Metacognitive awareness: impact of a metacognitive intervention in a pre-nursing course

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METACOGNITIVE AWARENESS: IMPACT OF A METACOGNITIVE INTERVENTION IN A PRE-NURSING COURSE

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy in The School of Education

by

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August 2013
In loving memory of my grandfather,
James Hardie Perry, Ed.D.,
whose calming presence and
love of learning I hope to emulate.

and

In loving memory of my grandmother,
Betty Jean Shipley,
whose genuine, kind laugh still echoes in my mind and
courages me to find joy in life’s challenges.
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ABSTRACT

To function effectively as nurses in the evolving, complex healthcare system, nursing students must learn to be skilled thinkers, know how to learn, and know how to use what they know in novel situations. Research in the field of metacognition may offer a useful framework to improve learning and to enhance critical thinking and clinical decision-making in nursing students. The purpose of this study is to describe how pre-nursing students’ self-reported metacognitive awareness correlates with age and academic variables and to explore the effects of a metacognitive intervention on students’ metacognitive awareness.

Using a quasi-experimental research design, the study consisted of a pre-test, an intervention, and a post-test with no control group. Students in a pre-nursing course completed the Metacognitive Awareness Inventory (MAI) before and after a metacognitive intervention. Students’ pre-test scores on the MAI were correlated to age and academic indicators including overall College grade point average (GPA), nursing GPA, and standardized test scores on the Test of Essential Academic Skills (TEAS). Post-test MAI scores were correlated with grades on the final reflective portfolio, a course-specific academic indicator. The study also analyzed whether or not there was a statistically significant increase in MAI scores following a metacognitive intervention.

Results of the study indicated that, in adult pre-nursing students, metacognitive awareness is not correlated with age or academic indicators. Following the metacognitive intervention, there was a statistically significant increase in students’ knowledge of cognition. Increases in total MAI scores and regulation of cognition scores were not statistically significant. Recommendations for improvements in faculty development related to metacognition and metacognitive interventions and implications for future research are discussed.
CHAPTER 1: INTRODUCTION

Problem

Today’s nursing graduates enter into a complex and changing healthcare environment that requires a diverse skill set. Advances in science and technology and an evolving market-driven healthcare system increase the expectations for both new and experienced nurses (Benner, Sutphen, Leonard, & Day, 2010; Institute of Medicine of the National Academies [IOM], 2010). Nurses make up the largest segment of the healthcare workforce with more than three million members who work in a variety of settings (IOM, 2010). They manage increasingly complex patient care situations by using scientific and technical skills along with compassion and creativity. Caring for individuals and populations holistically requires that nurses consider not only the science of physical health and illness, but also the cultural, social, emotional, psychological, economic, and spiritual factors at play.

To function effectively as nurses in this evolving, complex healthcare system, students must learn to be skilled thinkers, know how to learn, and know how to use what they know in novel situations. Rote memorization of facts and reliance on faculty to prescribe theoretical information and to dictate how to apply nursing theory to practice no longer serves as adequate preparation for professional nursing (Benner et al., 2010). Instead, nursing students must apply cognitive and metacognitive strategies to elucidate multifaceted solutions to complex problems. Cognitive skills such as problem solving and critical thinking are commonly highlighted in nursing curricula and research. On the other hand, metacognition, defined as “knowledge and awareness of [cognitive] processes and the monitoring and control of such knowledge and processes” (Tarricone, 2010, p. 1), is not typically an explicitly stated goal of nursing education. Metacognition generally refers to knowledge of cognition and the regulation of cognition, which
includes planning, monitoring, and evaluating cognitive processes often through reflective strategies (Kuiper, 2002, 2005; Kuiper & Pesut, 2004; Schraw, 1998; Schraw, Crippen, & Hartley, 2006; Schraw & Dennison, 1994; Schraw & Moshman, 1995; Tanner, 2012; Tarricone, 2011; Worrell, 1990). Self-Regulated Learning Theory describes the relationship between cognition and metacognition and suggests that domain-general metacognitive practices can regulate, and, therefore, improve domain-specific cognitive tasks (Schraw & Dennison, 1994) like clinical decision-making in nursing.

The need for metacognitive strategies in nursing education is two-fold. First, students are often unprepared for the rigors of College (Omidi & Sridhar, 2012; Perkins-Gough, 2008; Pintrich, 2002). Nursing school requires not only high-level content knowledge, but also application of that knowledge in complex situations. For this reason, nursing students need to develop new strategies as they think about their learning. Research in the field of metacognition may offer a useful framework to improve student learning. Second, metacognitive training may provide a basis for enhanced critical thinking and clinical decision-making throughout nursing school and nursing practice. In nursing, students are not simply concerned with the scientific complexities of a patient’s medical diagnosis. They must exhibit ethical comportment and caring behaviors that account for a patient’s holistic needs (Benner et al., 2010). Also, students learn to respect resources, to understand the healthcare system, and to collaborate effectively with healthcare team members (IOM, 2010).

If nurse educators implement instructional strategies providing students with the opportunity to practice and improve metacognitive skills, student learning and critical thinking may improve. The purpose of this study is to describe how pre-nursing students’ self-reported metacognitive awareness correlates with age and academic variables and to explore the effects of
a metacognitive intervention on students’ metacognitive awareness. This research contributes to our understanding of metacognitive awareness and instructional strategies in nursing education with an emphasis on metacognition in learning.

**Background**

The changes to the healthcare system have significant implications for nursing education. Experts agree that without radical change in nursing education, our graduates will be ill-prepared for practice. Medical and nursing knowledge increase exponentially each year, resulting in content-laden nursing curricula (IOM, 2010; Giddens, 2007). Covering content too often trumps the need for students to learn strategies that improve their learning and thinking, to hone skills of inquiry and reflection, and to apply new knowledge to practice.

National leaders in healthcare and nursing recently released reports outlining the need for the transformation of nursing education and recommending ways to improve the current model to prepare nurse graduates for current and future nursing practice environments. The Robert Wood Johnson Foundation and the Institute of Medicine (IOM) partnered to assess nursing and nursing education in the United States and recommended strategies for improvement. The resulting IOM report (2010) outlines the need for an education system that prepares nurses to function effectively in community settings, to understand coordination of care, to collaborate with health care team members, to recognize how policies and regulations affect patient access to health care, and to understand how policies, regulations, and resulting health care impact patient outcomes (IOM, 2010). To this end, the IOM report (2010) advises that nursing curricula

- teach concepts that can be applied in various contexts instead of rote memorization of facts,
- provide opportunities for students to practice higher-level thinking to promote effective clinical decision-making instead of a focus on task-based skill acquisition, and
- prepare students for collaborative team leadership roles and also for competencies in quality improvement and systems thinking.

The IOM report findings are congruent with established guidelines for baccalaureate nursing education as outlined in the American Association of Colleges of Nursing’s publication The Essentials of Baccalaureate Education for Professional Nursing Practice (American Association of Colleges of Nursing, 2008). Nursing education is slowly evolving to meet these demands.

A landmark study of nursing education funded by the Carnegie Foundation found that nursing education is slow to adapt to the changes in healthcare (Benner et al., 2010). Among other strategies, nursing education researchers recommend a pedagogical shift away from lecture and memorization to learning through practical application and reflection, which includes case studies, problem-based learning, team-based learning, simulation with debriefing, reflective writing, portfolios, and others (Benner et al., 2010; Billings & Halstead, 2009; Kantor, 2010). Kantor (2010) warns that teacher-centered, conventional pedagogy “forces students to memorize content and fosters the erroneous belief that nursing can be understood as predictable and devoid of ambiguity” (p. 414). In order to encourage the kind of thinking and learning that can be gained by application of content in the classroom, students must come to class prepared and can no longer rely on faculty to tell them what they need to know (Billings & Halstead, 2009). Instead, time spent with faculty and classmates is for clarification and application of the concepts through planned activities. Although the literature supports this pedagogical shift, challenges exist that must be overcome.
The first challenge is the tacit assumption that nurses with clinical expertise and content knowledge are qualified to teach nursing. In fact, many nurse educators are master practitioners, but have little or no training in pedagogical principles. Because of this, nurse educators are more likely to focus on content than on improving their teaching. Benner et al. (2010) report, “the current lack of focus on teaching is a central challenge to elevating the quality and effectiveness of nursing education” (p. 223). Sadly, with limited pedagogical knowledge, nursing faculty tend to reproduce the learning environment in which they were taught, focusing on delivering content and not on student learning. Excellent teaching to some nurse educators means organizing and synthesizing content to make it easier to understand and keeping students’ attention during lecture. Limited nurse educator training and faculty development significantly affect the landscape of nursing education. Although the scope of this problem is not addressed here, this study may provide information on one pedagogical strategy to improve student metacognitive skills. This approach can be added to a tool chest of appropriate methods for helping students to think, learn, and think about their learning.

The second challenge to consider is that students entering nursing schools are products of a lecture-driven education system in which memorization and regurgitation of information on exams are markers of success. They sit in class passively and listen to a teacher tell them what is deemed important. In nursing, this type of classroom environment will not provide students with the opportunity to apply concepts in novel situations (Benner et al., 2010). Patients rarely present with a textbook case of an illness, and every situation involves a variety of holistic and confounding factors that affect nursing actions. Educational experiences should include practicing application of theory in a variety of contexts and with emerging variables so that students can struggle with ethical dilemmas, navigate the healthcare system, and advocate for
individuals, families, and communities in a safe classroom, clinical, or laboratory environment with feedback and guidance from skilled nursing faculty.

To capitalize on class time, students must prepare for class by reading, watching videos, and using other means to become familiar with the content. They must become responsible for their own learning and begin to take ownership of their education. A significant challenge is that a student’s typical method of learning may no longer be adequate. Unfortunately, many nursing faculty expect students to be self-directed and to arrive in nursing school with effective cognitive and metacognitive skills that will make them successful in preparing for class and in applying theory in practice. Many students have difficulty with class preparation and with having to navigate through content and, therefore, the instructor may perceived them as unmotivated or lazy when, in fact, they require a new way of thinking about how they are learning.

To address these challenges, nurse educators can use existing literature on metacognition to create sound pedagogical approaches to help students learn metacognitive strategies. Simply telling students to use metacognitive strategies will not be sufficient. Instead, purposeful development of these advanced thinking and learning skills may help students thrive both in nursing school and in the practice of nursing. If students are to be successful in nursing school, the responsibility falls on nursing faculty to create opportunities for students to think about how they are learning using the best available research.

**Rationale**

Because of the aforementioned changes in the healthcare system and expectations for new nurses, nurse educators must incorporate new strategies to prepare their students both to learn and to practice nursing. Promising research in the field of metacognition offers a potential solution to fill the gap in instructional emphasis on thinking about learning in nursing education.
Metacognitive research suggests that explicitly teaching metacognitive skills can increase metacognitive awareness and improve learning outcomes (Bransford, Brown, & Cocking, 2000; Pate & Miller, 2001; Schraw, 1998; Winne & Hadwin, 1998; Tanner, 2012).

To date, nursing literature is only beginning to address the potential impact of metacognitive interventions on nursing students’ metacognition and clinical decision-making skills. Nursing literature on metacognition relates almost exclusively to clinical decision-making in junior and senior students and in practicing nurses. This study is the first to analyze the impact of a metacognitive intervention on the development of metacognitive awareness of learning strategies in pre-nursing students early in the nursing curriculum. Describing the correlation of students’ self-reported metacognitive awareness to their age, grade point averages, standardized test grade, and course assignment grade also adds to the existing body of knowledge on metacognition.

This research will contribute to our understanding of metacognitive awareness and offer instructional strategies in nursing education with an emphasis on metacognition in learning. Subsequent studies with this cohort of students could explore the transfer of metacognitive skills to practice settings and instructional strategies necessary to promote metacognition in clinical practice.

**Research Questions**

Chapter 3 provides a description of the instruments and variables used in the study including Metacognitive Awareness Inventory (MAI), overall College grade point average (GPA), nursing GPA, Test of Essential Academic Skills (TEAS), and final reflective portfolio. A review of the literature led to the following research questions:
- Question 1: Is there a correlation between pre-nursing students’ pre-test MAI scores and age?
- Question 2: Is there a correlation between pre-nursing students’ pre-test MAI scores and overall College GPA?
- Question 3: Is there a correlation between pre-nursing students’ pre-test MAI scores and nursing GPA?
- Question 4: Is there a correlation between pre-test MAI scores and overall score or subscores on the TEAS?
- Question 5: Is there a correlation between pre-nursing students’ post-test MAI scores and their final portfolio grades?
- Question 6: Is there a statistically significant increase in pre-nursing students’ MAI scores following a metacognitive intervention?

**Methods**

The researcher addressed these questions using a quasi-experimental research design. The study consisted of a pre-test, intervention, and post-test with no control group. Students in a pre-nursing course in a small College in the southeast completed the Metacognitive Awareness Inventory (MAI) before and after a metacognitive intervention. Students’ pre-test scores on the MAI were correlated to age and academic indicators including overall College GPA, nursing GPA, and TEAS scores using Pearson product-moment correlation coefficients. Post-test MAI scores were correlated with the grade on the final reflective portfolio. The study further analyzed whether or not a metacognitive intervention caused a statistically significant increase in MAI scores from pre-test to post-test using a paired-samples $t$ test.
Limitations

The following are limitations of the study:

- Several threats to internal validity are:
  - First, because of no control group, the results may indicate a difference in means, but cannot establish that the treatment is the cause of the difference.
  - Second, because of the pre-test, post-test design, there is the potential for testing effects such that the pre-test influences the post-test scores (Creswell, 2009).
  - Because students know that metacognition is an emphasis in the course, students may tend to inflate self-reported scores on the post-test to meet the expectations of the faculty or researcher.
  - The researcher is occasionally in the classroom interacting with students. The researcher, therefore, could inadvertently influence the intervention or the students’ perceptions of metacognition or the intervention.
- As a threat to external validity, participants are not randomly selected and, therefore, findings cannot be generalized to the population of pre-nursing students (Creswell, 2009).

Assumptions

The following are assumptions of the study:

- Metacognition may not be fully developed in undergraduate pre-nursing students (Schraw & Dennison, 1994).
- Instructional strategies can improve metacognition (Bransford, et al., 2000; Tanner, 2012).
- Reflection is generally considered to be essential to metacognitive processes (Tarricone, 2011).
- Metacognitive skills positively affect academic achievement (Pate & Miller, 2011).

**Definition of Key Terms**

- Critical thinking: “purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based” (Facione, 1990, p. 2).
- Metacognitive Awareness Inventory (MAI): a 52-item, self-report inventory on a 5-point Likert-type scale that measures metacognitive awareness (Schraw & Dennison, 1994).
- Nursing GPA: total number of grade points in all course work included in the nursing curriculum plan divided by the total number of credits taken in the nursing curriculum plan; calculated on a 4.0 scale.
- Overall College GPA: total number of grade points in all College course work divided by the total number of credits; calculated on a 4.0 scale.
- Reflection: “a generic term for those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to a new understanding and appreciation” (Boud, Keogh, & Walker, 1985, p. 19). For this study, reflection includes not only exploration of experiences, but also examination of one’s own thinking, or cognition.
Reflective Portfolio: both a learning strategy and an assessment tool requiring students to reflect on their own thinking and learning over a period of time and to provide and explain evidence of their progress and learning.

Test of Essential Academic Skills (TEAS): a standardized test, by Assessment Technologies Institute (ATI), that predicts which nursing school applicants are most likely to have success in early nursing school (ATI, 2012).

Summary

The purpose of this study is to describe how pre-nursing students’ self-reported metacognitive awareness correlates with age and academic variables and to explore the effects of a metacognitive intervention on students’ metacognitive awareness. This research contributes to our understanding of metacognitive awareness and instructional strategies in nursing education with an emphasis on metacognition in learning. A review of the relevant literature, a description of the study’s design and methods, results of data analysis, discussion of results, and conclusions are reported in the following chapters.
CHAPTER 2: REVIEW OF LITERATURE

History of Metacognition

The term metacognition first surfaced in the literature in the 1970s. Because the study of metacognition is relatively new, many definitions and models of metacognition have surfaced, complicating the study of this concept. Multiple related research constructs, such as self-regulation, self-efficacy, metacomprehension, cognition, reflection, metamemory, motivation, critical thinking, and others, add to the complexity of organizing and translating metacognition research (Tanner, 2012; Tarricone, 2011)

A review of the literature reveals a great number of attempts to define and frame the construct of metacognition over the last three decades (Flavell, 1979; Hacker, Dunlosky, & Graesser, 1998, 2009; Paris & Winograd, 1990; Schraw, 1998; Schraw & Dennison, 1994; Schraw & Moshman, 1995; Tarricone, 2012). The literature is replete with definitions of metacognition though no consensus has been reached on how to define it (Hacker, Dunlosky, & Graesser, 2009; Tarricone, 2011). Flavell first coined the term in the 1970s, defining metacognition as “one’s knowledge concerning one’s own cognitive processes and products or anything related to them, [and] to the active monitoring and consequent regulation and orchestration of these processes” (1979, p. 232). Flavell (1979) proposed that cognitive monitoring occurs among four classes of phenomena: metacognitive knowledge, metacognitive experiences, goals or tasks, and actions or strategies. He describes person, task, and strategy as the three categories of metacognitive knowledge (Flavell, 1979). The person category consists of “everything that you could come to believe about the nature of yourself and other people as cognitive processors” (Flavell, 1979, p. 907). This category includes knowing one’s strengths and weaknesses as a learner, knowledge of other’s strengths and weaknesses, and a general
understanding of how people learn. Knowing what the learning task is and what it entails is encompassed under the task category. The third category, strategy knowledge, involves knowing effective means for dealing with the given information and the means to acquire more useful information to achieve the identified task or goal. During a metacognitive experience one draws on metacognitive knowledge of the task and available strategies to address a task or goal (Flavell, 1979). The focus of Flavell’s early work was primarily on younger students’ metacognitive knowledge about cognitive and memory tasks.

