place. This presents a limitation that can be addressed in future studies. Finally, sample

selection was a convenience sample collected from students at one university and results may not be generalizable to the greater nursing student population.

Summary

The proposed study employed a mixed methods approach to understanding metacognition in nursing students during an active learning skills lab experience. As established by the literature review, this is the first study that explored the effect metacognition has on nursing student understanding and engagement with GI content. The use of MS can help nurse educators better understand how students learn which may improve thought processes, clinical reasoning, and decision making in the next generation of nurses. Sound clinical decision making is instrumental as patient acuity and complexity increase. Considering that metacognition is closely related to clinical decision making, it is vitally important to build this into the curriculum of nursing education to prepare the next generation of nurses.

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Chapter 4

Summary and Conclusions

As the nursing workforce ages, it is crucial that nurses entering the profession possess the necessary knowledge and skills to care for the complex, aging population. The American Association of Colleges of Nursing (AACN; 2014) recognizes the growing demands of the aging nursing workforce that will exacerbate the already projected shortage of Registered Nurses in the near future, thus worsening the healthcare crisis. Half of the nursing workforce are 50 years of age or older and nearing retirement (National Council of State Boards of Nursing, 2015). As they retire, the priceless knowledge that they possess must be replenished at an alarming rate. To provide holistic, safe, and effective care, graduates must be equipped with not just the skills and knowledge of a nurse but the identity of a professional nurse.

Additionally, nursing programs are faced with a widespread lack of clinical placements. The limited clinical sites not only forces nursing programs to turn away thousands of qualified applicants but denies current students the real-world preparation they need (National League for Nursing, 2013). As nursing programs continue to face difficulties in clinical placement, active learning exercises and metacognitive strategies using inexpensive technologies present a possible solution in which to build the critical thinking and clinical reasoning skills in nursing students. Likewise, for clinical situations

that are a rare, but a necessary part of the nursing curriculum, this presents a possible solution.

According to Benner (1984), expert nurses quickly grasp problems relating to the care of their patients and almost immediately consider diverse interventions to manage it. The development of these analytical skills is closely related to metacognition and problem-solving ability (Chartier, 2001). Novice nurses tend treat data in a noncomprehensive manner rather than seeing the bigger picture (August-Brady, 2005). There is an increasing demand for nurses who are equipped to handle the complex clinical demands while providing safe and effective care to the public that results in quality outcomes. This ultimately requires a paradigm shift. According to the IOM (2010):

> Care within the hospital continues to grow more complex, with nurses having to make critical decisions associated with care for sicker, frailer patients and having to use more sophisticated, life-saving technology coupled with information management systems that require skills in analysis and synthesis.

As nurse educators, we are charged with developing these skills or the ability to harness these skills in our students. Using metacognitive strategies enables the learner to respond promptly, safely, and effectively to unfamiliar situations using previously acquired knowledge.

This portfolio included two manuscripts. The first manuscript examined the concepts of engagement and reciprocity. This comparative concept analysis explored the relationship between two related concepts and established that engagement is a reciprocal relationship between two or more parties. Faculty and students alike have a

responsibility in fostering an engaging learning environment. This manuscript provided the foundation for additional exploration into engaging teaching strategies.

The second manuscript examined the use of metacognitive strategies in an effort to increase engagement and learning during an active learning exercise. Active learning in itself is an innovative teaching strategy that fosters engagement and deeper understanding. Although there was no significant difference between the intervention and control groups in learning outcomes, there was a larger increase in learning in the control group that participated in the MS. These results are promising. Qualitative themes that emerged supported the theoretical framework of Engagement Theory (Kearsley & Schneiderman, 1999). Students reported the need for collaboration and communication, that the active learning exercise created a realistic representation of material previously studied, and that they arrived at a deeper understanding personally, thus creating a sense of ownership. Ultimately students reported an increase in engagement when using the metacognitive questionnaire. This research study suggests that faculty can instill metacognitive thinking skills in students who can subsequently carry these skills with them as they enter the nursing profession. From researcher observation, the use of the metacognitive questionnaire generated increased investigation into the station/patient at hand. After repeated observation, questioning, and reasoning, students arrived at a decision that was stronger and more informed.

