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Development of Clinical Judgment in Nursing Students: A Learning Framework to use in Designing and Implementing Simulated Learning Experiences

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DEVELOPMENT OF CLINICAL JUDGMENT IN NURSING STUDENTS: A LEARNING FRAMEWORK TO USE IN DESIGNING AND IMPLEMENTING SIMULATED LEARNING EXPERIENCES

by

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ABSTRACT

An abstract of the dissertation of Paula Marie Gubrud-Howe for the Doctor of Education in Educational Leadership: Postsecondary Education presented July 9, 2008

Title: Development of Clinical Judgment in Nursing Students: A Learning Framework to Use in Designing and Implementing Simulated Learning Experiences

There is little doubt that health care has changed dramatically in the last 20 years. Consequently, learning to think like a nurse has become an increasingly complex endeavor. Therefore, professional education must be re-designed to facilitate the development of knowledge, skills, and attitudes that are required of nurses in today's practice environment. High-fidelity simulation provides an education environment for nursing students to develop new professional competencies such as clinical judgment.

The How People Learn (HPL) framework is a comprehensive instructional model that can be used to design clinical learning activities. The HPL framework emerged from the new science of learning and is based on discoveries related to how experts solve ambiguous problems in complex situations. High fidelity simulation, uses advances in technology to provide clinical learning experiences in a near

authentic hospital environment. The HPL framework provides guidance to the design of instructional strategies aimed at facilitating the development of clinical judgment in high-fidelity simulated learning laboratories.

The primary focus of this exploratory study was to better understand the development of clinical judgment in nursing students when using the HPL framework to design instructional strategies in high-fidelity simulation environments. A two group study design was applied to differentiate between the groups of students. Data sources incorporating both quantitative and qualitative methodologies were used.

Data analysis related to the research question did not identify statistically significant difference between the control and experimental group. The qualitative data analysis provided possible explanation for the results derived from the quantitative data. Additionally, the qualitative data analysis identified possible effective instructional strategies to use when designing and implementing learning activities that will facilitate the development of clinical judgment in high-fidelity simulation laboratories.

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BACKGROUND OF THE STUDY

Introduction

There is little doubt that health care has changed dramatically in the last 20 years. Consequently, changes in the health care delivery environment have affected clinical teaching, and learning to think like a nurse is an increasingly complex endeavor (Benner & Sutphen, 2006; Kimball & O'Neil, 2002; Tanner 2006b). The primary goal of this research study was to identify instructional practices that can be used to promote the development of clinical judgment when using high-fidelity simulation. This introductory chapter provides background for the research study. Changes in the health care environments that describe new demands of graduates from nursing programs are discussed. Challenges to creating optimum learning experiences that emphasize the development of clinical judgment are addressed. The conclusion of the chapter suggests promising instructional practices that can be used to promote the development of clinical judgment. These proposed practices were examined in the research study.

Discussion of the Problem

The landmark Institute of Medicine (IOM) Health Professions Education report (Greiner & Knebel, 2003) identified several recent discoveries that are directly affecting the practice and education of all health professions, including nursing (Greiner & Knebel 2003). Increased funding for biomedical research has resulted in continuous advances in clinical knowledge, and investment in pharmaceutical firms has resulted in doubling the number of new drugs approved each year (Greiner & Knebel, 2003). The burgeoning medical device industry continually produces advanced technical devices used by nurses as they are required to monitor patient conditions and deliver complex treatments (Greiner & Knebel; Kimball & O'Neil).

Changing demographics are also significantly influencing nursing practice (Greiner & Knebel, 2003). Americans are living longer, and as the population ages, there will be more people with serious chronic conditions. By the year 2030, there will be 70 million people over the age of 65. An estimated 125 million Americans already have one or more chronic conditions, and more than half of these people have multiple complex chronic conditions (Greiner & Knebel).

The mandate that all health professions use evidence-based practice as deliberate rationale for treatments and interventions is also creating new standards in the practice environment. Evidence-based practice is described as care that utilizes a combination of the best research evidence, clinical experience, and the client's desires (Pape, 2003). Therefore, traditional nursing practices such as provision of personal care are now being delegated by the nurse to assistive personnel. The professional nursing role now involves obtaining, analyzing, and applying the best evidence available to plan, coordinate and evaluate the effect of interventions provided.