More than a decade later, Paris and Winograd (1990) proposed that metacognition consists of cognitive self-appraisal and self-management of cognition. Cognitive self-appraisal is described as “personal reflections about one’s own knowledge states and abilities” (Paris & Winograd, 1990, p. 17), while self-management of cognition is “metacognition in action, i.e. how metacognition helps to orchestrate cognitive aspects of problem solving” (Paris & Winograd, 1990, p. 18). These divergent explanations and approaches to metacognition research have hindered the development of a standard definition and framework. Schraw describes a “fuzzy boundary that separates overlapping constructs such as metacognition, executive processes, and self-regulation” (2000, p. 298). To complicate things further, metacognition is challenging to assess because it is not directly observable and can be influenced by other factors (Lai, 2011). Though there have been efforts to synthesize and organize theory and research, such as the Buros Symposium on Issues in the Measurement of Metacognition and books on metacognition and self-regulation, theoretical consensus has not been reached (Hacker, Dunlosky, & Graesser, 1998, 2009; Schraw, 2000; Tarricone, 2011; Zimmerman & Schunk, 2011).
Nonetheless, key researchers generally agree that metacognition consists of two categories: knowledge of cognition and regulation of cognition (Hacker, 1998; Schraw, 1998; Schraw & Dennison, 1994; Schraw & Moshman, 1995; Schraw et al., 2006). Knowledge of cognition includes “knowledge of one’s knowledge, processes, and cognitive and affective states” (Hacker, 1998, p. 11). On the other hand, regulation of cognition is the executive control of cognition such as planning, monitoring, and evaluating cognitive functions (Tarricone, 2011). The next section provides further explanation of knowledge and regulation of cognition in relation to self-regulated learning.

**Self-Regulated Learning Theory**

A review of the literature on metacognition would be incomplete without consideration of self-regulation since the literature often discusses metacognition and self-regulation concurrently (Hacker et al., 2009; Schraw et al., 2006; Zimmerman & Schunk, 2011). Self-Regulated Learning Theory (SRLT), as described in Schraw, Crippen, and Hartley (2006) considers metacognition an integral part of self-regulation (Figure 1). The theory proposes that learning occurs in the interaction of three components: cognition, metacognition, and motivation (Schraw et al., 2006). Description of the components of this theory provides needed distinction between cognition and metacognition within the context of learning.

**Cognition and critical thinking**

Within the construct of self-regulated learning theory, cognition refers to simple strategies of learning, critical thinking, and problem-solving skills (Schraw et al., 2006). The Delphi Report of the American Philosophical Association provides a consensus definition of critical thinking stating that it is “purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential,
conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based” (Facione, 1990, p. 2). Interestingly, the same report suggests several cognitive skills are required for critical thinking: interpretation, analysis, evaluation, inference, explanation, and self-regulation (Facione, 1990). Experts clearly recognize the relationship between self-regulation and critical thinking (Kuiper, 2002). Literature on self-regulated learning and metacognition suggests that metacognition improves cognitive skills such as critical thinking (Kuiper, 2002, 2008; Schraw et al., 2006). Researchers further recommend that instruction of critical thinking should include both domain-general and domain-specific skills (Facione, 1990; Lai, 2011).


**Metacognition**

In self-regulated learning theory, metacognition refers to “skills that enable learners to understand and monitor their cognitive processes” (Schraw et al., 2006, p. 112). As mentioned before, the two main categories of metacognition described by Schraw and Moshman (1995) and
Schraw and Dennison (1994) are knowledge of cognition and regulation of cognition. Knowledge of cognition “refers to what individuals know about their own cognition or about cognition in general” (Schraw & Moshman, 1995, p. 352). Regulation of cognition includes “metacognitive activities that help control one’s thinking or learning” (Schraw & Moshman, 1995, p. 354). To conduct research on metacognition, specifically, requires a deeper look at the subcomponents of knowledge of cognition and regulation of cognition (Figure 2). Knowledge of cognition is generally segmented into declarative knowledge, procedural knowledge, and conditional knowledge (Schraw et al., 2006; Schraw & Moshman, 1995).

![Figure 2. Subcomponents of Metacognition. Described in “Promoting Self-Regulation in Science Education: Metacognition as Part of a Broader Perspective on Learning,” by G. Schraw, K. W. Crippen, and K. Hartley, 2006, Research in Science Education, 36, p. 111-139.](image)

Declarative knowledge refers to knowledge about oneself as a learner and knowledge about factors that affect one’s learning (Schraw & Moshman, 1995). The definition of declarative knowledge has recently “expanded to include individuals’ knowledge and understanding of their affective states, including self-efficacy and motivation, and how these characteristics affect task performance” (Harris, Graham, Brindle, & Sandmel, 2009, p. 133). An example of declarative knowledge would be that “most adult learners know the limitations of
their memory system and can plan accordingly” (Schraw et al., 2006, p. 114). In short, declarative knowledge includes knowledge about self, task, and applicable strategies for task completion.

Procedural knowledge refers to knowledge about how to carry out a task or complete a goal. Knowledge of learning strategies and other procedures would fall into this category (Schraw et al., 2006). Strategies may include “note-taking, slowing down for important information, skimming unimportant information, using mnemonics, summarizing main ideas, and periodic self-testing” (Schraw et al., 2006, p. 114). A person with conditional knowledge knows when, where, and why to use a particular procedure or strategy (Harris et al., 2009). Individuals need conditional knowledge to assess the demands of a learning situation and select the most appropriate strategies to complete the task (Schraw et al., 2006). As one might expect, studies indicate that adults generally have higher levels of knowledge of cognition and can describe that knowledge better than children (Flavell, 1979; Schraw & Moshman, 1995).

The second category of metacognition is the regulation of cognition, which refers to “metacognitive activities that help control one’s thinking or learning” (Schraw & Moshman, 1995, p. 354). Regulation of cognition includes at least three subsomponents: planning, monitoring, and evaluation (Schraw & Moshman, 1995). Planning refers to activities such as predicting, determining time allocation based on demands, recognizing relevant prior knowledge, and setting goals (Schraw et al., 2006; Schraw & Moshman, 1995). Developmental factors may contribute to regulation through planning as “older, more experienced learners possess more knowledge about cognition and use that knowledge to regulate their learning before they undertake a task” (Schraw & Moshman, 1995, p. 354). The ability to plan prior to starting a task
may improve outcomes regardless of the context and content of the task (Schraw & Moshman, 1995).

Monitoring of cognition refers to awareness of comprehension and self-assessment during a learning activity or task (Schraw & Moshman, 1995). Through monitoring, learning can be controlled as the learners consider how they are completing the task and whether their selected strategy is working. Learners then can make adjustments to their strategy by calling upon their declarative, procedural, and conditional knowledge to readjust their learning (Schraw et al., 2006). Monitoring of cognition is of particular interest because students’ self-awareness of their learning and subsequent monitoring can lead to improved understanding of content and problem-solving ability (Schraw & Moshman, 1995).

Evaluation of cognition “refers to appraising the products and regulatory processes of one’s learning” (Schraw et al., 2006, p. 114). When students evaluate their learning, they may ask themselves what the teacher or other readers or observers would think about their work. If they were to do this learning activity again, they might consider planning differently which would include reviewing their strategies and the conditional factors that impacted their performance (Tanner, 2012).

**Motivation**

Lastly, the self-regulated learning theory acknowledges that motivation to learn, including both self-efficacy and epistemological beliefs about the origin and nature of knowledge, affect cognition and metacognition (Schraw et al., 2006). Self-efficacy is defined as “the degree to which an individual is confident that he or she can perform a specific task or accomplish a specific goal” (Schraw et al., 2006, p. 115). Self-efficacy is thought to affect student success and motivation to learn (Harris et al., 2009). Research suggests that two main
methods increase self-efficacy in students: expert and non-expert models (Schraw et al., 2006). Experts, like teachers, can increase self-efficacy through modeling and informational feedback which would improve student performance. Feedback from other students, in the non-expert model, can also increase students’ confidence in their ability (Schraw et al., 2006). Metacognition has been widely tested, and instruments are available to assess metacognitive awareness as described both in this theoretical framework and in others.

Assessment of Metacognition

In spite of the lack of agreement on a definition of metacognition, researchers across the globe continue to study the construct (Tobias & Everson, 2009). Assessment data on metacognition result from observational strategies and self-report measures, including inventories, surveys, interviews, and analysis of student writing and verbalizations (Tobias & Everson, 2009). Some of the research is exploratory in nature as researchers seek to discover students’ use of metacognition, while other studies focus on learning metacognition through instructional strategies. Metacognition is particularly difficult to assess because it is often an implicit, unconscious thought process (Flavell, 1979; Schraw, 2000; Tobias & Everson, 2009). Direct observation can tell the researcher if the learner is completing the task, but further self-reported data from the learner are needed to determine how and if the learner is using metacognitive strategies.

Data may be collected before, during, and after a learning activity. One way to ascertain the learners’ thought processes is by using a think-aloud strategy, or reflection-in-action, in which the learners describe their thinking as they work to solve a problem (Tobias & Everson, 2009). This data collection approach may have unintended effects such as distraction from content because of cognitive overload (Pate & Miller, 2011). Other studies use judgments of
learning (JOL) or metacomprehension analyses to assess learners’ metacognitive monitoring techniques (Serra & Metcalfe, 2009). In these studies, students are asked to determine the extent to which they have learned the content or to predict how well they anticipate how they will perform on a test or task. Students with more accurate judgments of learning are thought to have higher metacognitive monitoring skills (Serra & Metcalfe, 2009).

Many assessment techniques gather qualitative and quantitative data after the learner completes the task. Learners either describe how they were thinking through the process, reflection-on-action, or how they rate their metacognitive skills by using an inventory or other scale (Tobias & Everson, 2009). Because learners have a retrospective view, they may have difficulty accurately recalling how they were thinking since it is often not an explicit process (Tobias & Everson, 2009).

Concerns about measuring metacognition stem from the implicit nature of this higher-level thinking construct. Nonetheless, methods such as content analysis of students’ writing (Bormotova, 2010), scoring of videotaped think-aloud sessions (Jacobse & Harskamp, 2012), verbal protocol analysis (Kuiper, 2002, 2005), and self-report scales (Pintrich & De Groot, 1990; Schraw & Dennison, 1994) are often used to assess this construct. Schraw (2000) reviewed metacognitive research and reported that “most measures of metacognition can be characterized by two salient features: (a) they were constructed for use within a specific study[,] and (b) there is little or no normative information about them even within the population for which they were designed” (p. 301). Many of the studies fail to report validity and reliability measures of the instrument, which would assess that the instrument both measures what it intends to measure and provides consistent results (Schraw, 2000). Also, researchers often omit a detailed description of the instrument’s factor structure preventing future researchers from identifying the theoretical
construct being tested (Schraw, 2000). By providing information about how the instrument scores relate to relevant performance indicators, studies would also be improved (Schraw, 2000, 2009).

Several self-report scales measuring metacognition are described in the literature. One such scale is the Motivated Strategies for Learning Questionnaire (MSLQ, Pintrich & De Groot, 1990). This 56-item instrument measures student motivation, cognitive strategy use, metacognitive strategy use, and management of effort on a 7-point Likert-type scale (Pintrich & De Groot, 1990). The scale was administered to 173 seventh graders, and although factor analysis resulted in three motivational factors and two cognitive factors, details of the factor loadings were not given (Pintrich & De Groot, 1990).

A second self-report scale is the Metacognitive Awareness Inventory (MAI), a 52-item inventory created by Schraw & Dennison (1994) to measure metacognitive awareness in adolescents and adults. Based on the categories and subcomponents of metacognition as described in the self-regulated learning theory, the inventory includes items to assess declarative knowledge, procedural knowledge, and conditional knowledge as well as regulatory functions of planning, monitoring, and evaluation (Schraw & Dennison, 1994). The researchers also include items labeled as information management and debugging under regulation of cognition. Information management refers to skills and strategies used during cognition to process more efficiently, and debugging refers to “strategies used to correct comprehension and performance errors” (Schraw & Dennison, 1994). Both information management and debugging are functions of monitoring of cognition. The factor analysis, which the researcher discusses in more detail in the methods section, reveals that the MAI does not measure the distinct subcomponents of
metacognition, but that this instrument is valid when factored on the two categories: knowledge of cognition and regulation of cognition (Schraw & Dennison, 1994).

In 2010, Li-Ling published a metacognitive inventory for nursing students (MINS) based on three other self-report inventories (Li-Ling, 2010). The 40-item inventory was tested for content validity, construct validity, and internal consistency. The items loaded on five factors including self-monitoring, self-modification, self-awareness, effective learning, and problem-solving (Li-Ling, 2010). While the analysis of this scale demonstrates validity, the scale itself is not structured around a theoretical model of metacognition or self-regulated learning. Also, the author only recommends using the instrument with nursing students in Taiwan and suggests the need for confirmatory factor analysis (Li-Ling, 2010).

Lastly, Balcikanli (2011) developed the Metacognitive Awareness Inventory for Teachers (MAIT). The MAIT, an instrument based on self-regulated learning theory, is a modified version of the MAI. Tested on pre-service teachers in Turkey, the final version of the inventory resulted in factor loading on six factors including declarative, procedural, and conditional knowledge and planning, monitoring, and evaluation of cognition (Balcikanli, 2011). Metacognition in teachers is of particular interest because of the potential relationship between teacher metacognition and student metacognition (Balcikanli, 2011).

While psychometric results of these self-report scales are promising, these inventories provide only a cursory view of metacognitive awareness. These inventories allow for rapid assessment of a large number of students, but fail to capture the in-depth complexities of metacognitive knowledge and regulation (Schraw, 2000). Therefore, they provide baseline data for researchers and may point to the need for more detailed analysis.
Metacognition and Learning

Metacognition is connected to learning in that the very construct suggests that explicit regulation of cognition causes a change in behavior and better learning outcomes. One of the key concepts reported in *How People Learn: Brain, Mind, Experience and School* is that “a metacognitive approach to instruction can help students learn to take control of their own learning by defining learning goals and monitoring their progress in achieving them” (Bransford, et al., 2000, p. 16). In addition, numerous studies have demonstrated the benefits of understanding the process of learning and how selection of cognitive strategies impacts learning (Bransford et al., 2000; Lin, 2001; Pintrich, 2002). The literature suggests that metacognitive skills may improve academic performance when explicitly taught within disciplines. (Bransford, Brown, & Cocking, 2000; Pintrich, 2002; Pintrich & De Groot, 1990) and that knowledge of metacognitive strategies can be transferred from one context to another (Bransford et al., 2000; Pintrich, 2002).

Because the academic community now recognizes that metacognition has a significant impact on learning, Bloom’s Taxonomy of Educational Objectives has been revised to include metacognition (Krathwohl, 2002). Bloom’s Taxonomy has been the framework for classifying and constructing learning objectives for over 50 years. The structure of the original taxonomy includes knowledge, comprehension, application, analysis, synthesis, and evaluation (Krathwohl, 2002). The revision created two dimensions: knowledge and cognitive. The cognitive dimension identifies cognitive processes used to achieve knowledge. The cognitive processes correspond with the verbs in an objective statement and include remembering, understanding, applying, analyzing, evaluating, and creating (Krathwohl, 2002). The revision to the knowledge dimension adds metacognitive knowledge to the existing factual, conceptual, and procedural knowledge
categories (Krathwohl, 2002). This addition of metacognition to a widely accepted framework acknowledges the importance of this construct in education and learning.

**Teaching Strategies for Metacognition**

A variety of domain-general recommendations to improve learning through metacognition emerges from the literature. For clarity, these recommendations are categorized as strategy support or strategy training. In terms of strategy support, authors recommend that metacognition be integrated throughout the curriculum instead of including it as an adjunct course or initiative (Hofer, Yu, & Pintrich, 1998). By including metacognitive strategies across many courses to address a variety of tasks, students are more likely to be able to transfer these skills to different contexts (Hofer et al., 1998). Most authors agree that knowledge of cognition and regulation of cognition can and should be taught explicitly (Cross & Paris, 1988; Pintrich, 2002; Schraw, 1998; Schraw et al., 2006; Tanner, 2012). To educate students about metacognition, authors suggest that teachers make their own metacognition explicit to students and foster an environment conducive to metacognition by using a variety of strategies (Schraw, 1998; Tanner, 2012). Therefore, faculty support of metacognitive training is critical.

Metacognitive strategy training is discussed extensively in the literature. Students who know more about how to study and about how learning occurs are more successful learners than those students with less metacognitive knowledge (Winne & Hadwin, 1998). Therefore, enlightening students about how they learn and how to identify both effective and ineffective learning strategies should subsequently improve their metacognition (Schraw et al., 2006). The following describes strategies for improving metacognitive knowledge and regulation.
Reflection

Models and definitions of reflection are plentiful, but a literature review of reflective practices in the health professions by Mann, Gordon, & MacLeod (2009) recognized two features inherent in all models. First, reflection is iterative, in that “the process of reflection is triggered by experience, which produces new understanding, and the potential or intention to act differently in response to future experience” (Mann et al., 2009, p. 597). Second, reflective models have a “vertical dimension” meaning that there are hierarchical levels of reflection (Mann et al., 2009). Critical reflection is the highest level of reflection initiated by stimulating or challenging situations (Mann et al., 2009; Tarricone, 2011).

The relationship between reflection and metacognition is inherent in the definition of metacognition. To consider consciously one’s own knowledge and how to control the regulation of that knowledge, one would be required to reflect (Tarricone, 2011). In the literature, nearly all of the strategies to improve metacognition contain an element of reflection as they require some degree of introspection, self-awareness, and self-knowledge (Tarricone, 2011). The following account of recommended metacognitive teaching strategies in the literature emphasizes the reflective nature of metacognitive thinking.

Strategy evaluation matrix

Schraw (1998) suggests strategies to increase metacognition in classroom instruction. One such strategy requires the purposeful instruction of learning strategies in a strategy evaluation matrix (SEM). In this approach, students create a table listing several strategies and how, when, and why to use the strategy to promote learning (Schraw, 1998). They then work in teams to discuss those strategies. By creating an SEM and discussing it with peers, students’ awareness of knowledge of cognition increases, but there is no effect on their ability to regulate
their learning (Schraw, 1998). However, in order to create this list of learning strategies, students must reflect on their previous experience to connect prior knowledge to their new strategies.