Students often report experiencing stress due to deficiencies in basic science knowledge and their ability to apply it in the clinical setting. The ability to transfer knowledge and the effectiveness of clinical teaching rests in facilitating student engagement through shared learning opportunities, student-faculty interaction, and

involving students in active learning exercises (D'Souza, Venkatesaperumal, Radhakrishnan, & Balachandran, 2013). Instilling metacognitive thinking in our students in an engaging, supportive learning environment facilitates this knowledge transfer (Kane, Lear, & Dube, 2014). This can be accomplished through simple activities in which students become consciously aware of their cognitive processes, connect previous knowledge to new situations, and push beyond in order to problem solve.

Finally, the most eye-opening phenomenon for the researcher was not using a metacognitive questionnaire to understand what the students were thinking, but instead to ultimately help students better understand themselves. The power and magic of metacognition ultimately comes from a learner learning about themselves, not necessarily from an outside individual understanding the phenomenon. Although the student may have answered a question correctly, they must then be cognizant of how and why. As an educator this is our ultimate goal, one that stimulates a student's cognition and metacognition.

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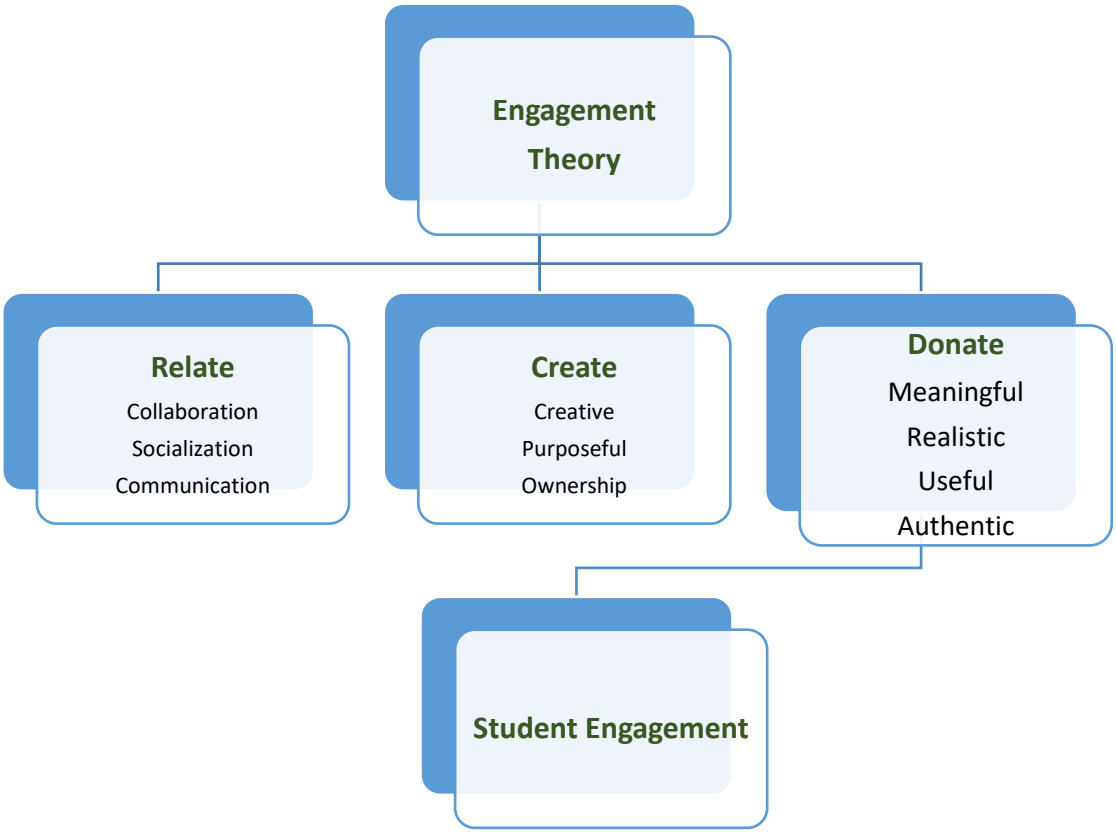
Appendix A: *Figure 2. Engagement Theory*



Appendix B

Station #2 Description of stations & faculty answer key

Gastrointestinal Lab

Station #2:

Patient is post-op day 2 after a Billroth 1 (gastroduodenostomy) for Peptic Ulcer Disease

1. What is the purpose of the nasogastric (NG) tube?

2. Describe the steps for assessing bowel sounds for this patient.

3. What color is the drainage expected from the tube at this time?

4. What would the nurse do if the tube was not draining? Why is it important for the NG tube to remain patent?

5. Describe the steps to irrigating an NG tube.

6. Should the nurse advance the tube if it slipped out an inch or two? Why or why not?

7. What daily care should be performed regarding the NG tube?

Station #2: Patient is post-op day 2 after a Billroth 1 (gastroduodenostomy) for Peptic Ulcer Disease

Patient has a nasogastric tube attached to low intermittent suction, continuous IVF, TED hose, SCD on and has a midline abdominal incision.