All this requires new graduates to demonstrate proficiency in competencies that were unfamiliar just a few years ago. In other words, in preparation for the new role demands, students must learn to provide nursing interventions based on evidence-based practice standards. Students must learn to work as a collaborative interdisciplinary member of the health care delivery team as they support the patient's attainment of optimal wellness. They must learn to assist patients in recovering from complex illness and use best practices when providing care for patients across the lifespan, including palliative and end-of-life care. In addition, the use of rapidly changing and complex technology used by nurses is expected in almost every health care setting. Students must learn to demonstrate proficiency in integrating the complex technology early in their clinical education experiences.

Despite these changes in actual delivery of health care and a call for reform from accreditation agencies, nursing education has been slow to respond (McEwen & Brown, 2002). Authorities contend that new nurses enter practice feeling unprepared, and they report that employers rank the preparation for new RNs as inadequate in many areas (National Council for State Boards of Nursing [NCSBN], 2003). Specifically, new graduates are under-prepared to respond to emergency situations, supervise care provided by others, and perform complex psychomotor skills (Joint Commission on Accreditation for Healthcare Organizations, 2002). A recent national survey indicated that employers rank critical thinking, or clinical decision-making, as the most important skill set needed in new graduates (NCSBN, 2003). However, the majority of today's nursing education programs continue to rely on curricula that emphasize content in lieu of the cognitive skill sets required to apply evidence-based knowledge to clinical decision-making (Greiner & Knebel, 2001; Ironside, 2001; Porter-O'Grady, 2001; Tanner, 2002). Despite the new role of expectations emphasizing use of clinical judgment to manage complex and ill-structured problems that require the application of sophisticated technology and in-depth knowledge, nursing education continues to be influenced by a narrow, task-specific view of nursing care (Kimball & O'Neil, 2002). The Joint Commission of Accreditation of Healthcare Organizations [JCAHO] (2002) described a "continental divide" (p. 30) between nursing education and practice, suggesting that nurse educators are teaching to the health care environment of yesterday.

In a provocative future thinking op-ed, nurse theorist Porter-O'Grady (2001) asserted that despite the evidence that registered nurses are practicing in an era of profound change, nurse educators continue to use "...resident, bed-based nursing care fundamentals as the foundation for basic nursing education" (p. 185). The current time-honored approaches to clinical nursing education are no longer adequate as they lack evidence-based learning activities that assist students to connect theoretical concepts and factual knowledge with their practicum experiences (Bellack, 2005; Brancato, 2006).

Historical Perspective

The early history of nursing education in the United States is somewhat uncertain. Records indicate physicians' schools began to informally train nurses in the late 18^{th} century (Dickson, 1993). The first formal nurse training schools were established in 1873 and followed the Nightingale curriculum model, which involved application of scientific rationale to explain nursing care activity. The early model of nursing education involved students assuming peripheral roles early in their clinical education experiences. They learned how to nurse by assuming increasing accountability in the hospital. As students developed increased proficiency they gradually took on more responsibility in the professional-practice environment over an extended period of time (Taylor & Care, 1999).

Hospital administrators and physicians soon determined that hospitals staffed with trained nurses experienced declining mortality rates and increased revenue (Dickson, 1993). According to Dickson (1993) as medicine was established as a powerful profession during the 20^{th} century, nursing began supporting physicians and hospitals in the endeavor of developing a health care delivery system characterized as a profit-making industry. During this period, both physician training and nurse training employed the apprenticeship model of education (learning by doing). Physician education used this model of schooling by associating physician students with practicing physicians. However, nursing students learned primarily from each other while caring for patients on the hospital wards, without master teachers or nurse supervisors. This form of informal training became well established as a means to staff hospitals with free labor. Consequently, the emphasis of clinical nursing education evolved into an apprenticeship model that emphasized providing service without support for the student as learner that is characteristic of professional education (Taylor & Care, 1999).

As the science of nursing has been established, delivery of nursing education has moved away from hospital schools to universities and college programs. In addition, nursing education is guided by discipline-specific research, formal curriculum, and accreditation standards mandating instruction to teach and evaluate critical thinking and clinical decision-making. Despite these internal and external drivers, characteristics of the previously established hospital-based apprenticeship model of nursing education persists in today's nursing education practicum experiences (Dickson, 1993; Gordon & Nelson, 2005; Infante, 1985; Porter-O'Grady, 2001; Tanner 2006a).