**Reflective prompts**

To improve regulation of cognition, Schraw (1998) recommends a regulatory checklist (RC). Essentially, this checklist consists of a list of prompting reflective questions to which students respond that focus on planning, monitoring, and evaluating their learning or problem solving. In one study, King (1991) found that fifth-grade students who used an RC showed significant gains in problem-solving and inquiry as compared to a control group. In an RC, students may plan by identifying the goal and the required strategies to complete the goal. To monitor their progress, they may reflect on whether or not they are reaching the goals or if they need to change their strategy. Finally, once the task is complete, students might consider whether or not the goal has been met and what they would do differently next time (Schraw, 1998).

Based on the regulatory checklist model suggested by Schraw (1998) and tested by King (1991), Pate & Miller (2011) sought to determine if the use of regulatory reflective questioning improved test scores for secondary-level career and technical education students. All students were taught the same curriculum, and students in the treatment group were given the regulatory checklist in addition to the regular assignments. From this randomized, post-test design, the results indicated that the difference in scores between the control and experimental group were statistically significant ($p = .027$) with a moderate effect size ($d = 0.5$) (Pate & Miller, 2011).

Tanner (2012) expounds on Schraw’s (1998) regulatory checklist model by offering an extensive list (Appendix A) of prompting reflective questions to promote metacognition in College biology students. Although this compilation of metacognition questions offers a domain-general, College-level approach to teaching metacognitive strategies explicitly, it has not yet
been tested. Tanner (2012) suggests that students can benefit from assessing their current thinking by identifying and addressing confusions, recognizing conceptual change, and journaling reflectively. The article offers planning, monitoring, and evaluating reflective self-questions based on four sets of activities: class session, active-learning task and/or homework assignment, quiz or exam, and overall course (Tanner, 2012). Regulatory checklists such as these are reflective in nature in that learners think both about what they know and about how their learning is progressing. Reflection is generally considered to be essential to metacognitive processes (Tarricone, 2011).

Because reflection is critical to metacognitive development, reflective portfolios are emerging as an assessment practice that promotes metacognition. Jones (2010) describes a study that addresses the use of reflective portfolios in the assessment of pre-service special education teachers. The participants noticed that the whole portfolio process requires reflection. The findings from this four-year study indicate that creation of a portfolio promotes “self-assessment, autonomy, reflection and meta-cognition” (Jones, 2010, p. 292). Assembling a portfolio requires learners to reflect on their work, their engagement in the class, and their learning.

**Metacognition in Nursing**

The concept of metacognition has not been ignored in the study of nursing education. As early as 1990, Worrell proposed that teaching metacognitive skills to nursing students was analogous to “preventive educational practice” (p. 170) in order to prevent learning shortfalls and course failure. Though she did not conduct a study, she did create a set of reflective questions to assist students with their reading of nursing textbooks. She called them self-talk questions and included examples for use before, during, and after reading (Worrell, 1990). These questions are consistent with the regulatory checklist questions later published by Schraw (1998).
In 1998, Fonteyn and Cahill studied the use of reflective clinical logs to improve student nurses’ metacognition. Although they described metacognition as knowledge and regulation of cognition, they did not explain how their analysis of the clinical logs differentiated between metacognition and cognition, or critical thinking. The study claims that since student nurses demonstrated thinking strategies similar to those of experienced nurses, the clinical logs should help students develop critical thinking, and, therefore, demonstrate metacognition (Fonteyn & Cahill, 1998). This type of ambiguity in nursing literature confounds the already complex construct of metacognition.

Chartier (2001) provides an example of a metacognitive strategy in nursing that centers around a case study. In this untested example, students consider their affective state prior to reading the case study and then answer questions about the hypothetical clinical situation. The questions require that students consider rationales for their decisions in an inquiry-based model and prompt students to think about how they are thinking (Chartier, 2001). Although this instructional method may ultimately prove to be effective in promoting metacognition, no empirical evidence was collected or analyzed to ascertain the efficacy. Also, pre-nursing students would not likely have the domain-specific nursing knowledge to solve higher-level case studies.

August-Brady (2005) conducted a quasi-experimental, pre-test-post-test design to study the effects of a metacognitive concept mapping intervention on students’ approach to learning and self-regulation of learning. Students created a concept map to describe their clinical patient based on the nursing process. The concept maps were scored with interrater reliability of 0.94 to 1.00, and the students completed two self-report inventories: Study Process Questionnaire-2 Factor (for approach to learning) and Strategic Flexibility Questionnaire (for self-regulation of learning) (August-Brady, 2005). The results indicated an increase in a deep approach to learning
and an increase, though not statistically significant, in adaptive control beliefs in the treatment group (August-Brady, 2005). Of concern in this study is the lack of explicit metacognitive strategies examined. Although concept mapping can promote metacognitive skills, appropriate instructional strategies integrating metacognition into concept mapping exercises and evaluations of concept maps are warranted.

In the field of metacognition in nursing and nursing education, Kuiper leads the way with several publications (Kuiper, 2002, 2005; Kuiper & Pesut, 2004). In 2002, Kuiper used verbal protocol analysis to review the written journals of 32 new graduate nurses who responded to self-regulation learning prompts during a preceptorship program. The learning prompts, such as “When I am distracted in the clinical area by noise, activity, or by lack of concentration, I…” (Kuiper, 2002, Sidebar) were reflective in nature. Analysis of the clinical journal revealed increased references to critical thinking (cognition) and self-correction (metacognition) during the course of the intervention (Kuiper, 2002). In a similar study with 40 senior-level baccalaureate students, Kuiper (2005) used verbal protocol analysis to examine audiotapes of student’s reflective journaling by using the same self-regulation learning prompts as the previous study (Kuiper, 2005). Analysis showed very little change in cognitive and metacognitive processes over time (Kuiper, 2005).

In 2004, Kuiper and Pesut described in their review of the literature the differentiation between cognitive and metacognitive skills. The authors equate cognitive skills with critical thinking and metacognitive skills with reflective thinking (Kuiper & Pesut, 2004). This distinction is congruent with the Self-Regulated Learning Theory described by Schraw & Dennison (1994) and Schraw & Moshman (1995). In this article and in several of Kuiper’s other writings (2002, 2005), the Self-Regulated Learning in Nursing model, developed by Kuiper, is
used as a framework. This model represents a triadic relationship between behavioral self-regulation and self-monitoring, environmental self-regulation, and metacognitive self-regulation (Kuiper, 2002, 2005; Kuiper & Pesut, 2004). Self-Regulated Learning in Nursing model may be appropriate for studies concerned with clinical reasoning as opposed to learning strategies. This literature review found that Self-Regulated Learning in Nursing model has not been used in articles not authored by Kuiper.

Summary

Self-regulated Learning Theory (Schraw et al., 2006) emerges as the most appropriate framework for the study of learning in nursing education because of its congruency with established concepts of critical thinking and problem-solving in nursing. Self-Regulated Learning Theory also clearly describes categories of metacognition and the relationship of metacognition to cognition and motivation. The Self-Regulated Learning Theory for Nursing (Kuiper, 2002) is based on clinical reasoning and, therefore, is not an appropriate choice for this study that emphasizes metacognition in learning for pre-nursing students.

Although research on metacognition began more than three decades ago, a review of the nursing literature yields limited information on metacognition in nursing. The existing nursing research on metacognition relates only to clinical reasoning of upper-level students and practicing nurses. Research on the following topics would add to the body of knowledge:

- the impact of metacognitive prompts on pre-nursing or nursing students’ metacognitive awareness using the Metacognitive Awareness Inventory (Schraw & Dennison, 1994).
- the correlation between metacognitive awareness and nursing course academic indicators.
the impact of metacognitive strategies associated with learning instead of clinical decision-making in clinical logs/journals.

the impact of metacognitive strategies on metacognitive awareness early in the nursing curriculum.

Research in other fields suggests that metacognitive interventions may improve learning and cognitive processes (Bransford et al., 2000; Pintrich & De Groot, 1990). Therefore, the explicit incorporation of metacognition teaching and reflective metacognition prompts may be an effective strategy for promoting learning in nursing education that can later be transferred to cognitive processes such as critical thinking and clinical decision-making. Tanner (2012) suggests a strategy for explicitly teaching metacognitive skills in biology courses that may prove useful in nursing education. This strategy includes the explicit integration of metacognitive questioning to promote students’ planning, monitoring, and evaluation of learning throughout the course. Tanner’s (2012) list of sample metacognitive questions is based on prior research, but has never been tested.

Therefore, this study adds to the body of knowledge by describing metacognitive awareness in a sample of pre-nursing students and demonstrates the effect of a metacognitive intervention on students’ metacognitive awareness. Additionally, this study correlates the MAI scores to students’ ages and academic indicators such as overall and nursing GPAs, the Test of Essential Academic Skills (TEAS) by Assessment Technologies Institute, and final reflective portfolio grades.
CHAPTER 3: RESEARCH DESIGN AND METHODS

Introduction

The purpose of this chapter is to describe the research design and methods of the study. This study addresses the concern that nursing students require a new metacognitive skill set to thrive in nursing school and to function in the complex and evolving healthcare system in which they will practice. Nursing curricula generally fail to explicitly teach metacognitive skills that may help students learn more effectively. Early in the curriculum, practicing strategies that focus students’ attention on how they learn may increase metacognitive awareness and lead to improved understanding and application of course content. Self-Regulated Learning Theory (Schraw et al., 2006) provides the framework for this study because it recognizes and describes the interrelationship between cognition, metacognition, and motivation in student learning. Although motivation is not measured in this study, students’ cognition was evaluated through the final reflective portfolio grades, and metacognition was assessed using self-reported scores from the Metacognitive Awareness Inventory (MAI).

An understanding of age-related differences in MAI scores may help the faculty make choices about assigning students to teams and more clearly understand the relationship between metacognition and age. Research reveals that students’ metacognitive ability is correlated with grade point average (Young & Fry, 2008) and academic success (Pate & Miller, 2011), but metacognitive awareness has never been correlated with the Test of Essential Academic Skills (TEAS). The TEAS test is a benchmark for admission, so a correlation between overall or subscores on the TEAS either may assist with selection of applicants or may indicate the need for further metacognitive training for students accepted into the program.
Research Questions

To address the gap in the literature and purpose of the study, the following research questions guided the study:

- **Question 1**: Is there a correlation between pre-nursing students’ pre-test MAI scores and age?
- **Question 2**: Is there a correlation between pre-nursing students’ pre-test MAI scores and overall College grade point average (GPA)?
- **Question 3**: Is there a correlation between pre-nursing students’ pre-test MAI scores and nursing GPA?
- **Question 4**: Is there a correlation between pre-test MAI scores and overall score or subscores on the TEAS?
- **Question 5**: Is there a correlation between pre-nursing students’ post-test MAI scores and their final portfolio grades?
- **Question 6**: Is there a statistically significant increase in pre-nursing students’ MAI scores following a metacognitive intervention?

Research Design

To address these questions, a quasi-experimental research design was used. The study consisted of a pre-test, an intervention, and a post-test with no control group. Students in a pre-nursing course completed the Metacognitive Awareness Inventory (MAI) before and after a metacognitive intervention. Students’ pre-test scores on the MAI were correlated to age and academic indicators including overall College GPA, nursing GPA, and TEAS scores. Post-test MAI scores were correlated with the grade on the final portfolio. The study also analyzed
whether or not there was a statistically significant increase in MAI scores following a metacognitive intervention.

**Setting and Sample**

The setting for the study is a small College in the southeast with less than 2,000 enrolled students. The School of Nursing is phasing out the Associate of Science in Nursing program and accepted its first cohort of students for the new Bachelor of Science in Nursing (BSN) program in Fall 2012. The new BSN program adopted a concept-based model for all of the nursing courses. The sample for this study consisted of undergraduate pre-nursing students enrolled in a pre-nursing course. Students take this course prior to enrollment in the nursing program. Students are expected to prepare for class and then engage in team learning activities. This convenience sample was chosen because students are in their first nursing clinical course. For each research question, students in the pre-nursing course who consented to participate and for whom data was available were included in the sample.

Two sections of the 4-credit hour pre-nursing course run concurrently with approximately 50 students in each section. Typically, two faculty members team-teach in the classroom portion of the course. These two faculty members are in the classroom throughout each class period. In the class, students are divided into teams of three to four students, and activities include individual work, team work, and class work. The clinical portion of the course consists of 45 contact hours spent in the simulation lab and long-term care settings. Students are assigned to clinical teams of eight or nine students. Six clinical faculty members are assigned to teach the clinical component of this course. Each of the clinical faculty has two clinical groups, one from section 1 and one from section 2. Clinical faculty members read students’ weekly reflections and assess their clinical competency based on an evaluation tool. Clinical faculty members are also
responsible for assessing the students’ mid-term and final portfolios along with the classroom faculty.

**Ethical Considerations**

Exemption was received from the Institutional Review Boards at both the College in which the participants are enrolled (Appendix B) and at Louisiana State University (Appendix C). A combined consent form approved by both institutions was used in the study. The researcher provided potential participants with an overview of the study and discussed ethical issues such as the voluntary nature of the participation, confidentiality of research data, and protection of the participants’ privacy. The researcher was available to respond to any questions posed by the potential participants.

The researcher distributed two combined consent forms (Appendix D) to the students, one for them to keep and one to be signed and returned should they choose to participate. Signing the consent form signified that they understood the study and voluntarily consented to participate. Paper copies of student data were kept in a locked file cabinet, and electronic data were kept on a secure, password-protected drive.

**Instruments**

**Metacognitive Awareness Inventory (MAI)**

The MAI is a 52-item self-report inventory that uses a 5-point Likert-type scale (Appendix E) that was designed and tested by Schraw and Dennison in 1994. The MAI consists of 52 statements representing two categories of metacognition: knowledge of cognition and regulation of cognition. Knowledge of cognition can be divided into three subcomponents: declarative knowledge (knowledge about self and strategies), procedural knowledge (knowledge about how to use strategies) and conditional knowledge (knowledge about when and why to use...
strategies) (Schraw & Dennison, 1994). Regulation of metacognition includes five areas: planning (goal setting), information management (organizing), monitoring (assessment of one’s learning and strategy), debugging (strategies used to correct errors) and evaluation (analysis of performance and strategy effectiveness after a learning episode) (Schraw & Dennison, 1994). For this study, information management and debugging were included in monitoring of cognition. The statements are listed randomly and not sequentially organized into these different areas (Schraw & Dennison, 1994).

The MAI was subjected to factor analysis. The first analysis produced a 6-factor solution with coefficient alpha for five of the six factors below 0.80 (Schraw & Dennison, 1994). Next, they forced a two-factor solution with factor one corresponding to knowledge of cognition and factor two to regulation of cognition. Six items loaded equally on factor one and two (items 27, 34, 40, 43, and 44), and two items failed to load on either factor (items 4 and 48). The coefficient alpha for items loading on each factor was as high as 0.91, indicating high internal consistency, and the coefficient alpha for the whole instrument reached 0.95 (Schraw & Dennison, 1994). The two factors accounted for 65% of the sample variance. The authors suggested that the results indicated that the MAI reliably measures knowledge of cognition and regulation of cognition based on a two-factor solution (Schraw & Dennison, 1994). Approval to use the MAI was granted by the author, Gregory Schraw. The MAI was adapted for use with a scannable answer sheet.

**Test of Essential Academic Skills (TEAS)**

The TEAS is a standardized test by Assessment Technologies Institute (ATI) that consists of 170 questions across 4 subject areas: Reading, English and Language Usage, Math, and Science (ATI, 2012). Studies reveal that results of the TEAS test can predict success in early
nursing school courses (Newton, Smith, & Moore, 2007; Newton, Smith, Moore, & Magnan, 2007). At the nursing school that serves as the setting of this study, submission of a TEAS score is an admission requirement. Students with a baccalaureate degree are exempt from this requirement. Most students in the pre-nursing course have taken the TEAS because they have applied to the nursing program for the following semester. Although a TEAS score below the required 58.7% does not preclude admission, it is a factor in admissions decisions.

**Reflective portfolio**

The researcher and other faculty created the reflective portfolio assignment and rubric in the summer of 2012. The assignment was incorporated into five sections of the pre-nursing course during the summer and fall semesters of 2012. Minor revisions to the assignment and rubric occurred before the 2012 fall semester based on faculty and student feedback. In the 2013 spring semester, the assignment was revised in two ways. First, for the midterm portfolio, students were expected to reflect on five assigned course outcomes instead of all ten of the course outcomes as was previously assigned. Second, though the portfolio itself requires metacognitive thinking, additional metacognitive prompts were added to the mid-term and final reflective portfolio assignments (Appendix F).

In the pre-nursing course, students submit two electronic portfolios, one at mid-term and one near the end of the course. The portfolios are submitted electronically through Google Drive on the College’s password-protected portal. The reflective portfolios require students to write an individual reflective overview that highlights what they have learned and how they have learned the content in the course. Also, students select evidence from the work they have produced during the course and reflect on how that evidence represents their learning.
Prior to assessing the portfolios, the faculty engaged in a norming session to ensure that all portfolios would be graded using the same expectations. To prepare for the norming session, faculty read and assessed four students’ portfolios using the portfolio rubric (Appendix G). For each course outcome, faculty indicated on the rubric whether the student “exceeded” expectations, “met” expectations, or “did not meet” expectations related to both course content, connections, and professional communication (Appendix G). During the norming session, the faculty compared and discussed the rationales for their assessments. Where discrepancies existed in grading, faculty members discussed the differences and agreed on a standard way to evaluate the students. After the norming was completed, two faculty members independently scored each reflective portfolio, as assigned. When discrepancies in grading were found, a third faculty member assessed the portfolio and the two highest assessments were used.

**Intervention**

The format for every class period of this pre-nursing course follows an individual-team-class sequence through which students work independently, then in teams, and then share team ideas with the class. The intervention attempted to explicitly teach metacognitive skills (Pintrich, 2002, Schraw, 1998; Tanner, 2012) in a variety of ways. The general form of the intervention consisted of three strategies:

- explicitly teaching students about metacognition early in the course and modeling teacher metacognition throughout the course,
- reflective writing, both through weekly reflections and two reflective portfolio assignments (mid-term and final), and
- team and class discussion of weekly reflections and mid-term portfolio draft.
To address the first strategy, on the first day of class following administration of the MAI, the researcher defined metacognition and why it is an explicit goal of this course. In subsequent weeks, as students discussed their reflections with their team and class, course faculty were asked to continue to relate the content of the discussions back to metacognition. Also, the researcher asked the course faculty to explicitly describe their thought processes in class as they worked with students to solve case study problems. As faculty model metacognition, students may become more aware of their own thinking (Pintrich, 2002).