1. What is the purpose of the nasogastric (NG) tube?

An NG tube is used to decompress the remaining portion of the stomach to decrease pressure on the suture line and to allow for resolution of edema and inflammation resulting from surgical trauma.

2. What color is the drainage expected from the tube at this time?

Observe the gastric aspirate for color, amount, and odor during the immediate postoperative period. The aspirate is usually bright red at first, with a gradual darkening within the first 24 hours after surgery. Normally the color changes to yellow-green within 36 to 48 hours.

3. What would the nurse do if the tube was not draining? Why is it important for the NG tube to remain patent?

If the tube becomes clogged during this period, the health care provider may order periodic gentle irrigations with normal saline solution. It is essential that the NG suction is working and that the tube remains patent so that accumulated gastric secretions do not put a strain on the anastomosis. This can lead to distention of the remaining portion of the stomach and result in (1) rupture of the sutures, (2) leakage of gastric contents into the peritoneal cavity, (3) hemorrhage, and (4) possible abscess formation.

4. Describe the steps to irrigating an NG tube.

Verify placement, draw up 30 to 60 ml of room temperature NS, instill slowly into the NG tube after suction is turned off and disconnected. Do not force if resistance is met. Reconnect to suction to allow irrigation fluid to flow back into suction container. Subtract the difference on you I&O.

5. Should the nurse advance the tube if it slipped out? Why or why not?

No, the nurse should not advance the tube. If the tube must be replaced or repositioned, call the health care provider to perform this task because of the danger of perforating the gastric mucosa or disrupting the suture line.

6. What daily care should be performed regarding the NG tube?

Oral care, clean nares of the nose, retape if needed, secure tubing to prevent displacement, check placement, measure drainage or empty and record on the I&O flowsheet.

Appendix C

Questionnaire

Student identifier (last four of cell phone number)_____

Please answer these questions at station:
Station #2: 2 day postop Billroth 1, gastroduodenostomy, for Peptic Ulcer Disease

1. What details lead you to this decision?

2. How does it fit with what you already know?

***See additional questions on reverse side**

3. How does it conflict with what you thought you knew?

4. What questions does this make you have?

5. Does this kind of questioning increase your engagement with the content? Please explain.

Appendix D

Pre/post-test (answer key)

Unique identifier (last four digits of cell phone number):_____

GI SIM Lab Pretest

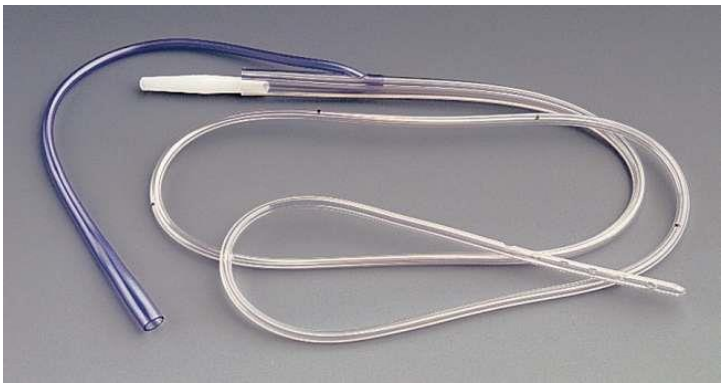
1. The patient with gastroesophageal reflux disease (GERD) has undergone surgery for a hiatal hernia repair. The patient has a nasogastric tube in place and the provider has ordered IV fluid replacement to be at 125 ml/hr plus the amount of drainage. The drainage from 0800 – 0900 is 45ml. At which rate should the IV pump be set for the next hour? 125ml + 45ml = 170ml

2. Which disease is the patient with GERD at greater risk for developing?
a. Hiatal hernia
b. Gastroenteritis
c. Esophageal cancer
d. Gastric Cancer