Current Practices in Clinical Education

Professional education is designed to guide a student in the acquisition of knowledge, skills, and attitudes within the area of discipline expertise. Students in a professional program must synthesize this knowledge and these skills and attitudes to create a repertoire of competencies they can use when faced with solving problems assigned to the profession. Professional competencies are largely acquired in the practicum component of professional programs (Benner & Sutphen, 2006; Infante, 1985; Taylor & Care, 1999). Within a variety of professions, practicum experiences are of tremendous importance in helping the student learn to integrate and apply classroom and laboratory learning as he or she makes the transition from student to professional (Benner & Sutphen, 2006; Epstein & Hundert, 2002; Infante, 1985).

Nursing continues to use the practicum experience as "...service under supervision..." (Infante, 1985, p. 16) instead of using a more developmental approach that allows students to engage in situations that require increasingly complex problem solving ability over time. A developmental approach to assuming responsibility for patient care is more prominent in other professions' clinical education experiences (Benner & Sutphen, 2006; Lave & Wenger, 1991; Tanner, 2006a). Consequently, there is a call for a shift in nursing education that emphasizes instructional strategies designed to promote a developmental approach to the acquisition of nursing knowledge, skills and attitudes that is supported by evidence-based educational practice (Ferguson & Day, 2005; Tanner, 2006a).

Multiple authorities describe shortcomings of practicum experiences that continue to persist in most undergraduate nursing programs (Gubrud-Howe & Schoessler, 2008; Ferguson & Day, 2005; Tanner, 1998, 2002, 2006a; Welk, 2002). Often, even beginning nursing students continue to assume primary responsibility for the care of the patient and patient care outcomes while engaged in practicum learning experiences. Other health professions provide extensive didactic and campus-based laboratory experiences before allowing students to engage in hospital-based practicum experiences involving actual patients. For instance, medical students are not responsible for the primary care activities or for developing the treatment plan for patients. Their schooling emphasizes learning, not accountability for patient outcomes (Infante, 1985; Tanner, 2006a). Problem-based learning has been widely adopted in medical education as a means of replacing the previous traditional apprenticeship model of medical education that required students to practice on actual patients early in their education experience (Epstein & Hundert, 2002). This approach to learning involves using hypothetical or authentic patient cases to help students develop meaningful links between theory and practice, thereby facilitating the opportunity to apply theory to realistic problems without the student's assuming responsibility for patient outcomes (Beers, 2005). In this model of learning, when the problem involves interaction with an actual patient, the patient's attending physician assumes the role of the professional accountable for medical outcomes, thereby emphasizing the medical student's role as learner.

In contrast, nursing students' practicum learning activities often do not provide opportunity to become proficient in even the most basic cognitive competencies before they encounter actual patients. Students often assume the role of providing care in their first practicum experience, which occurs within a few weeks of beginning their program of study. This creates a task-focused approach to the learning activity in the practicum experience. Students are not afforded the opportunity to function as learners where the primary objective is to discover how to apply the theoretical knowledge they are learning in the classroom and laboratory. Instead, nursing students are assigned to care for patients on an assigned hospital unit, clinic, or community-based setting early in their nursing education program. They assume responsibility for the patient's well being with unpredictable degrees of supervision by an experienced licensed nurse.

In addition to experiences that emphasize performing tasks instead of learning nursing theory and science, this situation regularly creates problems with coordinating the timing and sequencing of the theory that is presented in the classroom with the practice-based learning that occurs in the hospital or clinic. For example, it's common for students to be studying knowledge and skills related to the care of the obstetric patient in a didactic course and in the campus laboratory setting, while at the same time they are assigned to a practicum experience involving the care of patients with unrelated health problems such as cardiac or kidney disease.

Increasing Demands in Clinical Practice

The clinical practicum experience in nursing education has become more problematic in recent years. The complexity and severity of illness experienced by the hospitalized patient has increased considerably. The majority of hospitalized clients require nurses who have extensive knowledge of illness care and the ability to perform complex technical skills. Moreover, clinical judgments often involve situations where there is significant uncertainty due to the ill-structured nature of problems and the complex care needs of most patients. Beginning and even advanced nursing students are often ill-equipped, and not fully prepared, to function in the complex hospital environment. Nursing education continues to rely primarily on the hospitals as the setting uses for most clinical practicum. Patients with simple and straightforward health problems are rarely cared for in the hospital.