The second strategy involved purposeful reflective writing. Each student submitted an individual response to a series of weekly reflective metacognition prompts (Appendix H) that required the student to look back on previous weeks and/or to think forward to the next week’s class. For some prompts, students reflected on their learning during previous weeks and described how their experiences and performance in class, clinical or lab, and outside of class contributed to their learning of specific course outcomes. Other prompts were either identical to or adapted from the work of Tanner (2012) and related to planning, monitoring, or evaluating their learning. Prompting questions were chosen from all four of Tanner’s activity sections (Appendix A), including class section, active-learning and/or homework task, quiz or exam, and overall course (Tanner, 2012), depending on the course content and activities presented that week. Clinical faculty read students’ weekly reflections and provided feedback related to content-specific concerns or references to lab or clinical activities. In addition to weekly prompts, reflective metacognition prompts were included on the mid-term and final reflective portfolios.

To address the third strategy, during every class period, students discussed their responses to the prompts and compiled a team response that especially highlighted differences
among team member responses. Then, teams shared their responses with the class, and faculty facilitated a discussion that related the prompts and responses to metacognition. In so doing, students heard how other students were thinking and regulating their learning and may have recognized other students’ strategies for learning in a variety of situations (Paris & Paris, 2001; Pintrich, 2002).

Prior to the beginning of the course, the researcher facilitated discussions with course faculty concerning the literature on metacognition and ways to facilitate effectively these classroom activities to teach metacognition. Unfortunately, clinical faculty members were not assigned to the course in a timely manner, so orientation to metacognition for clinical faculty was limited. During the intervention, weekly course meetings provided an opportunity for course faculty to discuss and refine their approach to teaching metacognition. The researcher attended course meetings for the first two weeks until being reassigned to course development for other courses. In order to monitor the status of the intervention, the researcher checked the students’ online reflection submissions and attended class four times to assist with teaching and observe the faculty and students. Classroom visits occurred twice for each section of the pre-nursing course, once during week three and once during week seven.

**Data Collection Procedure**

Data collection occurred during the spring 2013 semester in two phases. On the first day of class for each section, the researcher attended class to discuss the study and answer any questions potential participants had about the study as described in the Ethical Considerations section of this proposal.
Phase One of data collection

Data collection in Phase One included obtaining MAI pre-test scores and students’ ages, GPAs, and TEAS scores. After collecting consent forms, the researcher asked students to complete the MAI by recording their answers on a scannable answer sheet with their name pre-coded. Following submission of the MAI, the researcher defined and discussed metacognition, and the ways in which this class addressed metacognition.

Only data from students who consent to participate were included. The researcher randomly assigned a 7-digit number to each participant. The ParSystem Software was used to record digitally the students’ responses. Data were exported to Microsoft Excel and checked for accuracy and completeness. Responses were recoded such that an “A” becomes a score of “1”, “B” becomes a score of “2”, “C” becomes a score of “3”, “D” becomes a score of “4”, and “E” becomes a score of “5” to match the authors’ original scoring rubric (Schraw & Dennison, 1994). Students who omitted an item or recorded multiple responses to an item on the MAI were excluded from the study.

After exporting data into Excel, the researcher added the students’ ages and College academic indicators, as numeric variables, to the Excel spreadsheet. Students’ ages and overall College GPAs were obtained directly from the College database to which the researcher has access. The researcher hand-calculated the nursing GPAs of each participant. The Admissions office and another faculty member verified nursing GPA calculations. Students’ TEAS scores were obtained from the Assessment Technologies Institute web site to which the researcher has access.
Phase Two of data collection

Data collection in Phase Two included obtaining MAI post-test scores and students’ final portfolio grades. In the last three weeks of the course, students submitted their final portfolios and completed the MAI post-test. Post-test data were collected, scored, exported, and recoded like MAI pre-test data and added to the Excel spreadsheet. Students’ final reflective portfolio grades were obtained from the course management system and added to the spreadsheet in the form of a percentage. The Excel spreadsheet was imported into SPSS for analysis. Paper and electronic copies of participant data were protected to ensure privacy and confidentiality.

Data Analysis

This study described the correlation of MAI scores to age, overall College GPA, nursing GPA, TEAS scores, and final reflective portfolio grades and examined data for mean differences in students’ pretest and posttest MAI scores. The software program SPSS was used for all data analyses. The following describes the statistical analysis that was used for each question in Phase One and Phase Two.

Phase One of data analysis

Pearson product-moment correlation coefficient (r) was used to analyze data for Questions 1, 2, 3, and 4 for Phase One. The description of that analysis follows the questions and hypotheses.

Question 1: Is there a correlation between pre-nursing students’ pre-test MAI scores and age?

- Null hypothesis: The correlation between pre-test MAI scores and age is zero.
- Alternate Hypothesis: The correlation between pre-test MAI scores and age is not zero.
Question 2: Is there a correlation between pre-nursing students’ pre-test MAI scores and overall College GPA?

- Null hypothesis: The correlation between pre-test MAI scores and overall College GPA is zero.
- Alternate Hypothesis: The correlation between pre-test MAI scores and overall College GPA is not zero.

Question 3: Is there a correlation between pre-nursing students’ pre-test MAI scores and nursing grade point average?

- Null hypothesis: The correlation between pre-test MAI scores and nursing GPA is zero.
- Alternate Hypothesis: The correlation between pre-test MAI scores and nursing GPA is not zero.

Question 4: Is there a correlation between pre-test MAI scores and overall score or subscores on the Test of Essential Academic Skills (TEAS)?

- Null hypothesis: The correlation between pre-test MAI scores and TEAS scores is zero.
- Alternate Hypothesis: The correlation between pre-test MAI scores and TEAS scores is not zero.

A two-tailed, bivariate analysis resulting in a Pearson product-moment correlation coefficient ($r$) was used to analyze data for Questions 1, 2, 3, and 4. Data for each correlation were plotted on a scatterplot to assess for linearity and homogeneity. The Pearson $r$ indicated the extent to which the variables were related. The researcher reviewed the resulting correlation matrix for levels of significance less than 0.05 and correlation coefficient values. Interpretations
of the positive and negative correlation coefficients followed conventions described in Hinkle, Wiersma, and Jurs (2003, p. 109): .00 to .30 is a very low or no correlation, .30 to .50 is a low correlation, .50 to .70 is a moderate correlation, .70 to .90 is a high correlation, and .90 to 1.0 is a very high correlation.

**Phase Two of data analysis**

In Phase Two, Pearson product-moment correlation coefficient (r) was used to analyze data for Question 5, and a paired-samples t test was used to analyze data for Question 6. The description of the analysis follows the questions and hypotheses.

**Question 5**: Is there a correlation between pre-nursing students’ post-test MAI scores and their final portfolio grades?

- **Null hypothesis**: The correlation between post-test MAI scores and final portfolio grades is zero.
- **Alternate Hypothesis**: The correlation between post-test MAI scores and final portfolio grades is not zero.

A two-tailed, bivariate analysis resulting in a Pearson product-moment correlation coefficient (r) was used to analyze data for Question 5. The analysis followed the same protocol described in Phase One for Questions 1, 2, 3, and 4 using the conventions from Hinkle, Wiersma, and Jurs (2003) for interpretation.

**Question 6**: Is there a statistically significant increase in pre-nursing students’ Metacognitive Awareness Inventory (MAI) scores following a metacognitive intervention?

- **Null hypothesis**: The mean difference between students’ pre-test and post-test MAI scores is zero.
Alternate hypothesis: The mean difference between students’ pre-test and post-test MAI scores is greater than zero.

To answer this question, a one-tailed, paired-samples t test was used. Post hoc statistical analysis was performed to determine power using G Power 3.1 Program. Using a one-tailed design with $\alpha = 0.05$, sample size of $n = 87$, and effect size of 0.5, the calculation of power is .999. Therefore, the anticipated sample of approximately 87 participants is sufficient to minimize errors.

In SPSS, the following variables were analyzed using a paired-samples t test: overall MAI score pre-test and overall MAI score post-test. The distribution of mean differences was assessed for normality, central tendency, and variability (standard error) (Hinkle, Wiersma, & Jurs, 2003). In the output, the correlation indicated the extent to which students’ pre-test scores correlated with their post-test scores. For the t test, the level of significance was assessed to determine statistical significance.

**Limitations**

The following are limitations of the study:

- There are several threats to internal validity.
  - First, because there is no control group, the results may indicate a difference in means, but cannot establish that the treatment is the cause of the difference.
  - Second, because of the pre-test, post-test design, there is the potential for testing effects such that the pre-test influences the post-test scores (Creswell, 2009).
Because students knew that metacognition was an emphasis of the course, there may have been a tendency for students to inflate self-reported scores on the post-test to meet the expectations of the course faculty or researcher.

The researcher attended class and discussed metacognition with the students. The researcher therefore could have inadvertently influenced the intervention or the students’ perceptions of metacognition or the intervention.

- Threat to external validity: Participants were not randomly selected and, therefore, findings cannot be generalized to the population of pre-nursing students (Creswell, 2009).

**Assumptions**

- Metacognition may not be fully developed in undergraduate pre-nursing students (Schraw & Dennison, 1994).
- Instructional strategies can improve metacognition (Schraw, 1998; Tanner, 2012).
- Reflection is generally considered to be essential to metacognitive processes (Tarricone, 2011).
- Metacognitive skills positively affect academic achievement (Pate & Miller, 2011; Pintrich & DeGroot, 1990).

**Summary**

This study addresses the concern that nursing students require a new metacognitive skill set to thrive in nursing school and in the complex and evolving healthcare system in which they will practice. Nursing curricula generally fail to explicitly teach metacognitive skills that may help students learn more effectively. Early in the curriculum, practicing strategies that focus students’ attention on how they learn may increase metacognitive awareness and lead to better
understanding and application of course content. Self-Regulated Learning Theory (Schraw, Crippen, & Hartley, 2006) provided the framework for this study because it recognizes and describes the interrelationship between cognition, metacognition, and motivation in student learning.

The sample consisted of pre-nursing students in a small College in the southeast. For each research question, students in the pre-nursing course who consented to participate and for whom data were available were included in the sample. To address the research questions, a quasi-experimental research design was used. The study consisted of a pre-test, intervention, and post-test with no control group. Students in a pre-nursing course completed the Metacognitive Awareness Inventory (MAI) before and after a metacognitive intervention. Using Pearson product-moment correlation coefficient (r), students’ pre-test scores on the MAI were correlated to age and academic indicators including overall College GPA, nursing GPA, and TEAS scores in Phase One. In Phase Two, MAI post-test scores were correlated with final portfolio grades. Data analysis in Phase Two also examined whether or not there was a statistically significant increase in MAI scores following a metacognitive intervention.

Data gleaned from this study provided a baseline understanding of the metacognitive awareness of pre-nursing students and whether or not a metacognitive intervention affected students’ metacognitive awareness. It contributed to nurse educators’ awareness of metacognition as a strategy to promote learning and may provide a viable instructional strategy for nursing educators to implement across the curriculum.
CHAPTER 4: RESULTS

Introduction

The purpose of this study is to describe how pre-nursing students’ self-reported metacognitive awareness correlates with age and academic variables and to explore the effects of a metacognitive intervention on students’ metacognitive awareness. The following describes the instruments and variables used in the study:

- **Metacognitive Awareness Inventory (MAI):** a 52-item, self-report inventory on a 5-point Likert-type scale that measures metacognitive awareness (Schraw & Dennison, 1994).

- **Nursing Grade Point Average (GPA):** total number of grade points in all course work included in the nursing curriculum plan divided by the total number of credits taken in the nursing curriculum plan; calculated on a 4.0 scale.

- **Overall College GPA:** total number of grade points in all College course work divided by the total number of credits; calculated on a 4.0 scale.

- **Reflective Portfolio:** both a learning strategy and an assessment tool requiring students to reflect on their own thinking and learning over a period of time and to provide and explain evidence of their progress and learning.

- **Test of Essential Academic Skills (TEAS):** a standardized test, by Assessment Technologies Institute (ATI), that predicts which nursing school applicants are most likely to have success in early nursing school (ATI, 2012).

The findings of this study are presented in the following sections organized by research phases and questions.
Results for Phase One

In Phase One, the researcher analyzed data related to MAI pre-test scores, age, overall GPA, nursing GPA, and TEAS score. Correlations between the MAI pre-test scores and both age and academic variables were the focus of Phase One analyses. Of the 102 students enrolled in the course on the first day of class, data from 95 students were included in Phase One statistical analysis. Of the seven students not included in the study, one student did not sign the consent form, two students were absent on the first day of class and subsequently dropped the course, three students either omitted items or entered more than one response to some items, and one student was excluded because the MAI pre-test score fell significantly outside of the normal distribution. Before analyzing correlations, descriptive statistics of the variables were obtained.

MAI pre-test variable descriptive statistics

The MAI pre-test was administered to students on the first day of class. For each of the 52 items, students recorded a response as Always False (score of 1), Sometimes False (score of 2), Neutral (score of 3), Sometimes True (score of 4), or Always True (score of 5). A sum of scores for each of the 52 items constitutes the total score for each student. Total scores could range from 52, for a response of Always False for all items, to a score of 260, for a response of Always True on all items. Total MAI pre-test scores for the sample were not normally distributed according to Shapiro-Wilk test of normality (n = 96, W = .970, p = .025) and ranged from 112 to 252 (n = 96, M=203.07, SD = 22.595). The low score of 112 was an outlier (z = -4.03) and was excluded from the data during analysis. Following exclusion of the outlier, the distribution met the assumption of normality using the Shapiro-Wilk test statistic (n = 95, W = .991, p = .760). Table 1 represents the descriptive statistics of the total MAI pre-test scores, the knowledge of
cognition category scores, and the regulation of cognition category scores from the 95 students included in the Phase One sample.

Table 1
Descriptive Statistics for MAI Pre-Test Scores (n = 95)

<table>
<thead>
<tr>
<th>MAI Pre-test Scores</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>154</td>
<td>252</td>
<td>204.03</td>
<td>20.659</td>
</tr>
<tr>
<td>Knowledge of Cognition</td>
<td>55</td>
<td>83</td>
<td>68.91</td>
<td>5.989</td>
</tr>
<tr>
<td>Regulation of Cognition</td>
<td>96</td>
<td>171</td>
<td>135.13</td>
<td>16.276</td>
</tr>
</tbody>
</table>

Age variable descriptive statistics

Age for each of the students included in Phase One of the study was obtained from the College database. The age distribution did not meet the assumption of normality. Most students (51, 53.3%) were between 19 and 21 years of age. Twenty students (21.1%) were 26 years of age or older (Table 2). Figure 3 shows the frequency distribution of the students’ ages.

Table 2
Descriptive Statistics for Student Age Variable (n = 95)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Age</td>
<td>19</td>
<td>43</td>
<td>23.65</td>
<td>5.404</td>
</tr>
</tbody>
</table>

Figure 3. Histogram of Frequency of Students’ Ages (n = 95)
GPA variables descriptive statistics

Data for the overall College GPA variable were retrieved from the College database. Grades for all College-level courses completed by the student were included in the overall College GPA calculation. The admissions department, the researcher, and another faculty member calculated the nursing GPA for each student. The nursing GPA was calculated using grades for all courses on the nursing curriculum plan. Table 4 lists the possible letter grades earned by students at the participants’ College and the resulting grade points earned for each letter grade. Using letter grades from the students’ transcripts, all GPA calculations were based on the 4.0 scale in place at the participants’ College (Table 4).

Table 4
Grade Points Earned Per Letter Grades Used For GPA Calculations

<table>
<thead>
<tr>
<th>Grade</th>
<th>Point Equivalency</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.0</td>
</tr>
<tr>
<td>B+</td>
<td>3.33</td>
</tr>
<tr>
<td>B</td>
<td>3.0</td>
</tr>
<tr>
<td>C+</td>
<td>2.33</td>
</tr>
<tr>
<td>C</td>
<td>2.0</td>
</tr>
<tr>
<td>D+</td>
<td>1.33</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
</tr>
</tbody>
</table>

The data for both the overall College GPA (M = 2.955, SD = .442) and the nursing GPA (M = 3.100, SD = .402) were normally distributed and there were no outliers. Thirty-two students (33.7%) in the sample had less than a 2.75 overall College GPA and 20 students (21.1%) had less than a 2.75 nursing GPA. A nursing GPA of 2.75 is recommended for admission to the nursing program. Descriptive statistics for both the overall College GPA and nursing GPA can be found in Table 5.
Table 5
Descriptive Statistics for GPA Variables (n = 95)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall GPA</td>
<td>2.11</td>
<td>3.95</td>
<td>2.96</td>
<td>.442</td>
</tr>
<tr>
<td>Nursing GPA</td>
<td>2.23</td>
<td>3.92</td>
<td>3.10</td>
<td>.402</td>
</tr>
</tbody>
</table>

TEAS variable descriptive statistics

The TEAS test is required for any nursing program applicant unless the applicant has already earned a baccalaureate degree. Of the 95 students included in Phase One analyses, 71 students (74.7%) completed the TEAS. Of the 24 students with no TEAS scores, 10 students had a baccalaureate degree and 14 had not yet taken the test. The TEAS composite scores, Science subscores, and Reading subscores followed a normal distribution. The TEAS subscores of Math and English do not meet the assumption of normality. The descriptive statistics for the overall TEAS composite score and each of the four subscores are reported in Table 6.

Table 6
Descriptive Statistics for TEAS Composite Score and TEAS Subscores (n = 71)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEAS Composite</td>
<td>44.0</td>
<td>87.3</td>
<td>67.182</td>
<td>9.188</td>
</tr>
<tr>
<td>Reading Subscore</td>
<td>47.6</td>
<td>92.9</td>
<td>75.392</td>
<td>9.822</td>
</tr>
<tr>
<td>Math Subscore</td>
<td>40.0</td>
<td>93.3</td>
<td>68.804</td>
<td>14.382</td>
</tr>
<tr>
<td>Science Subscore</td>
<td>33.3</td>
<td>83.3</td>
<td>58.477</td>
<td>10.747</td>
</tr>
<tr>
<td>English Subscore</td>
<td>33.3</td>
<td>93.3</td>
<td>69.301</td>
<td>12.071</td>
</tr>
</tbody>
</table>

Phase One results by research questions

To answer research Questions 1, 2, 3, and 4, the researcher analyzed the data by first reviewing scatterplots and, then, using two-tailed, bivariate analyses resulting in Pearson product-moment correlation coefficients ($r$). The researcher used the conventions described in Hinkle, Wiersma, and Jurs (2003, p. 109) to interpret the positive and negative correlation coefficients such that .00 to .30 is a very low or no correlation, .30 to .50 is a low correlation, .50 to .70 is a moderate correlation, .70 to .90 is a high correlation, and .90 to 1.0 is a very high correlation.
Question 1: Is there a correlation between pre-nursing students’ pre-test MAI scores and age?