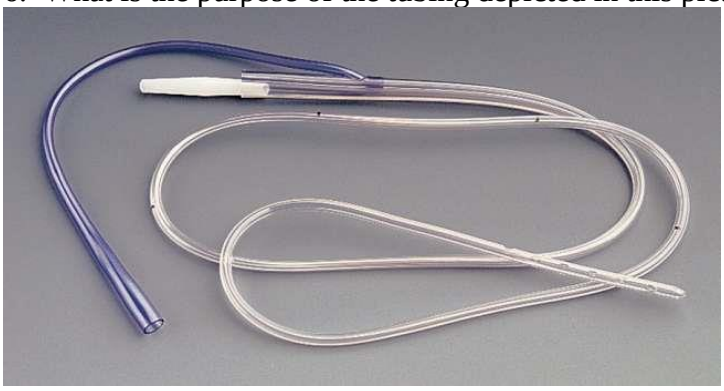
3. The nurse is administering morning medications to the patient diagnosed with gastroesophageal reflux disease (GERD). Which medication should have priority?
a. Proton pump inhibitor
b. Non-narcotic analgesic
c. Histamine receptor antagonist
d. Mucosal barrier agent

4. The patient had a gastroduodenostomy (Billroth I operation) and reports generalized weakness, sweating, palpitations, and dizziness 15 to 30 minutes after eating. What long-term complication is occurring?
a. Malnutrition
b. Bile reflux gastritis
c. Dumping syndrome
d. Postprandial hypoglycemia

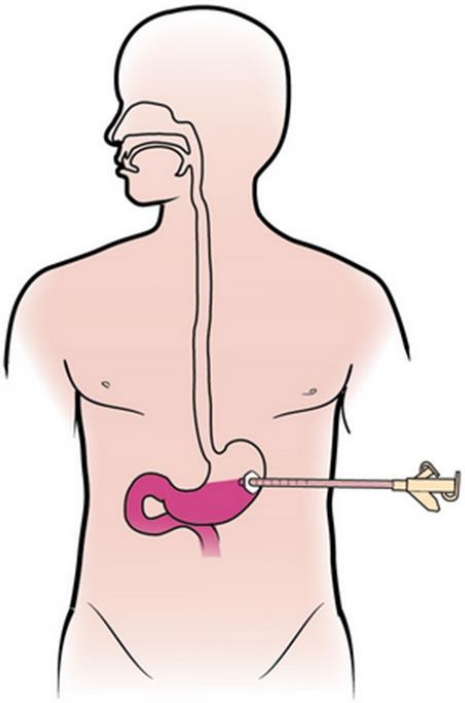
5. Identify the tubing depicted in this picture: salem sump



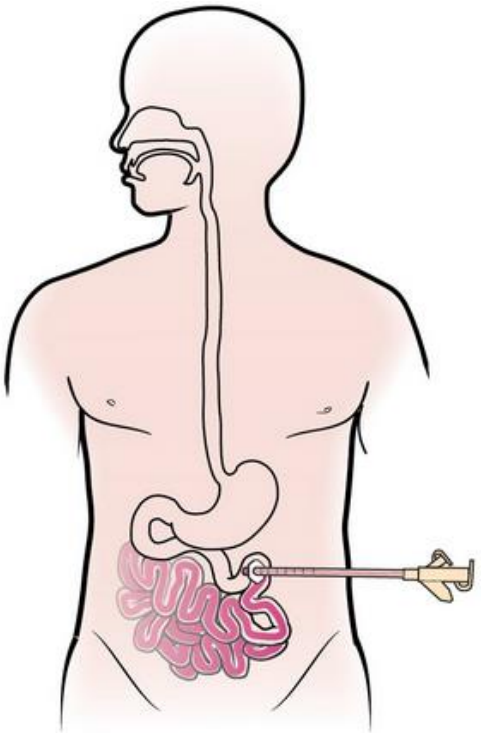
6. What is the purpose of the tubing depicted in this picture: gastric decompression