Previously, beginning nursing students were assigned to care for patients who were stable and recovering as expected from illness or surgery. The clinical decisions involved in these care delivery situations involved a high level of certainty, which allowed beginning students to function without continuous direct supervision. Today's shortened length of hospital stays has eliminated the availability of such patients as they are discharged to home or a care facility early in the recovery process. Most hospitalized patients now require clinical judgments that involve significant levels of uncertainty. Allowing students to function in such an environment without the opportunity to become proficient at performing complex psychomotor skills and to develop clinical judgment compromises both learning and, more importantly, the well-being of the hospitalized client.

The nursing shortage has also exacerbated the problem, as fewer experienced staff nurses are available to assist and supervise students as they care for unstable hospitalized patients (Bellack, 2005; Tanner, 2002). The clinical faculty is often responsible for instruction of up to eight students who are stationed on several different units throughout the hospital. This leaves minimal time for instructional activity as the priority actions for clinical teachers involves arranging for good clinical placements and developing relationships with staff so they will welcome and assist students. Faculty spend significant time and energy facilitating communication between multiple students and the hospital staff nurses, and they are obligated to assure that students administer treatments and procedures in a timely and safe manner. Patient care tasks govern the nursing instructors' and students' schedule, thereby compromising available time to engage in dialog and reflective practices with other students, expert nurses, and clinical faculty. Clinical faculty often do not have time to facilitate critical reflection or provide the formative assessment necessary for the development of clinical judgment. There is little time to help students identify evidence-based rationales for actions taken and to connect learning from current experiences to those in the past in order to see possible implications for similar problems that the student will confront in the future. As a result, the emphasis of clinical instruction often must focus on narrow subject content related to disease and treatment. More importantly, clinical faculty spend much of their instructional time supervising psychomotor tasks commonly performed on patients to assure safety standards are met. This model of clinical education occurs at the expense of teaching and learning activities that are designed to assure that students develop problem-solving and clinical judgment skills.

Promising Solutions

A New Model of Clinical Judgment

The Research-based Model of Clinical Judgment in Nursing is informed by over 200 research studies (Tanner, 2006b). This model of clinical judgment explains how nurses come to, as Tanner (1998) described, "...a conclusion about a patient's needs, concerns or health problems and/or the decision to take action (or not), and to use or modify standard approaches, or to improvise new ones that are deemed appropriate by the patient's response" (p. 19). The Research-based Model of Clinical Judgment, also referred to as Tanner's model throughout this manuscript, will be discussed thoroughly in chapter two.

An instrument developed by Lasater (2007b) that measures performance in clinical judgment in simulation has been used in subsequent studies. Lasater's clinical judgment rubric is based on Tanner's clinical judgment model and is being used extensively in Oregon's pre-licensure nursing education programs. Another recently completed dissertation studied the rubric and addressed the construct validation of the instrument (Sideras, 2007). Additional research that will further provide a means to understand and measure the Research-based Model of Clinical Judgment in Nursing is important. Instructional practices that facilitate the development of Tanner's model of clinical judgment also need to be discovered. Nine of Oregon's nursing programs have created a statewide curriculum and are integrating Tanner's theoretical framework to create new learning activities to use in clinical education.