A scatterplot of MAI pre-test scores and age revealed that a linear relationship did not exist between these two variables (Figure 4). The correlation coefficient ($r = .128$) represented a very low positive correlation between MAI pre-test scores and student age (Table 7).

![Figure 4. Scatterplot of Total MAI Pre-test Scores and Students’ Ages (n = 95)](image)

Table 7  
Relationship Between Pre-Test MAI scores and Age Using Pearson Product-Moment Correlation ($r$) Analyses (n = 95)

<table>
<thead>
<tr>
<th>Variable</th>
<th>$r$</th>
<th>$p^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.128</td>
<td>.218</td>
</tr>
</tbody>
</table>

$^a$ Two-tailed significance

Question 2: Is there a correlation between pre-nursing students’ pre-test MAI scores and overall College GPA?

A scatterplot of MAI pre-test scores and overall GPA revealed that a linear relationship did not exist between these two variables (Figure 5). The correlation coefficient ($r = -.054$) represented a very low negative correlation between MAI pre-test scores and overall GPA (Table 8).
Figure 5. Scatterplot of Total MAI Pre-test Scores and Overall College GPA (n = 95)

Table 8
Relationship Between Pre-Test MAI Scores and Overall GPA Variable Using Pearson Product-Moment Correlation (r) Analyses (n = 95)

<table>
<thead>
<tr>
<th>Variable</th>
<th>r</th>
<th>p^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall GPA</td>
<td>-.054</td>
<td>.605</td>
</tr>
</tbody>
</table>

^a Two-tailed significance

**Question 3: Is there a correlation between pre-nursing students’ pre-test MAI scores and nursing GPA?**

A scatterplot of MAI pre-test scores and nursing GPA revealed that a linear relationship did not exist between these two variables (Figure 6). The correlation coefficient (r = .031) represented a very low positive correlation between the MAI pre-test and nursing GPA (Table 9).
Table 9
Relationship Between Pre-Test MAI scores and Nursing GPA Variable Using Pearson Product-Moment Correlation \((r)\) Analyses (n = 95)

<table>
<thead>
<tr>
<th>Variable</th>
<th>(r)</th>
<th>(p^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursing GPA</td>
<td>.031</td>
<td>.768</td>
</tr>
</tbody>
</table>

\(^a\) Two-tailed significance

**Question 4: Is there a correlation between pre-test MAI scores and overall score or subscores on the Test of Essential Academic Skills (TEAS)?**

TEAS composite scores.

A scatterplot of MAI pre-test scores and TEAS composite scores revealed that a linear relationship did not exist between these two variables (Figure 7). The correlation coefficient \((r = .013)\) represented a very low positive correlation between MAI pre-test scores and TEAS composite scores (Table 10).

![TEAS Composite](image)

**Figure 7. Scatterplot of Total MAI Pre-test Scores and TEAS Composite Scores (n = 71)**

Table 10
Relationship Between Pre-Test MAI scores and TEAS Composite Score Variable Using Pearson Product-Moment Correlation \((r)\) Analyses (n = 71)

<table>
<thead>
<tr>
<th>Variable</th>
<th>(r)</th>
<th>(p^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEAS Composite Score</td>
<td>.013</td>
<td>.916</td>
</tr>
</tbody>
</table>

\(^a\) Two-tailed significance
TEAS reading subscore.

A scatterplot of MAI pre-test scores and TEAS reading subscores revealed that a linear relationship did not exist between these two variables (Figure 8). The correlation coefficient \( r = -0.039 \) represented a very low negative correlation between MAI pre-test scores and TEAS reading subscores (Table 11).

Figure 8. Scatterplot of Total MAI Pre-test Scores and TEAS Reading Subscore \((n = 71)\)

<table>
<thead>
<tr>
<th>Variable</th>
<th>( r )</th>
<th>( p^a )</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEAS Reading Subscore</td>
<td>-0.039</td>
<td>.749</td>
</tr>
</tbody>
</table>

\(^a\) Two-tailed significance

Table 11
Relationship Between Pre-Test MAI scores and TEAS Reading Subscores Variable Using Pearson Product-Moment Correlation \((r)\) Analyses \((n = 71)\)

TEAS math subscore.

A scatterplot of MAI pre-test scores and TEAS math subscores revealed that a linear relationship did not exist between these two variables (Figure 9). The correlation coefficient \( r = .044 \) represented a very low positive correlation between MAI pre-test scores and TEAS math subscores (Table 12).
Figure 9. Scatterplot of Total MAI Pre-test Scores and TEAS Math Subscore (n = 71)

Table 12
Relationship Between Pre-Test MAI scores and TEAS Math Subscores Variable Using Pearson Product-Moment Correlation (r) Analyses (n = 71)

<table>
<thead>
<tr>
<th>Variable</th>
<th>r</th>
<th>p^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEAS Math Subscore</td>
<td>.044</td>
<td>.713</td>
</tr>
</tbody>
</table>

^a Two-tailed significance

TEAS science subscore.

A scatterplot of MAI pre-test scores and TEAS science subscores revealed that a linear relationship did not exist between these two variables (Figure 10). The correlation coefficient (r = .058) represented a very low positive correlation between MAI pre-test scores and TEAS science subscores (Table 13).

Figure 10. Scatterplot of Total MAI Pre-test Scores and TEAS Science Subscore (n = 71)
Table 13
Relationship Between Pre-Test MAI scores and TEAS Science Subscores Variable Using Pearson Product-Moment Correlation (r) Analyses (n = 71)

<table>
<thead>
<tr>
<th>Variable</th>
<th>r</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEAS Science Subscore</td>
<td>.058</td>
<td>.632</td>
</tr>
</tbody>
</table>

* Two-tailed significance

TEAS English subscore.

A scatterplot of MAI pre-test scores and TEAS English subscores revealed that a linear relationship did not exist between these two variables (Figure 11). The correlation coefficient (r = -.031) represented a very low negative correlation between MAI pre-test scores and TEAS English subscores (Table 14).

![Scatterplot of Total MAI Pre-test Scores and TEAS English Subscore](chart.png)

Figure 11. Scatterplot of Total MAI Pre-test Scores and TEAS English Subscore (n = 71)

Table 14
Relationship Between MAI Pre-Test Scores and TEAS English Subscores Variable Using Pearson Product-Moment Correlation (r) Analyses (n = 71)

<table>
<thead>
<tr>
<th>Variable</th>
<th>r</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEAS English Subscore</td>
<td>-.031</td>
<td>.799</td>
</tr>
</tbody>
</table>

* Two-tailed significance

Pearson product-moment correlations revealed that there were very low, insignificant correlations between the MAI pre-test scores and other variables including age, overall GPA, nursing GPA, TEAS composite score, and TEAS subscores. The correlation coefficients ranged from -.054 (overall GPA) to .128 (age).
Further analyses using the correlation matrix revealed statistically significant correlations between other variables (Table 15). High positive correlations between TEAS subscores and the TEAS composite scores were expected because the subscores contribute to the composite score. There were statistically significant, low positive correlations between the TEAS composite and overall GPA \( (r = .297, p = .012) \) and nursing GPA \( (r = .349, p = .003) \). Of the TEAS subscores, the reading subscore was least correlated with overall GPA \( (r = .172, p = .152) \) and nursing GPA \( (r = .194, p = .104) \). A statistically significant, low negative correlation was found between student age and overall GPA \( (r = -.279, p = .006) \). There was a very low negative correlation between age and nursing GPA \( (r = -.191, p = .063) \).

**Results for Phase Two**

Phase Two data collection consisted of obtaining MAI post-test scores and final portfolio numerical grades. Data analyses for Phase Two included a paired-samples \( t \) test comparing MAI pre-test data from Phase One to MAI post-test data and a Pearson product-moment correlation between MAI post-test scores and final portfolio grades. Of the 95 students included in Phase One data and analyses, 87 students completed the MAI post-test. Of the eight students not included in post-test data, six students dropped or withdrew from the course and two students were unavailable to take the post-test in spite of multiple attempts by the researcher to connect with the students. Of the 87 students with post-test scores, one student did not turn in a final portfolio and therefore received a grade of zero. That student’s portfolio grade was an outlier so it was excluded from the analysis of the correlation between MAI post-test score and final portfolio grade. Descriptive statistics of the variables were obtained prior to further analyses.
Table 15
Correlation Matrix of the Variables of Age, Overall GPA, Nursing GPA, TEAS Reading Subscores, TEAS Math Subscores, TEAS Science Subscores, TEAS English Subscores, and TEAS Composite Scores

<table>
<thead>
<tr>
<th>Variables</th>
<th>Age</th>
<th>Overall GPA</th>
<th>Nursing GPA</th>
<th>Read.</th>
<th>Math</th>
<th>Science</th>
<th>English</th>
<th>TEAS Comp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>1</td>
<td>-.279**</td>
<td>-.191</td>
<td>-.062</td>
<td>-.179</td>
<td>.032</td>
<td>-.054</td>
<td>-.076</td>
</tr>
<tr>
<td>p</td>
<td>.006</td>
<td>.063</td>
<td>.606</td>
<td>.135</td>
<td>.793</td>
<td>.652</td>
<td>.530</td>
<td></td>
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<tr>
<td>N</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>Overall GPA</td>
<td>r</td>
<td>-.279**</td>
<td>1</td>
<td>.894**</td>
<td>.172</td>
<td>.244*</td>
<td>.250*</td>
<td>.313**</td>
</tr>
<tr>
<td>p</td>
<td>.006</td>
<td>.000</td>
<td>.152</td>
<td>.040</td>
<td>.036</td>
<td>.008</td>
<td>.012</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>Nursing GPA</td>
<td>r</td>
<td>-.191</td>
<td>.894**</td>
<td>1</td>
<td>.194</td>
<td>.301*</td>
<td>.313**</td>
<td>.294*</td>
</tr>
<tr>
<td>p</td>
<td>.063</td>
<td>.000</td>
<td>.104</td>
<td>.011</td>
<td>.008</td>
<td>.013</td>
<td>.003</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>Read.</td>
<td>r</td>
<td>-.062</td>
<td>.172</td>
<td>.194</td>
<td>1</td>
<td>.486**</td>
<td>.476**</td>
<td>.441**</td>
</tr>
<tr>
<td>p</td>
<td>.606</td>
<td>.152</td>
<td>.104</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td></td>
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<tr>
<td>N</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>Math</td>
<td>r</td>
<td>-.179</td>
<td>.244*</td>
<td>.301*</td>
<td>.486**</td>
<td>1</td>
<td>.588**</td>
<td>.410**</td>
</tr>
<tr>
<td>p</td>
<td>.135</td>
<td>.040</td>
<td>.011</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>r</td>
<td>.032</td>
<td>.250*</td>
<td>.313**</td>
<td>.476**</td>
<td>.588**</td>
<td>1</td>
<td>.520**</td>
</tr>
<tr>
<td>p</td>
<td>.793</td>
<td>.036</td>
<td>.008</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>r</td>
<td>-.054</td>
<td>.313**</td>
<td>.294*</td>
<td>.441**</td>
<td>.410**</td>
<td>.520**</td>
<td>1</td>
</tr>
<tr>
<td>p</td>
<td>.652</td>
<td>.008</td>
<td>.013</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>TEAS Comp.</td>
<td>r</td>
<td>-.076</td>
<td>.297*</td>
<td>.349**</td>
<td>.749**</td>
<td>.807**</td>
<td>.850**</td>
<td>.720**</td>
</tr>
<tr>
<td>p</td>
<td>.530</td>
<td>.012</td>
<td>.003</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td></td>
</tr>
</tbody>
</table>

Overall GPA = Overall College GPA; Nursing GPA = Nursing GPA; Read. = TEAS Reading subscore; Math = TEAS Math subscore; Science = TEAS Science subscore; English = TEAS English subscore; TEAS Comp. = TEAS Composite Score

*a Two-tailed significance
** Correlation is significant at the 0.01 level.
* Correlation is significant at the 0.05 level.
MAI post-test variable descriptive statistics

The MAI post-test was administered to students at the end of the course. As with the pre-test, students recorded a response for each of the 52 items as Always False (score of 1), Sometimes False (score of 2), Neutral (score of 3), Sometimes True (score of 4), or Always True (score of 5). Total MAI post-test scores were normally distributed according to Shapiro-Wilk test of normality (W = .984, p = .353) and ranged from 158 to 253 (n = 87, M=206.598, SD = 22.179). There were no outliers found. Table 16 represents the descriptive statistics of the total MAI post-test, the knowledge of cognition category scores, and the regulation of cognition category scores from the 87 students included in the paired-samples t test analysis comparing the MAI pre-test and post-test scores.

Table 16
Descriptive Statistics for MAI Post-Test Scores (n = 87)

<table>
<thead>
<tr>
<th>MAI Post-Test Scores</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>158</td>
<td>253</td>
<td>206.598</td>
<td>22.179</td>
</tr>
<tr>
<td>Knowledge of Cognition</td>
<td>53</td>
<td>83</td>
<td>69.710</td>
<td>7.250</td>
</tr>
<tr>
<td>Regulation of Cognition</td>
<td>99</td>
<td>172</td>
<td>136.890</td>
<td>16.387</td>
</tr>
</tbody>
</table>

To correlate the MAI post-test scores to final portfolio grades, one student was removed from the sample because the student did not submit a final portfolio, receiving an outlier grade of zero. Removal of the outlier to correlate MAI post-test scores to final portfolio grades had little effect on the descriptive statistics of the MAI post-test (n = 86, M = 206.465, SD = 22.274).

Final portfolio grade variable descriptive statistics

The students’ final portfolio grades were obtained from the course management system. Of the 87 students included in Phase Two analyses, one student did not turn in a portfolio and received a grade of zero (z = -8.45). That grade represented an outlier and was removed from the data set. Even with the outlier removed, the distribution of final portfolio grades failed to meet the assumption of normality using Shapiro-Wilk test of normality (W = .877, p = .000). The
portfolio scores were positively skewed (skewedness = -.912). Table 17 represents the
descriptive statistics for the final portfolio grades.

Table 17
Descriptive Statistics for Final Portfolio Grades (n = 86)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Portfolio Grades</td>
<td>80</td>
<td>97</td>
<td>91.291</td>
<td>4.308</td>
</tr>
</tbody>
</table>

Phase Two results by research questions

Question 5: Is there a correlation between pre-nursing students’ post-test MAI
scores and their final portfolio grades?

Review of a scatterplot and analyses using Pearson product-moment correlation
coefficient (r) assisted in answering Question 5. A scatterplot of MAI post-test scores and final
portfolio grades revealed that a linear relationship did not exist between these two variables
(Figure 12). The correlation coefficient (r = .188) represented a very low positive correlation
between MAI post-test scores and final portfolio grades (Table 18).

![Scatterplot of Total MAI Post-test Scores and Final Portfolio Grades](image)

Figure 12. Scatterplot of Total MAI Post-test Scores and Final Portfolio Grades (n = 86)

Table 18
Relationship Between MAI Post-Test Scores and Final Portfolio Grades Variable Using Pearson
Product-Moment Correlation (r) Analyses (n = 86)

<table>
<thead>
<tr>
<th>Variable</th>
<th>r</th>
<th>p&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Portfolio Grades</td>
<td>.188</td>
<td>.082</td>
</tr>
</tbody>
</table>

<sup>a</sup> Two-tailed significance
Because no statistically significant correlation existed between MAI pre-test scores and final portfolio grades using Pearson $r$, Kendall’s tau-b and Spearman’s rho were also calculated. These additional correlation coefficients yielded similar results to the Pearson $r$ in that there were very low correlations and the correlations were not statistically significant.

**Question 6: Is there a statistically significant increase in pre-nursing students’ MAI scores following a metacognitive intervention?**

To answer this question, the mean differences were analyzed for normality, central tendency, and variability. Shapiro-Wilk test of normality indicated that the distribution of mean differences was normal ($W = .988, p = .635$). Table 19 shows descriptive statistics of the mean differences between the MAI pre- and post-test.

Table 19
Descriptive Statistics of Mean Differences between MAI Pre-Test Scores and MAI Post-Test Scores (n = 87)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Differences</td>
<td>-38</td>
<td>33</td>
<td>2.437</td>
<td>15.315</td>
<td>1.642</td>
</tr>
</tbody>
</table>

Once assumptions had been met, a one-tailed, paired-samples $t$ test was used to determine if the means of the MAI post-test were significantly higher than the means of the MAI pre-test at $\alpha = .05$. The results of the $t$ test (Table 20) indicated that there was not a statistically significant increase in MAI post-test scores as compared to MAI pre-test scores.

Table 20
Results of a Paired-Samples $t$ Test Comparing Mean Differences Between MAI Post-Test Scores and MAI Pre-Test Scores (n = 87)

<table>
<thead>
<tr>
<th>MAI Post-test – MAI Pre-test</th>
<th>$t$</th>
<th>df</th>
<th>$p^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.484</td>
<td>86</td>
<td>.071</td>
</tr>
</tbody>
</table>

$^a$ One-tailed significance
The lack of statistical significance warranted further analyses. The author of the MAI survey categorized each item by the metacognitive category and the subcomponent it was assessing. Table 21 describes the distribution of the items by metacognitive category and subcomponent.