1. This type of feeding tube is a gastrostomy tube.



8. This type of feeding tube is a jejunostomy tube.



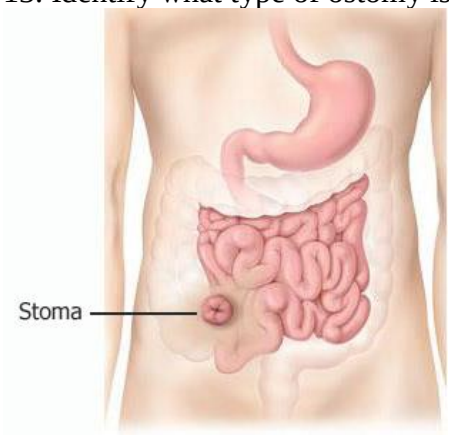
9. A patient who underwent an abdominal-perineal resection for colorectal cancer has a Jackson Pratt (JP) drainage tube. Which assessment data warrants immediate intervention by the nurse?
a. The bulb is round and has 40ml of fluid
b. The drainage tube is taped to the dressing
c. The JP insertion site is pink and has no drainage
d. The JP bulb has suction and is sunken in

10. The nurse is planning the care of a patient who has had an abdominal-perineal resection for colorectal cancer. Which interventions should the nurse implement? Select all that apply.
a. Provide meticulous skin care to the stoma
b. Assess the flank incision
c. Maintain the indwelling catheter
d. Irrigate the JP drains every shift
e. Position the client in Semi-Fowler's position

11. The patient who had an abdominal-perineal resection is being discharged. Which discharge information should the nurse teach?
a. Call the provider if any blood is noted on the stoma
b. Limit ambulation to prevent pouch displacement
c. Sit upright in a chair at least three times daily
d. Empty the pouch when it one-third to one-half full

12. Identify what type of ostomy is depicted in the picture: sigmoid colostomy

13. Identify what type of ostomy is depicted in the picture: Ileostomy



14. Which sign/symptom should the nurse expect to find in a patient diagnosed with ulcerative colitis?

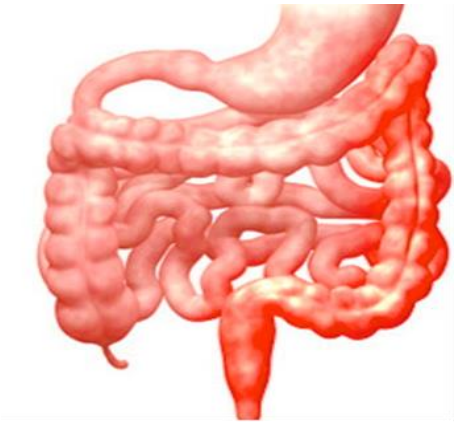
a. Twenty bloody stools a day
b. Oral temperature of 102°F
c. Hard, rigid abdomen
d. Urinary incontinence

15. Which statement by the patient with ulcerative colitis who has a new ileostomy indicates further teaching is needed?

a. "My stoma should be pink and moist"
b. "I will irrigate my ileostomy every morning"
c. "I will call my provider if I get a red, itchy rash"
d. "I will change my pouch if it starts to leak"

16. The nurse is assuming care for an ulcerative colitis patient with a new ileostomy. Which abdominal quadrant should the nurse expect the stoma to be in?
a. RLQ
b. LLQ
c. RUQ
d. LUQ

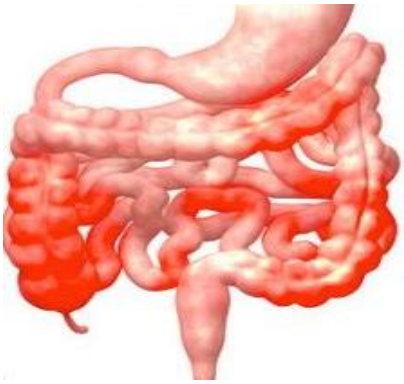
17. Which type of inflammatory bowel disease (IBD) does this picture depict? ulcerative colitis



18. The nurse is preparing to hang a new bag of total parental nutrition (TPN) for a patient with Crohn's disease. The bag has 1,500 ml of 50% dextrose, 10ml of trace elements, 20ml of multivitamins, and 20ml of potassium chloride. The bag is to infuse over the next 24 hours. At what rate should the nurse set the pump? 1500ml + 10ml + 20ml + 20ml = 1550ml / 24hr = 64.58 or 64.6 or 65ml/hr

19. Which intervention should the nurse implement for the patient diagnosed with an acute exacerbation of Crohn's disease?
a. Provide a low-residue diet
b. Rest the patient's bowels
c. Assess vital signs daily
d. Administer antacids orally