Emerging Sciences of Learning

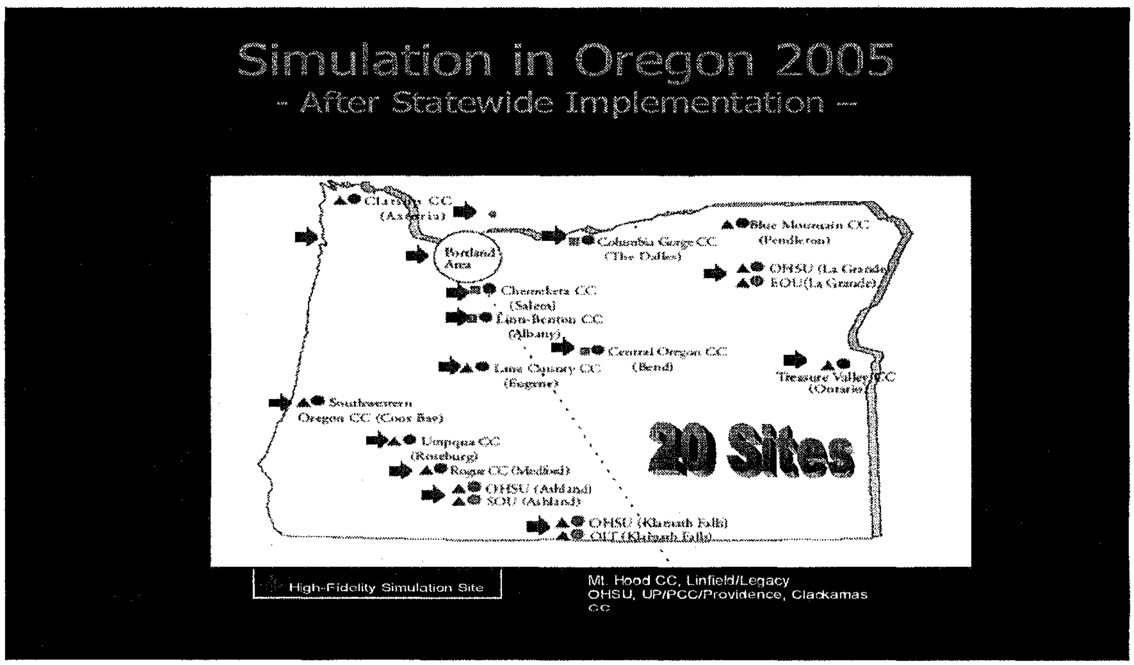
Recent research in the science of learning (Bransford, Brown and Cocking, 2000) provides direction for different approaches to the design of instructional practices. Bransford, Brown and Cocking (2000) offers new science and theory that describes the learning process and the development of competent performance. This research provides understanding of complex reasoning and problem-solving processes and proposes an educational framework known as How People Learn (HPL) that can be used to design learning environments. The HPL framework can be used to design curriculum, learning activities, and assessment in clinical nursing education. Bransford, Brown and Cocking (2000) suggest that a number of new technologies can be used to create learning experiences that integrate the principles of the HPL framework. New technologies can help people visualize difficult-to understand concepts through interactive instruction. Interactive technology allows students to learn by doing and to receive continuous feedback. All this helps students to continually retrieve, refine and build upon their knowledge and understanding (Bransford, Brown, & Cocking, 2000).

New Technology: High-fidelity Medical Simulation

High-fidelity simulation, which involves the use of life-like mannequins and real-life clinical scenarios, is becoming increasingly common in healthcare training including nursing education. A federal grant administered through the Oregon Governor's Health Care Initiative has provided high-fidelity human simulators to the majority of Oregon's nursing programs. Currently there are 26 simulation centers in Oregon (Seropian, Driggers, Taylor, Gubrud-Howe, & Brady, 2006). Virtually every nursing education program in Oregon has access to one of these centers (Figure 1).

Figure 1

Simulation in Oregon. Source: Oregon Simulation Alliance



Efforts are underway to create a networked system of these high-fidelity simulation laboratories throughout the state. The simulation laboratories closely replicate the hospital and other care environments, thereby allowing students to interact with near-authentic patients, to practice psychomotor skills in the context of an actual patient situation, and to engage in the experiential learning and reflective practices necessary to learn clinical judgment and clinical decision-making skills. The emerging simulation laboratories include high-fidelity, life-size mannequins called Human Patient Simulators (HPS). The HPS is computer-controlled and responds physiologically to interventions such as oxygen and medication administration. Physiological features include a speaking voice activated by the instructor or technician, palpable pulses, audible and visible respirations, measurable blood pressure, and audible heart, lung, and bowel sounds. The mannequin has open orifices that allow students to insert tubes and apply treatments while they monitor the HPS response. Additional modular features can be applied to the HPS that simulate a variety of wounds and injuries. In addition to the sophisticated mannequin, the surrounding environment is designed to closely replicate an authentic nursing care environment and includes props such as supplies and equipment used to administer treatments.