Table 21
MAI Survey Items by Metacognition Category and Subcomponent

<table>
<thead>
<tr>
<th>Metacognition Category</th>
<th>Metacognition Subcomponent</th>
<th>Item Number on MAI Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of Cognition</td>
<td>Declarative Knowledge</td>
<td>5, 10, 12, 16, 17, 20, 32, 46</td>
</tr>
<tr>
<td></td>
<td>Procedural Knowledge</td>
<td>3, 14, 27, 33</td>
</tr>
<tr>
<td></td>
<td>Conditional Knowledge</td>
<td>15, 18, 26, 29, 35</td>
</tr>
<tr>
<td>Regulation of Cognition</td>
<td>Planning</td>
<td>4, 6, 8, 22, 23, 42, 45</td>
</tr>
<tr>
<td></td>
<td>Monitoring (Including Information Management Strategies and Debugging)</td>
<td>1, 2, 9, 11, 13, 21, 25, 28, 30, 31, 34, 37, 39, 40, 41, 43, 44, 47, 48, 49, 51, 52</td>
</tr>
<tr>
<td></td>
<td>Evaluation</td>
<td>7, 19, 24, 36, 38, 50</td>
</tr>
</tbody>
</table>

Further statistical analyses were performed to determine if a statistically significant increase in MAI scores following the intervention was evident in either of the metacognition categories or any of the metacognition subcomponents. First, the sum of the scores for each category and subcomponent were calculated for each participant in the sample. Then, a paired-samples t test, $\alpha = .05$, was used to analyze the difference in the means of each category and subcomponent. Table 22 and Table 23 summarize the results of each t test.

These results show that, when isolated by metacognition category and subcomponent, students scored significantly higher in the overall category of knowledge of cognition ($M = .920$, $t = 1.703$, $p = .046$, $d = .183$) and more specifically in the metacognition subcomponents of procedural knowledge ($M = .701$, $t = 3.187$, $p = .001$, $d = .342$) and regulation through evaluating ($M = 1.161$, $t = 3.677$, $p = .000$, $d = .394$).
Table 22
Paired-Samples $t$ Test of Mean Difference of Metacognition Categories (n = 87)

<table>
<thead>
<tr>
<th>Category</th>
<th>Subcomponent</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error of Mean</th>
<th>t</th>
<th>df</th>
<th>$p^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of Cognition</td>
<td>Declarative</td>
<td>.172</td>
<td>2.800</td>
<td>.300</td>
<td>.574</td>
<td>86</td>
<td>.283</td>
</tr>
<tr>
<td></td>
<td>Procedural</td>
<td>.701</td>
<td>2.052</td>
<td>.220</td>
<td>3.187</td>
<td>86</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Conditional</td>
<td>.046</td>
<td>2.505</td>
<td>.269</td>
<td>.171</td>
<td>86</td>
<td>.432</td>
</tr>
<tr>
<td>Regulation of Cognition</td>
<td>Planning</td>
<td>.092</td>
<td>3.902</td>
<td>.418</td>
<td>.220</td>
<td>86</td>
<td>.414</td>
</tr>
<tr>
<td></td>
<td>Monitoring</td>
<td>.264</td>
<td>7.705</td>
<td>.826</td>
<td>.320</td>
<td>86</td>
<td>.375</td>
</tr>
<tr>
<td></td>
<td>Evaluating</td>
<td>1.161</td>
<td>2.945</td>
<td>.316</td>
<td>3.677</td>
<td>86</td>
<td>.000</td>
</tr>
</tbody>
</table>

$^a$ One-tailed significance

Table 23
Paired-Samples $t$ Test of Mean Difference of Metacognition Subcomponents (n = 87)

<table>
<thead>
<tr>
<th>Category</th>
<th>Subcomponent</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error of Mean</th>
<th>t</th>
<th>df</th>
<th>$p^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of Cognition</td>
<td>Declarative</td>
<td>.172</td>
<td>2.800</td>
<td>.300</td>
<td>.574</td>
<td>86</td>
<td>.283</td>
</tr>
<tr>
<td></td>
<td>Procedural</td>
<td>.701</td>
<td>2.052</td>
<td>.220</td>
<td>3.187</td>
<td>86</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Conditional</td>
<td>.046</td>
<td>2.505</td>
<td>.269</td>
<td>.171</td>
<td>86</td>
<td>.432</td>
</tr>
<tr>
<td>Regulation of Cognition</td>
<td>Planning</td>
<td>.092</td>
<td>3.902</td>
<td>.418</td>
<td>.220</td>
<td>86</td>
<td>.414</td>
</tr>
<tr>
<td></td>
<td>Monitoring</td>
<td>.264</td>
<td>7.705</td>
<td>.826</td>
<td>.320</td>
<td>86</td>
<td>.375</td>
</tr>
<tr>
<td></td>
<td>Evaluating</td>
<td>1.161</td>
<td>2.945</td>
<td>.316</td>
<td>3.677</td>
<td>86</td>
<td>.000</td>
</tr>
</tbody>
</table>

$^a$ One-tailed significance
CHAPTER 5: DISCUSSION

Introduction

The purpose of this study is to describe how pre-nursing students’ self-reported metacognitive awareness correlates with age and academic variables and to explore the effects of a metacognitive intervention on students’ metacognitive awareness. A quasi-experimental design was used, consisting of a pre-test, intervention, and post-test with no control group. Limitations include threats to internal validity related to lack of a control group, potential testing effects, potential inflation of self-report scores, and interaction between researcher and participants. There is a threat to external validity and limited generalizability of findings because participants were not randomly selected and represent only pre-nursing students at the study setting.

The following discussion of the study results begins with an explanation of the descriptive statistics of the Metacognitive Awareness Inventory (MAI) scores, as data related to MAI scores were used to answer each research question. Then, a discussion of the study findings is presented, organized by research phases and questions.

Discussion of MAI descriptive statistics results

The Metacognitive Awareness Inventory (MAI) was the instrument used to measure students’ metacognitive awareness for each research question in this study. The pre-test was administered on the first day of class and the post-test was administered within the last three weeks of the course. Metacognition is difficult to assess because it is often implicit and, therefore, not directly observable (Flavell, 1979; Schraw, 2000; Tobias & Everson, 2009). Attempts to quantify metacognition and assess it quickly and efficiently led to the development of the MAI (Schraw & Dennison, 1994).
One limitation of the MAI is that students must be aware of their cognition to respond appropriately to the 52 items. Reliance on students to assess their own thinking can lead to inaccuracies in student responses. Also, the MAI factor analysis conducted by Schraw and Dennison (1994) revealed that the items factored on the two categories of metacognition, knowledge and regulation of cognition, but did not factor on the distinct subcomponents of metacognition, rendering the analysis of the subcomponents questionable.

The results of the descriptive statistics of both the MAI pre-test and post-test were consistent with expectations from the literature. The scores from both tests were normally distributed, after removal of a pre-test outlier. In previous studies, the scores for knowledge of cognition and regulation of cognition were positively correlated in the moderate to high range (Schraw & Dennison, 1994; Sperling, Howard, Staley, & DuBois, 2004). That trend continued in the results from this study. For the MAI pre-test, knowledge and regulation of cognition were moderately correlated ($r = .646, p = .000$), and for the post-test, those metacognition categories were highly correlated ($r = .719, p = .000$). These findings support the key theoretical assumption that knowledge of cognition and regulation of cognition are related. Further discussion of findings related to MAI scores is reported in the following sections.

**Phase One Discussion**

In Phase One, the researcher analyzed data related to MAI pre-test scores, age, overall College grade point average (GPA), nursing GPA, and scores on the Test of Essential Academic Skills (TEAS). A two-tailed, bivariate analysis resulting in a Pearson product-moment correlation coefficient ($r$) was used to analyze data for Questions 1, 2, 3, and 4.
Discussion of Question 1 results

Question 1 asks if a correlation exists between pre-nursing students’ MAI pre-test scores and their age. The literature suggests that knowledge of cognition increases with age and that adults are better able to use that knowledge to regulate their cognition than children (Schraw & Moshman, 1995). It is also recognized that knowledge of cognition develops early in children, usually by 10 years of age, followed by regulation of cognition emerging in the form of planning between 10 to 14 years of age (Schraw & Moshman, 1995). Monitoring and regulation of cognition are thought to develop slowly and may not be completely operative even in adults (Lai, 2011; Schraw & Moshman, 1995).

Much of the research on metacognition focuses on metacognitive development in children, not adults. Although experts agree that adults have higher metacognitive abilities than young children (Schraw & Moshman, 1995), there is limited evidence about metacognitive changes throughout college and adulthood. Because increased metacognition is evident with more experience (Schraw & Moshman, 1995), one might hypothesize that older students with more experience should have higher levels of metacognition, however there is no evidence in the literature to support this assumption.

The results of this study’s correlation analysis indicate that metacognitive awareness assessed by the MAI is not correlated with age in this sample (r = .128, p = .218). One factor contributing to this may be the skewed distribution of ages in the sample. Students’ ages did not follow a normal distribution as more than half of the students (53.3%) were 19 to 21 years of age. Additionally, individual confounding factors could contribute to the lack of correlation. For example, a 43-year-old student who has been out of school for twenty years may have less metacognitive awareness on an inventory that asks about learning strategies than a 20-year-old
student who has been continuously enrolled in school and recently completed a course in study skills.

A review of the literature revealed no research examining the correlation between MAI scores and age. The items on the MAI ask participants to self-report their knowledge and regulation of cognition related to learning. Although, the items are domain-general, they may be more appropriate and relevant to adults who are also students, so most researchers use the MAI to study College students. Because undergraduate College students are typically 18 to 23 years of age, limited age variability exists in samples from this demographic, making correlations with age less appropriate.

The lack of correlation between metacognitive awareness and age reminds nursing faculty that variability exists in students’ metacognitive awareness across all age groups. Nurse educators should not assume that non-traditional, older students, are more aware of their own metacognitive processes. Research shows that College students may not use metacognitive processes unless they are encouraged to do so (Dominowski, 1998), so students of all ages may require explicit instruction in metacognition strategies.

**Discussion of Questions 2, 3, and 4 results**

Questions 2, 3, and 4 seek to determine whether or not a correlation exists between pre-nursing students’ MAI pre-test scores and the academic variables of overall College GPA, nursing GPA, and TEAS composite scores and subscores. The literature suggests that metacognitive skills improve academic performance (Bransford, Brown, & Cocking, 2000, Pintrich, 2002; Pintrich & De Groot, 1990), however, measures of academic performance vary considerably. Researchers may use GPAs, standardized tests, grades on content-specific assignments, and course grades to assess academic performance. The two academic measures
used in Phase One were GPAs and scores from a standardized test, the TEAS. Grade point averages are sometimes criticized because they represent a measure of academic success and not necessarily a measure of learning. Interestingly, in this study, a low correlation was found between the standardized TEAS composite scores and overall College GPA ($r = .297, p = .012$) and nursing GPA ($r = .349, p = .003$). Studies indicate that the TEAS can predict success in early nursing school courses so the low correlation between the TEAS composite scores and GPAs may lead nursing faculty to reconsider admission requirements.

A review of the literature revealed that correlations between metacognition and academic indicators varied considerably depending on how metacognition was assessed (Pintrich, Wolters, & Baxter, 2000; Tobias & Everson, 2009). One study that revealed a low positive correlation ($r_s = .23$) between MAI scores and GPA (Young & Fry, 2008). However, other studies show that when researchers use self-report measures, like the MAI, to measure metacognition, very low correlations usually exist between scores on those measures and both GPA and standardized tests (Pintrich et al., 2000; Sperling et al., 2004; Tobias & Everson, 2009). When other, more content-specific methods are used to assess metacognition, there is often a relationship between metacognition and GPA (Everson & Tobias, 1998; Tobias & Everson, 2009).

The results from this study are congruent with the literature. There was almost no correlation between MAI pre-test scores and both overall College GPA ($r = -.054, p = .605$) and nursing GPA ($r = .031, p = .768$). This lack of relationship could represent an inherent problem in assessing metacognition with the MAI instrument and other self-report inventories. To adequately report metacognition, students would have to be aware of their metacognitive strategies, but the literature suggests that adult learners may not be consciously aware of their cognition (Dominowski, 1998; Lai, 2011; Schraw & Moshman, 1995).
The very low correlations between MAI pre-test scores and academic variables may also result from a lack of emphasis on metacognition in most classrooms. Too often, GPA and standardized tests measure rote knowledge and not problem-solving or critical thinking that may require higher metacognitive abilities. In other words, students have not been asked to use metacognitive skills to earn their GPAs. Students may have been successful in school, as evidenced by high grades, without ever thinking about their thinking. Standardized tests, like the TEAS, are designed to ensure that students have adequate content knowledge to be successful in future courses. The TEAS may not, however, require that students use higher-level metacognitive strategies. Therefore, the very low correlation between the MAI pre-test scores and the TEAS composite \((r = .058, p = .632)\) in this study is congruent with the findings in the literature. The correlations between the MAI pre-test scores and the TEAS subscores were similarly unremarkable.

Nurse educators must prepare students to manage complex care needs of patients and to have skills in negotiation, collaboration, ethical comportment, and cultural competence. Nurses who think about their thinking and who regulate their thinking may be better able to adapt their skills to novel, dynamic clinical situations. Nurse educators should be aware that the metacognitive awareness and skills needed to practice nursing effectively in today’s society may not be predicted from GPAs and TEAS scores, even though these parameters are key factors determining admission to nursing programs. Academic indicators like GPA and the TEAS may, however, indicate adequate content knowledge and readiness for nursing school. Once in nursing school, students will require metacognitive training to improve self-reflection and regulatory skills that are critical to nursing school success and effective decision-making in clinical practice.
Phase Two Discussion

In Phase Two, the researcher analyzed data related to MAI post-test scores and final reflective portfolio grades. Phase Two data collection occurred in the last few weeks of the pre-nursing course following a semester-long metacognitive intervention.

Discussion of intervention

The implementation of the intervention was more difficult than expected for a number of reasons. First, one of the primary faculty for the course retired unexpectedly one week before the course started. Two faculty members agreed to split the teaching load of the retired faculty member, which meant that they were teaching in six sections of three different courses. Second, one of the faculty members who replaced the retiree took medical leave for six weeks during the semester, which resulted in a higher student to teacher ratio during that time period. Third, clinical faculty members were not in place prior to the start of the course and, therefore, had an abbreviated orientation to the course and metacognition training. Clinical faculty members were responsible for weekly feedback to students on their reflective prompts, but only related to content accuracy and connections. Clinical faculty also participated in grading of the portfolios.

Fourth, of the three classroom teachers and six clinical faculty members in the course, only two had taught in the course before. The new additions to the course had no experience responding to reflective writing or grading portfolios so the learning curve was steep. Finally, there was a significant change in the researcher’s engagement with the pre-nursing course. In the beginning of the semester, the researcher was reassigned to focus on course development for new courses, which meant limited involvement in the pre-nursing course. The researcher monitored the intervention by attending class and by randomly checking students’ online reflection submissions. Classroom visits occurred twice for each section of the pre-nursing course, once
during week three and once during week seven. During those visits the researcher assisted in facilitating discussions about the portfolios, metacognition, and reflection. During week two and week ten, the researcher reviewed five student reflective writing submissions to ensure that reflective writing was being required by faculty and completed by students.

The plan for the intervention was threefold: explicitly teach students about metacognition early in the course and model teacher metacognition throughout the course; assign reflective writing, both weekly reflections and two reflective portfolio assignments (mid-term and final); and discuss weekly reflections and mid-term portfolio draft with the team and the class. Course faculty members agree that they could have improved on modeling metacognition and making its discussion more explicit. The faculty also reported the need for clinical faculty to be assigned to the course as early as possible to allow for extensive orientation to the course, reflective writing, and metacognition. These concerns related to the intervention represent an additional limitation of the study and may have affected the results of Phase Two analyses.

Further faculty development related to metacognition is warranted prior to implementation of a subsequent intervention. In fact, assessing metacognitive awareness of faculty may be warranted as this has recently surfaced as a potential factor in students’ metacognitive awareness (Balcikanli, 2011).

**Discussion of Question 5 results**

Following the intervention, scores on the MAI post-test were correlated to number grades on the final reflective portfolio using bivariate analysis resulting in a Pearson product-moment correlation coefficient ($r$). The final portfolio required students to reflect on their learning of course content and to respond to metacognitive prompts. Because of the integration of reflection and metacognition in the portfolio, the researcher expected to find a moderate positive
correlation between the MAI post-test scores and the final portfolio grades, but the analysis revealed a very low positive correlation ($r = .188, p = .082$) between these variables.

One possible explanation for the findings is that the final portfolio grades did not follow a normal distribution and were positively skewed. The course faculty admitted that grade inflation was a problem on the final portfolio. Because the final rubric was not posted to the course management system in a timely manner and inconsistencies were found between posted portfolio documents and the rubric, the faculty accounted for these faculty-created issues when recording grades. Course faculty members were unable to describe to the researcher a formula for grade inflation, but they indicated that students received higher grades than they should have for their work. Also, students received feedback on their midterm portfolio, which followed the same format as the final portfolio, so student familiarity with the assignment, with reflective writing, and with faculty expectations may have contributed to the positively skewed grades.

**Discussion of Question 6 results**

To answer Question 6, a one-tailed, paired-samples $t$ test was used to analyze whether or not there was a statistically significant increase in MAI scores following the metacognitive intervention. This analysis was applied to total MAI scores and to the knowledge of cognition and regulation of cognition categories of the MAI. The researcher expected a statistically significant increase in total MAI scores, but the results of the study did not support that hypothesis ($t = 1.484, df = 86, p = .071$). Lack of statistical significance may have resulted from ineffective implementation of the intervention.

Factor loadings of the MAI from a previous study support the analysis of MAI scores in the categories of knowledge of cognition and regulation of cognition (Schraw & Dennison, 1994). For the current study, the scores in the category of knowledge of cognition resulted in a
statistically significant increase ($t = 1.703, p = .046$) but the effect size was small ($d = .183$). Results revealed no statistically significant increase in the scores for regulation of cognition ($t = 1.182, p = .120$). The results from these $t$ tests were somewhat surprising because the students engaged in many activities and prompts that should have promoted regulation of cognition, including the final portfolio.

To gain a better understanding of the results, the researcher further explored the distinct metacognition subcomponents subsumed under the categories of knowledge of cognition (declarative, procedural, and conditional knowledge) and regulation of cognition (planning, monitoring, and evaluating). Results from one-tailed, paired-samples $t$ tests of scores from specific metacognitive subcomponents on the MAI should be used with caution because the factor analysis from Schraw and Dennison’s (1994) study of the MAI inventory did not support analysis at this smaller grain size. The following discussion of the specific metacognitive subcomponents is for exploratory purposes and to inform future metacognitive interventions.