20. Which type of inflammatory bowel disease (IBD) does this picture depict? Crohn's disease



Appendix E

Demographic information questionnaire

1. What is your age (in years)? _____

2. Are you
   □ Male
   □ Female

3. Where do you live?
   □ On campus in dorms
   □ On campus apartments
   □ Off campus multiple dwellings (apartment, condo, duplex)
   □ Off campus single dwelling (house)

4. Are you of Hispanic or Latino origin or descent?
   □ Yes
   □ No

5. What is your race? (please mark one or more)
   □ White
   □ Black or African American
   □ Asian
   □ American Indian or Alaska Native
   □ Native Hawaiian or other Pacific Island

6. What is your employment status?
   □ Full-time (40 or more hours per week)
   □ Part-time (Less than 40 hours per week)
   □ Not employed

7. What is your current GPA?
   □ 3.5-4.0
   □ 3.0-3.49
   □ 2.5-2.99
   □ < 2.49

8. Which lecture section are you assigned to?
   □ Ladd
   □ Dyck

Should the researcher have any additional questions, what is an appropriate number to contact you at?

Unique identifier (last four digits of cell phone number):_____

Appendix F

Informed Consent

THE UNIVERSITY OF TEXAS AT TYLER

Informed Consent to Participate in Research

Institutional Review Board #F2017-39

Approval Date: November 2, 2017

You have been invited to participate in this study, titled: Effect of Metacognition Strategy on Nursing Students' Achievement and Engagement in an Active Learning Exercise.

The purpose of this study is to investigate the effect metacognition has on nursing student understanding and engagement with GI content. Your participation is completely voluntary, and if you begin participation and choose to not complete it, you are free to not continue without any adverse consequences.

If you agree to be in this study, we will ask you to do the following things:

- Allow researcher to receive results of your pre and post-test over the GI content
- Turn in your questionnaires completed during the skills lab today
- Complete a demographic questionnaire
- Allow researcher to use notes made during the day for the study

We know of no known risks to this study, other than becoming a little tired of answering the questions, or you may even become a little stressed or distressed when answering some of the questions. If this happens, you are free to take a break and return to the survey to finish it, or, you can discontinue participation without any problems. Potential benefits to this study are: better understanding of your though processes.

I know my responses to the questions are confidential. If I need to ask questions about this study, I can contact the principle researcher, Theresa Naldoza at 325-721-4371 or tnaldoza@patriots.uttyler.edu, or, if I have any questions about my rights as a research participant, I can contact Dr. Gloria Duke, Chair of the UT Tyler Institutional Review Board at gduke@uttyler, or 903-566-7023.

I have read and understood what has been explained to me. If I choose to participate in this study, I will check "Yes" in the box below and provide the researcher with my pre-test and demographic questionnaire. If I choose to not participate, I will check "No" in the box below.

☐ Yes, I choose to participate in this study.

☐ No, I choose to not participate in this study

Unique identifier (last four digits of cell phone number): _____

Appendix G

Introduction Script

Hello everyone, my name is Theresa Naldoza. I am currently a PhD in Nursing at UT Tyler. I am completing the requirements for my dissertation and I want to invite you to include your input in my research study. The purpose of this study is to investigate the effect metacognition, thinking about thinking or thought processes, has on nursing student understanding and engagement with GI content.

For both intervention and control groups: Before coming to the skills lab today, you completed a pre-test. The answers you provided on this test will be valuable to my study.

For intervention groups ONLY: The questionnaires you completed while rotating through the simulation lab were created in an effort to better understand student thinking, understanding, and engagement with the content you are covering. I would like the opportunity to include these in my study.

I ask that you complete the consent form, turn in your questionnaire answers (control group ONLY), and complete this demographic questionnaire if you do consent. In three weeks, your faculty member will have an online post-test to complete. If you do not consent, your information will not be used in the research. Your participation is completely voluntary, will not adversely affect any standings in your course(s), and confidential in that names will not be used, but instead a unique identifier (last four digits of cell phone number). Please include this number on all documents.

Appendix H

Study Timeline

The study has an anticipated timeline of 4 weeks from start to finish.