All of these features are manipulated in a control room behind a one-way mirror, which allows the instructor to adjust the HPS physiologic symptoms in response to student action. The faculty use computer programs to control all of the physiological features exhibited by the mannequins. Through interface with the computer, the data emitted from the mannequin can be changed in response to student intervention. The programming can also be designed and stored as predictable case-based scenarios. For instance, the blood pressure and heart rate can be programmed to change in response to the administration of specific medication. High-fidelity simulation environments allow students to make mistakes and therefore practice vicariously using the simulation technology. Students are able to observe, experiment and learn from the outcomes of their judgments, decisions and actions.

Simulated experiences also allow for a developmental approach to practicum experiences. The scenarios can be designed by faculty to mimic varying degrees of complexity, thereby creating intentional levels of uncertainty in decision making. These planned simulations allow students to be exposed to scenarios involving both simple and complex clinical judgments (Cioffi, 2001; Hertel & Millis, 2002; Eder-VanHook ,2004; Medley & Horne, 2005). The simulated learning environment allows the teacher to design problem-based learning that includes an appropriate level of complexity. Faculty can create sequential experiences so that students confront a gradual increase in problem difficulty. In addition, instructors are able to coordinate the presentation of theoretical concepts with supporting experiential and reflective learning activities.

Reflective learning is an important feature of simulated clinical experiences. The simulations can be recorded using video or digital technology that are used in a debriefing activity. As students immediately review their recorded performance, faculty facilitate critical reflection through debriefing discussions, allowing students to connect past, current, and future learning. When instructors facilitate debriefing immediately after the simulation, this allows the student's thinking to become visible (Bransford, Brown, and Cocking, 2000) to self, faculty, and peers.

In summary, high-fidelity medical simulation creates a learning environment that helps students extend their understanding of subject matter. It provides a controlled learning environment and teaches reflective practices required for learners to make sound clinical judgments. Most importantly, it can reduce errors in the real patient environment as novice students will practice in the simulated environment before confronting the complexity of today's practice setting.

Purpose and Significance of the Study

Purpose

The purposes of this exploratory study were twofold. The first was to identify instructional strategies that lead to improved clinical judgment when using high-fidelity simulation. Specifically, this study examined the effect of a learning framework as described by Bransford, Brown and Cocking (2000). This framework, known as the How People Learn (HPL) framework, guided the learning activities that were designed for the experimental group participating in this study. The second purpose of this study was to contribute to the further development of an instrument designed to measure the development of clinical judgment as defined by the Research-based Model of Clinical Judgment in Nursing (Lasater, 2005; Tanner, 1998, 2006b).

Significance of Study

Numerous studies exist in the aviation, military, medicine and anesthesiology related to high-fidelity simulation (Ericson, 2004, Hertel & Millis, 2002; Issenberg, McGaghie, Petrusa, Gordon, Scalese, 2005). Rigorous research projects designed to address the use of high-fidelity simulation in nursing education are urgently needed to establish evidence-based practice. Because high-fidelity simulation is new technology used in clinical education, this study informs an emerging practice. Publications in the nursing literature describe high-fidelity simulation laboratories and provide advice on the "how to" related to establishing and operating a simulation lab, developing scenarios, and programming the computers that drive the mannequin (Bearnson & Wiker, 2005; Jeffries, 2005; Seropian, Brown, Gavilanes, & Driggers, 2004). However, research studies in the nursing literature establishing this technology as a viable learning tool to promote the development of clinical judgment in undergraduate nursing students are just beginning to be published (Lasater 2007a; Lasater 2007b; Sideras, 2007).

In summary, Oregon's nursing education programs are in the process of implementing simulation throughout the state as one strategy to improve graduates' competency in clinical judgment. This study used high-fidelity human simulation to create an experiential learning environment that emulates the hospital environment. This simulated learning environment allowed students to engage in experiential learning without the burden of possibly causing harm to actual patients. This study aims to contribute to a research-based guiding framework that identifies optimum instructional strategies that promotes the development of clinical judgment in high fidelity simulation environments.

Definitions

The following are preliminary definitions provided to create the context for reviewing this study. These definitions are discussed in-depth in the literature review section.

Clinical Practicum-Involves a learning activity that takes place in an authentic workplace environment where health care is provided to actual patients.