The results indicated that under knowledge of cognition, gains in procedural knowledge were significant ($t = 3.187, p = .001, d = .342$), and students demonstrated a statistically significant increase in items related to evaluating cognition ($t = 3.677, p = .000, d = .394$) in the regulation of cognition category. Procedural knowledge items on the MAI assess students’ awareness of how they use learning strategies, such as, “I try to use strategies that have worked in the past” and “I have a specific purpose for each strategy I use.” In this pre-nursing class, students were required to read and prepare before class, and they usually took a quiz on the content of the reading before engaging in class activities. An increase in procedural knowledge may have resulted from responding to weekly reflection prompts and the subsequent class discussions about the responses and appropriate learning strategies.
The mean difference in scores for evaluating cognition recorded the most significant increase of the metacognition subcomponents. This increase may be explained by the considerable focus on evaluation of cognition throughout the course. Each week, students were asked to respond to the prompt, “Which confusions remain and how am I going to get them clarified?” This prompt requires that students look back on their learning and evaluate their understanding and learning strategies. For the mid-term and final portfolios, students recorded how they came to understand the content and meaning of each course outcome through their class and clinical experiences. Also, the mid-term portfolio included additional prompts, such as, “To what extent did I accomplish the goals of this portfolio assignment?” and “If I were the instructor, what would I identify as strengths and weaknesses of my work?” The pre-nursing course’s emphasis on evaluation of cognition may have succeeded in improving students’ awareness of this metacognitive skill.

Results of the $t$ tests may have been significant with a sustained and effective faculty development strategy. Successful implementation of metacognitive interventions requires that faculty be able to define metacognition and to recognize their own metacognitive processes. Prior to future metacognitive interventions, faculty would benefit from engaging in reflective writing and activities that explicitly foreground their metacognition. Faculty may also be more motivated to promote metacognition in students if they understand its relevance to learning and critical thinking as reported in the literature.
CHAPTER 6: CONCLUSIONS

Introduction

To function effectively as a nurse in the evolving, complex healthcare system, students must learn to be skilled thinkers, know how to learn, and know how to use what they know in novel situations. Research in the field of metacognition may offer a useful framework to improve student learning throughout nursing school and to enhance critical thinking and clinical decision-making in nursing practice. The purpose of this study is to describe how pre-nursing students’ self-reported metacognitive awareness correlates with age and academic variables and to explore the effects of a metacognitive intervention on students’ metacognitive awareness.

Conclusions

Results of the study indicate that, in adult pre-nursing students, metacognitive awareness is not correlated with age or academic indicators including overall College grade point average (GPA), nursing GPA, standardized test scores on the Test of Essential Academic Skills (TEAS), and final portfolio grades. Therefore, nursing instructors should not assume that older, non-traditional students and students with high academic indicators are more aware of their own metacognitive processes. Nurse educators are interested in students’ acquisition of content knowledge, in their ability to think in complex care environments, and in their capacity to reflect on their thinking and nursing actions. Metacognitive skills may be a means to develop each of these competencies. The results of this study should remind nurse educators that students, regardless of age and academic variables, do not enter nursing school with a full complement of metacognitive skills. Instead, development of these skills through metacognitive interventions may be indicated.
Implementation of metacognitive interventions requires significant faculty development. Faculty members are largely unaware of metacognitive processes both in themselves and in their students. When faculty members do not understand the relationship between metacognition and student learning, the result is a weak commitment to pedagogical strategies using reflective thinking and metacognition. Faculty members need support from administration and metacognition training from experts to better understand their own metacognitive processes and to promote student metacognition. Although students’ overall metacognitive awareness did not increase significantly after the metacognitive intervention, their awareness of knowledge of cognition did show statistically significant improvement. Enhancements in faculty development in metacognition may yield more significant increases in students’ metacognitive awareness.

**Implications For Future Research**

Further research is needed in the area of metacognition in pre-nursing and nursing students. Repetition of this study in multiple settings is warranted following assessment of faculty metacognition and more extensive faculty training related to metacognition and intervention strategies. Nurse educators require an understanding of the definition and strategies of metacognition along with the rationale for improving metacognition in nursing students as described in the literature. Use of multiple indicators of metacognition, such as self-report inventories, reflection-in-action methods, and reflection-on-action methods, would lend to validity of the results.

Subsequent studies with this cohort of students and future nursing students could explore the transfer of metacognitive skills to practice settings and the instructional strategies necessary to promote metacognition in clinical practice. A new method of assessing metacognition in nursing students and new nurses that is discipline-specific may be needed.
Summary

Improvements in faculty training, assessment of faculty metacognition, and consistent and explicit metacognitive training of students may improve student metacognition regardless of age and academic variables. Nurse educators have a tremendous opportunity to improve student cognition and clinical decision-making through metacognitive interventions.
REFERENCES


## APPENDIX A
SAMPLE SELF-QUESTIONS FROM TANNER (2012)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Planning</th>
<th>Monitoring</th>
<th>Evaluating</th>
</tr>
</thead>
</table>
| Class session | - What are the goals of the class session going to be?  
- What do I already know about this topic?  
- How could I best prepare for the class session?  
- Where should I sit and what should I be doing (or not doing) to best support my learning during class?  
- What questions do I already have about this topic that I want to find out more about? | - What insights am I having as I experience this class session? What confusions?  
- What questions are arising for me during the class session? Am I writing them down somewhere?  
- Do I find this interesting? Why or why not? How could I make this material personally relevant?  
- Can I distinguish important information from details? If not, how will I figure this out? | - What was today's class session about?  
- What did I hear today that is in conflict with my prior understanding?  
- How did the ideas of today's class session relate to previous class sessions?  
- What do I need to actively go and do now to get my questions answered and my confusions clarified?  
- What did I find most interesting about class today? |
| Active-learning task and/or homework assignment | - What is the instructor's goal in having me do this task?  
- What are all the things I need to do to successfully accomplish this task?  
- What resources do I need to complete the task? How will I make sure I have them?  
- How much time do I need to complete the task?  
- If I have done something like this before, how could I do a better job this time? | - What strategies am I using that are working well or not working well to help me learn?  
- What other resources could I be using to complete this task? What action should I take to get these?  
- What is most challenging for me about this task? Most confusing?  
- What could I do differently mid-assignment to address these challenges and confusions? | - To what extent did I successfully accomplish the goals of the task?  
- To what extent did I use resources available to me?  
- If I were the instructor, what would I identify as strengths of my work and flaws in my work?  
- When I do an assignment or task like this again, what do I want to remember to do differently? What worked well for me that I should use next time? |
<table>
<thead>
<tr>
<th>Activity</th>
<th>Planning</th>
<th>Monitoring</th>
<th>Evaluating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz or exam</td>
<td>▪ What strategies will I use to study (e.g., study groups, problem sets,</td>
<td>▪ To what extent am I being systematic in my studying of all the material</td>
<td>▪ What about my exam preparation worked well that I should remember to do</td>
</tr>
<tr>
<td></td>
<td>evaluating text figures, challenging myself with practice quizzes, and/or</td>
<td>for the exam?</td>
<td>next time?</td>
</tr>
<tr>
<td></td>
<td>going to office hours and review sessions)?</td>
<td>▪ To what extent am I taking advantage of all the learning supports</td>
<td>▪ What did not work so well that I should not do next time or that I should</td>
</tr>
<tr>
<td></td>
<td>▪ How much time do I plan on studying? Over what period of time and for</td>
<td>available to me?</td>
<td>change?</td>
</tr>
<tr>
<td></td>
<td>how long each time I sit down do I need to study?</td>
<td>▪ Am I struggling with my motivation to study? If so, do I remember why I</td>
<td>▪ What questions did I not answer correctly? Why? How did my answer</td>
</tr>
<tr>
<td></td>
<td>▪ Which aspects of the course material should I spend more or less time</td>
<td>am taking this course?</td>
<td>compare with the suggested correct answer?</td>
</tr>
<tr>
<td></td>
<td>on, based on my current understanding?</td>
<td>▪ Which of my confusions have I clarified? How was I able to get them</td>
<td>▪ What questions did I not answer correctly? Why? What confusions do I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>clarified?</td>
<td>have that I still need to clarify?</td>
</tr>
<tr>
<td>Overall course</td>
<td>▪ Why is it important to learn the material in this course?</td>
<td>▪ In what ways is the teaching in this course supportive of my learning?</td>
<td>▪ What will I still remember 5 yr from now that I learned in this course?</td>
</tr>
<tr>
<td></td>
<td>▪ How does success in this course relate to my career goals?</td>
<td>How could I maximize this?</td>
<td>▪ What advice would I give a friend about how to learn the most in this</td>
</tr>
<tr>
<td></td>
<td>▪ How am I going to actively monitor my learning in this course?</td>
<td>▪ In what ways is the teaching in this course not supportive of my learning?</td>
<td>course?</td>
</tr>
<tr>
<td></td>
<td>▪ What do I most want to learn in this course?</td>
<td>How could I compensate for or change this?</td>
<td>▪ If I were to teach this course, how would I change it?</td>
</tr>
<tr>
<td></td>
<td>▪ What do I want to be able to do by the end of this course?</td>
<td>▪ How interested am I in this course? How confident am I in my learning?</td>
<td>▪ What have I learned about how I learn in this course that I could use in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>What could I do to increase my interest and confidence?</td>
<td>my future biology/science courses? In my career?</td>
</tr>
</tbody>
</table>

APPENDIX B
INSTITUTIONAL REVIEW BOARD APPROVAL FROM OUR LADY OF THE LAKE COLLEGE

Date: December 29, 2012
Study Number: 1226
Study Title: Impact of a Metacognitive Intervention in a Pre-Nursing Course
Primary Investigator: Bronwyn Doyle, MSN, RN, CPN
Secondary Investigators: Pamela Blanchard, Associate Professor, LSU School of Education
Approval Designation: Exempt Review
Primary Reviewer (Date): Michael Dreznick (December 29, 2012)
Secondary Reviewer (Date): Rhoda Reddix (December 28, 2012)

Dear Ms. Doyle,

I am pleased to inform you that Michael Dreznick and Rhoda Reddix of the Our Lady of the Lake College Institutional Review Board have reviewed and approved your proposed study entitled Impact of a Metacognitive Intervention in a Pre-Nursing Course conducted by Bronwyn Doyle and Pamela Blanchard.

Thank you for your submission and I would like to wish you success with your study.

Best regards,

[Signature]

Dr. Michael T. Dreznick,
Associate Professor and OLOL College IRB Chair

Received as email attachment from M. Dreznick, Our Lady of The Lake College Institutional Review Board Chair, on December 29, 2012.
APPENDIX C
INSTITUTIONAL REVIEW BOARD APPROVAL FROM LOUISIANA STATE UNIVERSITY

Application for Exemption from Institutional Oversight

Unless qualified as meeting the specific criteria for exemption from Institutional Review Board (IRB) oversight, all LSU research projects involving human subjects, samples, or data obtained from human, directly or indirectly, with or without their consent, must be approved or exempted in advance by the LSU IRB. This form helps the PI determine if a project may be exempted, and is used to request an exemption.

A Complete Application Includes All of the Following:
(A) Two copies of this completed form and two copies of parts B through F.
(B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts B & C)
(C) Copies of all instruments to be used.
(D) If this proposal is part of a grant proposal, include a copy of the proposal and all recruitment materials.
(E) The consent form that you will use in the study (see part 3 for more information.)
(F) Certificate of Completion of Human Subjects Protections Training for all personnel involved in the project, including students who are involved with testing or handling data, unless already on file with the IRB. Training link: [http://phs.obipe.com/sacc/login.php]
(G) IRB Security of Data Agreement: [http://research.lsu.edu/files/item36734.pdf]

1) Principal Investigator: Briony Doyle, MSN, RN, CPN
Department: Education
Phone: 225-205-1556
Email: briony.doyle@oakcollegel.com

2) Co-Investigator(s): Please include department, rank, phone and e-mail for each.
(Please identify and name supervising professor in this space)

3) Project Title: Impact of a Metacognitive Intervention in a Pre-Nursing Course

4) Proposed (yes or no) No If Yes, LSU Proposal Number

Also, if YES, either:
□ This application completely matches the scope of work in the grant
□ More applications will be filled later

5) Subject pool (e.g., Psychology students) Undergraduate pre-nursing students at Our Lady of the Lake College

*Circle any "vulnerable populations" to be used: children < 18; the mentally impaired; pregnant women, the elderly, etc. Projects with recruiter persons cannot be exempted.

6) PI Signature

Date 12-5-2012

I certify the responses are accurate and complete. If the project scope or design is later changes, I will resubmit for review. I will obtain written approval from the Authorized Representative of all LSU Institutions in which the study is conducted. I also understand that it is my responsibility to maintain copies of all consent forms at LSU for those years after completion of the study. If I leave LSU before that time the consent forms should be preserved in the Departmental Office.

Screening Committee Action: Exempted Not Exempted Category/Paragraph

Signed Consent Waived: Yes

Reviewer: Katie A. Gaede
Signature Date 12/13/12

Received as email attachment from J. Pasqua, Louisiana State University Institutional Review Board Coordinator, on December 21, 2012.
APPENDIX D
PARTICIPANT LETTER AND CONSENT FORM

November 25, 2012

Dear Nursing Student,

I am an Assistant Professor at Our Lady of the Lake College and a graduate student at Louisiana State University, School of Education. I am conducting a study to explore how beginning nursing students learn and think about their learning. This letter is written to request your participation in this study. Consenting to participate in the study means that you are allowing the researcher to:

- access and use your demographic and academic data from the College’s database and Assessment Technologies Institute website in the study. Demographic data may include age, race, gender, and other information. Academic data may include overall College grade point average (GPA), nursing GPA, score on the Test of Essential Academic Skills (TEAS), and other academic information.
- access and use your course grades, including course assignments and quiz grades, and final course grade in the study.
- use your results on the Metacognitive Awareness Inventory (MAI) developed by Schraw and Dennison (1994).

All students will complete the MAI at the beginning and end of the course as a course requirement, but allowing inclusion of your data in this study is voluntary. If you choose not have your data included, there are no consequences. Should you decide to participate, you may withdraw at any time. Though the results of this study will be published, your responses will be aggregated so that individual student data is not revealed.

If you have any questions concerning this project, please contact me at 225-490-1696 or e-mail me at bronwyn.doyle@ololcollege.edu. Your signature below indicates your willingness to be included as a participant and have your responses, including self-reported demographics, included in the analysis.

Sincerely,

Bronwyn Doyle, MSN, RN, CPN
Assistant Professor
Our Lady of the Lake College
School of Nursing

Acknowledgement of Rights and Informed Consent:

The study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about subjects’ rights or other concerns, I can contact Robert C. Mathews, Chairman, LSU Institutional Review Board at (225) 578-8692 or Dr. Michael Dreznick, Chairman of the Our Lady of the
Lake College Institutional Review Board, at 225-214-6982. I agree to participate in the study described above and acknowledge the researchers' obligation to provide me with a copy of this consent form if signed by me.

________________________________  ______________________________  __________
Print Student Participant Name                  Signature                  Date
APPENDIX E
METACOGNITIVE AWARENESS INVENTORY

Please respond to the questions on this inventory by indicating how true or false each statement is about you. For example, if a statement is ALWAYS FALSE, bubble in A on your answer sheet. Your responses will be reported as aggregated data, so please answer as truthfully as you can.

<table>
<thead>
<tr>
<th>ALWAYS</th>
<th>SOMETIMES</th>
<th>SOMETIMES</th>
<th>ALWAYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FALSE</td>
<td>FALSE</td>
<td>NEUTRAL</td>
<td>TRUE</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>

1. I ask myself periodically if I am meeting my goals.
2. I consider several alternatives to a problem before I answer.
3. I try to use strategies that have worked in the past.
4. I pace myself while learning in order to have enough time.
5. I understand my intellectual strengths and weaknesses.
6. I think about what I really need to learn before I begin a task.
7. I know how well I did once I finish a test.
8. I set specific goals before I begin a task.
9. I slow down when I encounter important information.
10. I know what kind of information is most important to learn.
11. I ask myself if I have considered all options when solving a problem.
12. I am good at organizing information.
13. I consciously focus my attention on important information.
14. I have a specific purpose for each strategy I use.
15. I learn best when I know something about the topic.
16. I know what the teacher expects me to learn.
17. I am good at remembering information.
18. I use different learning strategies depending on the situation.
19. I ask myself if there was an easier way to do things after I finish a task.
20. I have control over how well I learn.
21. I periodically review to help me understand important relationships.
22. I ask myself questions about the material before I begin.
23. I think of several ways to solve a problem and choose the best one.
25. I ask others for help when I don't understand something.
ALWAYS  SOMETIMES  NEUTRAL  SOMETIMES  ALWAYS
FALSE    FALSE    NEUTRAL    TRUE    TRUE
A         B         C         D         E

26. I can motivate myself to learn when I need to.
27. I am aware of what strategies I use when I study.
28. I find myself analyzing the usefulness of strategies while I study.
29. I use my intellectual strengths to compensate for my weaknesses.
30. I focus on the meaning and significance of new information.
31. I create my own examples to make information more meaningful.
32. I am a good judge of how well I understand something.
33. I find myself using helpful learning strategies automatically.
34. I find myself pausing regularly to check my comprehension.
35. I know when each strategy I use will be most effective.
36. I ask myself how well I accomplished my goals once I'm finished.
37. I draw pictures or diagrams to help me understand while learning.
38. I ask myself if I have considered all options after I solve a problem.
39. I try to translate new information into my own words.
40. I change strategies when I fail to understand.
41. I use the organizational structure of the text to help me learn.
42. I read instructions carefully before I begin a task.
43. I ask myself if what I'm reading is related to what I already know.
44. I re-evaluate my assumptions when I get confused.
45. I organize my time to best accomplish my goals.
46. I learn more when I am interested in the topic.
47. I try to break studying down into smaller steps.
48. I focus on overall meaning rather than specifics.
49. I ask myself questions about how well I am doing while I am learning something new.
50. I ask myself if I learned as much as I could have once I finish a task.
51. I stop and go back over new information that is not clear.
52. I stop and reread when I get confused.