- Submit research proposal to IRB for review in October/November 2017
- Gain IRB approval by November 10, 2017
- Data collection November 16-17, 2017
- Data analysis November/December 2017
- Report findings and write manuscript December 2017 – February 2018
- Present findings March or April 2018

Intervention protocol

Week #1	All participants complete the pre-test, receive didactic instruction, and rotate through the skills lab stations. Intervention group will answer the four metacognitive questions and one engagement question at three of the six skill stations. The control group will rotate through the skill stations as normal. During debriefing, informed consent will be obtained with the opportunity for the students to opt out of the study.
Week #2	Qualitative data analysis
Week #3	Qualitative data analysis

Week #4	All participants complete the post-test.

Appendix I

Engagement Observation Form

Group # _____ (of 24 students)

Group #	Engagement	Disengagement
	Listening Writing Reading/re-reading Asked a question Answered/explained a question Talking/discussion about topic Exchanging ideas Justifying an answer Relating task to prior knowledge	Copied down what another student had Not taking notes Talking about irrelevant topics Packing up belonging early/moving on early Not responding to questions Not participating in discussion Involved in an irrelevant task (i.e. phone use)

THE UNIVERSITY OF TEXAS AT TYLER
3900 University Blvd. • Tyler, TX 75799 • 903.565.5774 • FAX: 903.565.5858

Office of Research and Technology Transfer

Institutional Review Board

November 3, 2017

Dear Ms. Naldoza,

Your request to conduct the study: *Effect of a Metacognition Intervention on Nursing Students' Engagement and Understanding in an Active Learning Exercise,* IRB #F2017-39 has been approved by The University of Texas at Tyler Institutional Review Board under expedited review. This approval includes the written informed consents that are attached to this letter, and your assurance of participant knowledge of the following prior to study participation: this is a research study; participation is completely voluntary with no obligations to continue participating, and with no adverse consequences for non-participation; and assurance of confidentiality of their data.

In addition, please ensure that any research assistants are knowledgeable about research ethics and confidentiality, and any co-investigators have completed human protection training within the past three years, and have forwarded their certificates to the IRB office (G. Duke).

Please review the UT Tyler IRB Principal Investigator Responsibilities, and acknowledge your understanding of these responsibilities and the following through return of this email to the IRB Chair within one week after receipt of this approval letter:

- This approval is for one year, as of the date of the approval letter
- **The Progress Report form must be completed for projects extending past one year.** Your protocol will automatically expire on the one year anniversary of this letter if a Progress Report is not submitted, per HHS Regulations **prior** to that date (45 CFR 46.108(b) and 109(e): http://www.hhs.gov/ohrp/policy/contrev0107.html
- Prompt reporting to the UT Tyler IRB of any proposed changes to this research activity
- **Prompt reporting to the UT Tyler IRB and academic department administration will be done of any unanticipated problems involving risks to subjects or others**

- Suspension or termination of approval may be done if there is evidence of any serious or continuing noncompliance with Federal Regulations or any aberrations in original proposal.
- Any change in proposal procedures must be promptly reported to the IRB prior to implementing any changes except when necessary to eliminate apparent immediate hazards to the subject.
- Expediated approval with signed consents & revision in data collection (per email)

Best of luck in your research, and do not hesitate to contact me if you need any further assistance.

Sincerely,

Gloria Duke, PhD, RN

Gloria Duke, PhD, RN
Chair, UT Tyler IRB

Biosketch

NAME Theresa Naldoza MSN, RN, CNE		POSITION TITLE Doctoral Candidate, The University of Texas at Tyler Registered Nurse, Hendrick Medical Center, Labor & Delivery (L&D)	
EDUCATION/TRAINING			
INSTUTION & LOCATION	DEGREE (*if applicable)*	COMPLETION DATE	FIELD OF STUDY
McMurry University Abilene, TX	BSN	05/2007	Nursing
Hardin-Simmons University Abilene, TX	MSN	05/2010	Nursing – Education & Administration
University of Texas at Tyler Tyler, TX	PhD	05/2018	Nursing

A. Personal Statement

B. Positions and honors

01/2018 – present	L&D Staff Nurse Hendrick Medical Center, Abilene, Texas
08/2009 – 12/2017	Assistant Professor Patty Hanks Shelton School of Nursing (a consortium of Hardin-Simmons University & McMurry University)
06/2008-03/2013	Nurse Aid, Registered Nurse, Charge Nurse Telemetry Hendrick Medical Center, Abilene, Texas

C. Professional Memberships

2014 – present	Phi Kappa Phi
2007 – present	Sigma Theta Tau National Honor Society Omicron Zeta Chapter