Laboratory Practicum-Involves a learning activity in a campus-based laboratory where students develop and practice application of knowledge and skills used in patient care. The practicum laboratory-learning environment seeks to replicate the actual workplace environment.

Clinical Judgment-Describes the ways nurses come to understand the problems, issues, and concerns of patients/clients. Involves decision-making and actions that incorporate both deliberate, conscious application of discipline-specific knowledge and intuitive responses (Benner, Tanner, & Chesla, 1996).

Clinical Reasoning-"Processes by which nurses make their judgments and includes the deliberate process of generating alternatives, weighing them against the evidence and choosing the most appropriate, and those patterns that might be characterized as engaged, practical reasoning (e.g., recognition of a pattern, an intuitive clinical grasp, a response without evident forethought)" (Tanner, 2006b, p. 203).

Cognitive Apprenticeship-An instructional model derived from the metaphor of the apprentice working under the master craftsperson in traditional societies...In cognitive apprenticeship, the task or skill performance may be observable but emphasis is placed on the thinking associated with the task or situation at hand (Wolley & Jarvis, 2007).

Evidence-based Practice- A systematic approach to determine the most current and relevant evidence upon which to base decisions about care (Melnyk & Fineout-Overholt, 2005).

*Expertise-*Application of a highly organized body of both procedural and conceptual knowledge that can be accessed readily and used with superior ease and efficiency (Bransford, Brown, & Cocking, 2000).

*High-fidelity Simulation-*A learning environment that provides a near complete replica of the hospital environment. Includes a sophisticated mannequin controlled through interface with a computer. The mannequin is known as a patient simulator and breathes, responds to medication, talks, and drives all patient=monitoring equipment in the patient care environment (Eder-VanHook, 2004).

*Metacognition-*Affects acquisition, comprehension, retention, and application of what is learned. Involves self-knowledge of one's cognition and self-regulation of cognitive processes (Hartman, 2001).

Nursing Process-"A systematic rational method of planning and providing individualized nursing care" (Kozier, Erb, Berman, & Snyder, 2004, p. 249).

*Uncertain Decisions-*Involves situations mandating application of knowledge and/or performance tasks where there is limited ability to predict outcomes (Cioffi, 2001).

CHAPTER II

REVIEW OF LITERATURE

Introduction

In response to changing health care practices, the role of the nurse has evolved from primarily providing task-focused activity to assuming more responsibility for making clinical judgments (Greiner & Knebel, 2003; JCAHO, 2002; Kimball & O'Neil, 2002; Tanner 2006b). A recent national survey indicated that employers rank critical thinking, or clinical decision making, as the most important skill set needed in new graduates, (NCSBN, 2004) yet nursing education programs continue to emphasize a narrow task-focused approach to clinical education (Brown & Doane, 2007; Porter-O'Grady, 2001). Multiple authorities assert that nursing education needs to be reformed. For example, a report published by the Joint Commission on Accreditation for Healthcare Organizations [JCAHO] (2002) recommends nursing education programs be redesigned to assure that graduates are prepared with the knowledge and skills necessary to lead, supervise and interact as the pivotal point of care among the members of the interdisciplinary health care team. A study published by the Robert Wood Johnson Foundation (Kimball & O'Neil, 2002) contends nursing education must be reformed to assure that students are equipped to make clinical judgments when faced with ill-structured and complex patient care problems in a variety of health care settings. Unfortunately, despite recommendations that nursing education foster competence in reasoning used to make clinical judgments, many nursing education curricula continue to emphasize a narrow task-focused view of the nursing role (JCAHO, 2002; Kimball & O'Neil, 2002; Porter O'Grady, 2001).

Nursing is a practice discipline, and, consequently, nursing education has always embraced and continues to recognize the usefulness of experience-based education (Benner & Sutphen, 2006; Gaberson & Oermann; 2007). However, the current model of experience-based clinical education does not address the competency requirements of the new role demands (Bellack, 2005; Kimball & O'Neil, 2002; National League for Nursing, 2005; Porter-O'Grady, 2001; Tanner, 2002). The heightened concern for patient safety resulting from the Institute of Medicine (IOM) report, *To Err Is Human* (Kohn, Corrigan, & Donaldson, 2000), has created appropriate mandates that assure that patient needs and safety are the primary concern for nurses, physicians, and hospitals. These mandates, however, are beginning to guide the development of policies that restrict students from participating in the care delivered to patients in some clinical learning environments (Reilly, 2007).