APPENDIX F
REFLECTIVE PORTFOLIO DESCRIPTION: MID-TERM AND FINAL

Portfolio readers will rely on your Reflective Overview (RO) to guide them through your portfolio and to help them understand the evidence you included, why you chose it, and how it represents your learning. Both your RO and your evidence will be evaluated. An effective portfolio will depend on the quality of the evidence and the extent to which the RO makes connections between the evidence and the assigned course outcomes.

For the Mid-Term Portfolio address the following 5 course outcomes:
CO 1: Identify holistic factors affecting the health of individuals, families, communities, and populations across the lifespan.
CO 2: Demonstrate selected beginning nursing skills using scientific and nursing principles.
CO 6: Recognize the principles of effective communication in the delivery of high quality care.
CO 8: Describe legal issues relevant to the delivery of health care.
CO 10: Recognize importance of inquiry and reflection in professional nursing.

For the Final Portfolio address all 10 of the course outcomes, as follows:
CO 1: Identify holistic factors affecting the health of individuals, families, communities, and populations across the lifespan.
CO 2: Demonstrate selected beginning nursing skills using scientific and nursing principles.
CO 3: Recognize the nursing process as a framework for providing basic nursing care.
CO 4: Identify the significance of evidence-based practice in health care delivery.
CO 5: Identify uses of technology in the delivery of quality health care.
CO 6: Recognize the principles of effective communication in the delivery of high quality care.
CO 7: Discuss the roles of team members within the healthcare system.
CO 8: Describe legal issues relevant to the delivery of health care.
CO 9: Identify ethical principles necessary for caring relationships.
CO 10: Recognize importance of inquiry and reflection in professional nursing.

For each assigned course outcome, you should fulfill all of the following expectations:

Course Content:
- Full coverage of portfolio period
  - The RO and evidence represents course content coverage from the beginning of the course until submission of the portfolio (this applies to the midterm and final cumulative portfolio)

- Full and accurate understanding
  - The writer “knows” the content and “knows how” to appropriately apply that knowledge (where relevant).
  - Explanations of and references to course content and concepts are accurate and well developed enough to demonstrate that the writer understands the content.
Connections:
- Reflective overview explains clearly and fully the connections between outcomes and evidence (showing personal learning)
  - Reflective Overview guides and explains, connecting course learning outcomes to relevant, appropriate, and sufficient evidence.
  - Writers show how they are making connections among course work, pre-class work, post-class work, clinical/SETH experiences, and SETH experiences.
  - For each outcome, as a way to demonstrate and explain learning, writers describe how their thinking / knowledge / understanding has changed over time and is more developed now than earlier in this class.
  - Writers emphasize personal learning and not just team learning.
  - Writers explain why they chose particular pieces of evidence and explain specifically and fully how the evidence they chose is an example of “learning” or how that evidence (or producing that evidence) contributed to their learning.
  - Writers weave references to evidence into their explanations and do not merely say “see XYZA for my evidence.”
  - Writers do not assume that readers are familiar with N1730 content or the class activities and therefore fully explain the context of the evidence and how it is relevant.
- Between course content and current/future professional practice
  - Writers show how they are transferring learning from one experience to another such as applying course content in clinical practice.
  - Writers describe how their learning relates to their future nursing career and why this content is relevant to nursing practice?

The overall portfolio should meet the following expectations:

Professional Communication:
- Organization
  - Writers correctly link references in the RO to the documents serving as evidence. Writer verifies that each link is directing the reader to the appropriate evidence.
  - When referring to evidence, writers are specific about where readers should look and why. Writers identify each piece of evidence and more specifically where in the evidence readers should focus their attention (which paragraph on the page or which prompt, etc.).
- College-level work
  - Overview represents College-level writing and shows that writers have devoted time and care to planning, drafting, revising, and editing / proofreading.
  - The readers are not distracted by problems with sentence level concerns, mechanics, punctuation, or other features that would show a lack of care and professionalism.

See the Portfolio Rubric for grading criteria.
APPENDIX G
FINAL REFLECTIVE PORTFOLIO RUBRIC

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Evaluate for each course outcome:

Content:
- Full course of portfolio period
- Thorough, complete, and accurate knowledge
  - Knows content and how to apply content
  - Explanations of and references to course content and concepts are accurate and well developed

Connections:
- Between reflective overview and evidence (showing personal learning)
  - Connect course learning outcomes to relevant, appropriate, and sufficient evidence.
  - Weave evidence references into their explanations and do not merely say “see XYZA for my evidence.”
  - Explain the context of the evidence and how it is relevant.
  - Explain why they chose particular pieces of evidence and explain specifically and fully how the evidence they chose is an example of “learning” or how that evidence (or producing that evidence) contributed to their learning.
  - Show how they are making connections among course work, pre-class work, post-class work, clinical experiences, and SETH / Lab experiences
  - Describe how their thinking / knowledge / understanding has changed over time and is more developed now than earlier in this class.
  - Emphasize personal learning and not just team learning.

- Between course content and current/future professional practice
  - Apply theory to practice
  - Relate learning to their future nursing career and/or relevance to nursing practice?
Evaluate for overall portfolio:

**Professional Communication:**

- **Organization**
  - Links evidence within reflective overview (functioning link)
  - Specific about where in evidence readers should look and why (which paragraph on the page or which prompt, etc.)

- **College-level work**
  - Overview represents College-level writing and shows that writers have devoted time and care to planning, drafting, revising, and editing / proofreading.
  - The readers are not distracted by problems with sentence level concerns, mechanics, punctuation, or other features that would show a lack of care and professionalism.
  - Revisions have been more than merely adding text.

**Comments**

- Portfolios that earn grades in the "A" range will have met all and exceeded several expectations.
- Portfolios that earn grades in the "B" range will have generally met all expectations.
- Portfolios that earn grades in "C" range will have met most but not all of the expectations.
- Portfolios that earn grades in the “D” range do not meet most of the expectations, even though students have submitted work that attempts to meet the requirements.
- A grade of “F” signifies that the student has not submitted the assignment.
APPENDIX H
INTERVENTION:
REFLECTIVE METACOGNITION WEEKLY PROMPTS

Week 1 – Introductions/Create class code of professional behavior
- Administer Metacognitive Awareness Inventory (MAI)
- Faculty will define metacognition and why it is an explicit goal of this course.

Week 2 – Clarifying questions about course/Communication/Legal/Ethical/Vital Signs
- Pre-class assignment: Read the course syllabus and supporting course documents on Moodle. Respond to the following questions and be prepared to share your responses with your team and the class.
  - Which confusions about course materials remain and how am I going to get them clarified?
  - Why is it important to learn the content in this course?
  - How am I going to actively monitor my learning in this course?
  - What do I most want to learn in this course?
  - What strategies did I use to study for the quiz?
- In class assignment:
  - In your teams, discuss your responses to the prompts.
  - Compile a team response that highlights the differences among team member responses.
  - As a class, share team responses and compile a class response to the prompts.
  [Faculty relates these activities to metacognition.]

Week 3 – Holism/Diversity/Protection and Adaptation/Safety/Body Mechanics
- Pre-class assignments: Respond to the following questions and be prepared to share your responses with your team and the class.
  - As I think about the previous weeks in this course:
    - How did my experiences and performance, including class preparation, in-class activities, and SETH/clinical activities, help me to gain a better understanding of the following course outcomes.
      - CO 6: Recognize the principles of effective communication in the delivery of high quality care.
      - CO 8: Describe legal issues relevant to the delivery of health care.
    - Now that I have thought about these course outcomes, which confusions remain and how am I going to get them clarified?
  - As I prepare for this week:
    - Prior to reading the textbook, what do I already know about this topic that could guide my learning?
    - After reading the textbook, which confusions remain and how am I going to get them clarified?
    - How is the reading relevant to me?
- In class assignment:
In your teams, discuss your responses to the prompts.

Compile a team response that especially highlights the differences among team member responses.

As a class, share team responses. [Faculty relates these activities to metacognition.]

**Week 4 – Nutrition/Integumentary/Bed-making/Bathing/Personal Care**

- Pre-class assignments - Respond to the following questions and be prepared to share your responses with your team and the class.
  - As I think about the previous weeks in this course:
    - How did my experiences and performance, including class preparation, in-class activities, and SETH/clinical activities, help me to gain a better understanding of the following course outcomes.
    - CO 1: Identify holistic factors affecting the health of individuals, families, communities, and populations across the lifespan.
    - CO 9: Identify ethical principles necessary for caring relationships.
  - Now that I have thought about these course outcomes, which confusions remain and how am I going to get them clarified?

- As I prepare for this week:
  - What is the instructor’s goal in having me do this portfolio?
  - What are all the things I need to do to successfully complete this portfolio?
  - What resources do I need to complete the portfolio and how will I get them?
  - How much time do I need to complete the portfolio?
  - How am I going to monitor my progress as I prepare my mid-term portfolio?

- In class assignment:
  - In your teams, discuss your responses to the prompts.
  - Compile a team response that especially highlights the differences among team member responses.
  - As a class, share team responses. [Faculty relates these activities to metacognition.]

**Week 5 – Team Dynamics/Evidence-Based Practice Intro and Project/Skills Assessment**

- Pre-class assignments - Respond to the following questions and be prepared to share your responses with your team and the class.
  - As I think about the previous weeks in this course:
    - How did my experiences and performance, including class preparation, in-class activities, and SETH/clinical activities, help me to gain a better understanding of the following course outcomes.
    - CO 2: Demonstrate selected beginning nursing skills using scientific and nursing principles.
    - CO 10: Recognize importance of inquiry and reflection in professional nursing.
Now that I have thought about these course outcomes, which confusions remain and how am I going to get them clarified?

As I prepare for this week:

- What is the instructor’s goal in having me do this evidence-based practice project?
- What resources do I need to complete the project and how will I get them?
- If I have completed a team project before, how could I do a better job this time?
- Because this is a team activity, what strategies will I propose to the team to facilitate our completion of the project?
- Pertaining to skills assessment this week: How prepared am I to perform the skills? How have I taken advantage of the resources available to me?

In class assignment:

- In your teams, discuss your responses to the prompts.
- Compile a team response that especially highlights the differences among team member responses.
- As a class, share team responses and compile a class response to the prompts.

[Faculty relates these activities to metacognition.]

**Week 6 – Perfusion/Oxygenation/Regulation and Metabolism/Clinical Orientation**

- Pre-class assignments - Respond to the following questions and be prepared to share your responses with your team and the class.
  - As I think about the previous weeks in this course:
    - How did my experiences and performance, including class preparation, in-class activities, and SETH/clinical activities, help me to gain a better understanding of the following course outcomes.
      - CO 1: Identify holistic factors affecting the health of individuals, families, communities, and populations across the lifespan.
      - CO 6: Recognize the principles of effective communication in the delivery of high quality care.
    - Now that I have thought about these course outcomes, which confusions remain and how am I going to get them clarified?
  - As I prepare for this week:
    - In what ways is the teaching in this course supportive of my learning?
      - How can I maximize this?
    - In what ways is the teaching in this course not supportive of my learning?
      - How will I compensate for this?
  - In class assignment:
    - In your teams, discuss your responses to the prompts.
    - Compile a team response that especially highlights the differences among team member responses.
    - As a class, share team responses and compile a class response to the prompts.

[Faculty relates these activities to metacognition.]
Week 7 – Safety/Portfolio Draft Due for Peer Review
- Pre-class assignments - Respond to the following questions and be prepared to share your responses with your team and the class.
  - As I think about the previous weeks in this course:
    - How did my experiences and performance, including class preparation, in-class activities, and SETH/clinical activities, help me to gain a better understanding of the following course outcomes.
      - CO 3: Recognize the nursing process as a framework for providing basic nursing care.
      - CO 10: Recognize importance of inquiry and reflection in professional nursing.
    - Now that I have thought about these course outcomes, which confusions remain and how am I going to get them clarified?
  - As I prepare for this week:
    - What is most challenging or confusing for me about creating the portfolio?
    - What could I do differently now to address these challenges and confusions before the assignment is turned in?
- In class assignment:
  - In your teams, discuss your responses to the prompts.
  - Compile a team response that especially highlights the differences among team member responses.
  - As a class, share team responses and compile a class response to the prompts.
    - [Faculty relates these activities to metacognition.]

Week 8 – Cognition and Perception
- Mid-term Portfolio due on Monday
- Metacognitive prompts included in the mid-term portfolio assignment
  - To what extent did I accomplish the goals of this portfolio assignment?
  - To what extent did I use the resources available to me?
  - If I were the instructor, what would I identify as strengths and weaknesses of my work?
  - When I do my final portfolio, what do I want to do differently? What worked well for me that I should do next time?
- No additional prompts this week

Week 9 – Cognition and Perception/Musculoskeletal
- Pre-class assignments - Respond to the following questions and be prepared to share your responses with your team and the class.
  - As I think about the previous weeks in this course:
    - How did my experiences and performance, including class preparation, in-class activities, and SETH/clinical activities, help me to gain a better understanding of the following course outcomes.
      - CO 2: Demonstrate selected beginning nursing skills using scientific and nursing principles.
CO 4: Identify the significance of evidence-based practice in health care delivery.

CO 5: Identify uses of technology in the delivery of quality health care.

- Now that I have thought about these course outcomes, which confusions remain and how am I going to get them clarified?
  - As I prepare for this week:
    - To what extent am I being systematic in my studying of all the material for the daily quizzes?
    - What about my quiz preparation is working well that I should remember to do next time?
    - What is not working so well that I should change?

In class assignment:
  - In your teams, discuss your responses to the prompts.
  - Compile a team response that especially highlights the differences among team member responses.
  - As a class, share team responses and compile a class response to the prompts.

[Faculty relates these activities to metacognition.]

Week 10 – Nutrition and Elimination/Sexuality

- Pre-class assignments - Respond to the following questions and be prepared to share your responses with your team and the class.
  - As I think about the previous weeks in this course:
    - How did my experiences and performance, including class preparation, in-class activities, and SETH/clinical activities, help me to gain a better understanding of the following course outcomes.
      - CO 3: Recognize the nursing process as a framework for providing basic nursing care.
      - CO 7: Discuss the roles of team members within the healthcare system.
      - CO 8: Describe legal issues relevant to the delivery of health care.
    - Now that I have thought about these course outcomes, which confusions remain and how am I going to get them clarified?
  - As I prepare for this week:
    - As I work through the case studies in class, how do I identify the most important information? How will I get better at this?
    - Do I find the case studies interesting? Why or why not?
    - How can you make the course content personally relevant?

In class assignment:
  - In your teams, discuss your responses to the prompts.
  - Compile a team response that especially highlights the differences among team member responses.
  - As a class, share team responses and compile a class response to the prompts.

[Faculty relates these activities to metacognition.]

Week 11 – Healthcare Team Members and Healthcare System

- Pre-class assignments - Respond to the following questions and be prepared to share your responses with your team and the class.
As I think about the previous weeks in this course:
- How did my experiences and performance, including class preparation, in-class activities, and SETH/clinical activities, help me to gain a better understanding of the following course outcomes.
  CO 1: Identify holistic factors affecting the health of individuals, families, communities, and populations across the lifespan.
  CO 4: Identify the significance of evidence-based practice in health care delivery.
  CO 6: Recognize the principles of effective communication in the delivery of high quality care.
- Now that I have thought about these course outcomes, which confusions remain and how am I going to get them clarified?

As I prepare for this week:
- Am I struggling with my motivation to study for this course or prepare for class? If so, do I remember why I am taking this course?

In class assignment:
  - In your teams, discuss your responses to the prompts.
  - Compile a team response that especially highlights the differences among team member responses.
  - As a class, share team responses and compile a class response to the prompts.

Week 12 – Protection and Adaptation-Cancer, Immunity/End of Life Care
  - Pre-class assignments - Respond to the following questions and be prepared to share your responses with your team and the class.
    - As I think about the previous weeks in this course:
      - How did my experiences and performance, including class preparation, in-class activities, and SETH/clinical activities, help me to gain a better understanding of the following course outcomes.
      CO 5: Identify uses of technology in the delivery of quality health care.
      CO 7: Discuss the roles of team members within the healthcare system.
      CO 9: Identify ethical principles necessary for caring relationships.
      CO 10: Recognize importance of inquiry and reflection in professional nursing.
      - Now that I have thought about these course outcomes, which confusions remain and how am I going to get them clarified?
    - As I prepare for this week:
      - To what extent am I taking advantage of all of the supports available to me?
  - In class assignment:
    - In your teams, discuss your responses to the prompts.
    - Compile a team response that especially highlights the differences among team member responses.
    - As a class, share team responses and compile a class response to the prompts.
      [Faculty relates these activities to metacognition.]
Week 13 – No Class
- Students work independently on final portfolio
- Students work in teams to finalize posters for evidence-based practice project poster presentations
- No additional metacognitive prompts

Week 14 - History of Nursing and Nursing Education
- Final Portfolio due on Monday
- Metacognitive prompts included in the final portfolio assignment
  - What will I still remember 5 years from now that I learned in this course?
  - What advice would I give a friend about how to learn the most in this course?
  - What have I learned about how I learn in this course that I could use in my future nursing courses and in my career?
- No additional prompts this week
- Administer the MAI as a post-test during class
THE VITA

Bronwyn Perry Doyle is a registered nurse and maintains certification as a Certified Pediatric Nurse. After receiving her Bachelor of Science in Nursing degree from Louisiana State University Health Sciences Center in 1999, she practiced nursing in the hospital, doctors’ office, and school settings. She received certification to teach sixth through twelfth grade science through Teach Baton Rouge and taught Biology at Istrouma High School for three years. After working as a school nurse at Southeast Middle School, she worked as the Nursing Skills Laboratory Coordinator at Our Lady of the Lake College.

In 2009, Bronwyn Doyle completed her Master of Science in Nursing degree, Educator Track, at Our Lady of the Lake College, School of Nursing. She currently works as a faculty member and Curriculum Committee Chair at Our Lady of the Lake College, School of Nursing, in Baton Rouge, Louisiana. She serves as Chair of the Curriculum Task Force for the new Bachelor of Science in Nursing program at the College. In that capacity, she provides development and support to faculty as they adopt active learning strategies in a concept-based, integrated curriculum design. The degree of Doctor of Philosophy will be conferred upon her at the August 2013 Commencement Ceremony.