The concern for patient safety paired with the complexity of providing care in the current acute-care hospital environment produces unnecessary anxiety for all participants (patients, staff, students, and teachers), which often compromises learning in the clinical environment (Henneman & Cunningham, 2005; Reilly, 2007; Salas, et al., 2005). When used early in the curriculum, the acute-care setting in particular is questionable as an optimum environment for learning (Gubrud-Howe & Schoessler, 2008; Tanner, 2006a). Beginning students lack knowledge and confidence required to simultaneously provide complex care while engaging in the deep cognitive and reflective thinking necessary to learn from the experience (Gubrud-Howe & Schoessler, 2008; Leflore, Anderson, Michael, Engle & Anderson, 2007; Reilly, 2007; Tanner, 2006a). Use of experience-based learning provided simply for the sake of experience sometimes results in a chaotic sequence of distinct and often disconnected activities (Leflore et al., 2007). This current approach to clinical education often provides little opportunity for students to develop understanding of the patient's pathophysiology and clinical presentation of disease, and also to grasp an understanding of the illness experience for both the patient and family, while managing the complex technology (Gubrud-Howe & Schoessler, 2008; Reilly, 2007; Tanner 2006a). All these factors must be juxtaposed when making sound clinical judgments.

This chapter explores several relevant constructs evident in a conceptual framework to use when considering clinical learning activity that is designed to facilitate the development of the Research-based Model of Clinical Judgment in Nursing (Tanner, 2006b). First, the nursing process is discussed. The nursing process is the current avowed theoretical model used in nursing education to teach students problem-solving and decision-making in the patient care environment. Next, recent research and theoretical literature are examined to describe a new emerging model of clinical judgment called the Research-based Model of Clinical Judgment in Nursing (Tanner, 2006b). (The Research-based Model of Clinical Judgment in Nursing is often referred to as Tanner's model of clinical judgment in this manuscript). The discussion that follows, summarizing new discoveries in the science of learning. The chapter also discusses recent research reviews, describing thinking used by experts when addressing complex problems. A learning framework called the How People Learn (HPL) framework which emerged from the study on expert thinking is presented (Bransford, Brown, & Cocking, 2000). The characteristics of thinking used by experts are compared with the processes used in Tanner's model of clinical judgment. The HPL framework is presented as a model to guide the design of learning activities that promote the development of clinical judgment (Tanner, 2006b) in simulation learning environments. The final discussion presents the conceptual framework that was used to guide the research proposal.

Clinical Judgment

The Nursing Process

Historically, the process that nurses use to solve and act upon problems has relied on a rational theoretical model designed to emulate the scientific method. This theoretical model is called the nursing process (Kozier, Erb, Berman, & Snyder, 2004). It emerged in the 1960s as a means of describing the act of providing nursing care (Latimer, 1995). Most nursing textbooks and State Statutes that govern nursing practice define the act of providing nursing care in terms of the nursing process (Kozier, et al.). The nursing process is a problem-solving procedure and that relies on the assumption that clinical reasoning predominantly involves linear means-ends analytical thinking (Benner, 2004; Tanner, 2006b). The nursing process involves a step-wise, rational approach to thinking about clinical problems. Nursing textbooks universally present the nursing process as five distinct phases: (1) assessing data, (2) identifying the problem based on analysis of data (often called nursing diagnosis), (3) planning goals and interventions with intent to address the identified problem, (4) implementing planned interventions, and (5) evaluating goals and interventions designed to address the problem.

Traditionally, most nursing textbooks have presented the nursing process as cyclical and the five phases as following a logical sequence. Recently, some nursing texts have proposed that the phases are closely interrelated and overlap, and also have acknowledged that more than one component may be involved in the nurse's problem-solving at any one time (Kozier, et al., 2004). Kozier and associates (2004) explained: "The phases of the nursing process are not discrete entities but overlapping, continuing sub-processes...for example, assessing, which may be considered in the first phase of the nursing process, is also carried out during the implementation and evaluating phases" (p. 257). Figure 2 provides a conceptual illustration of the nursing process.

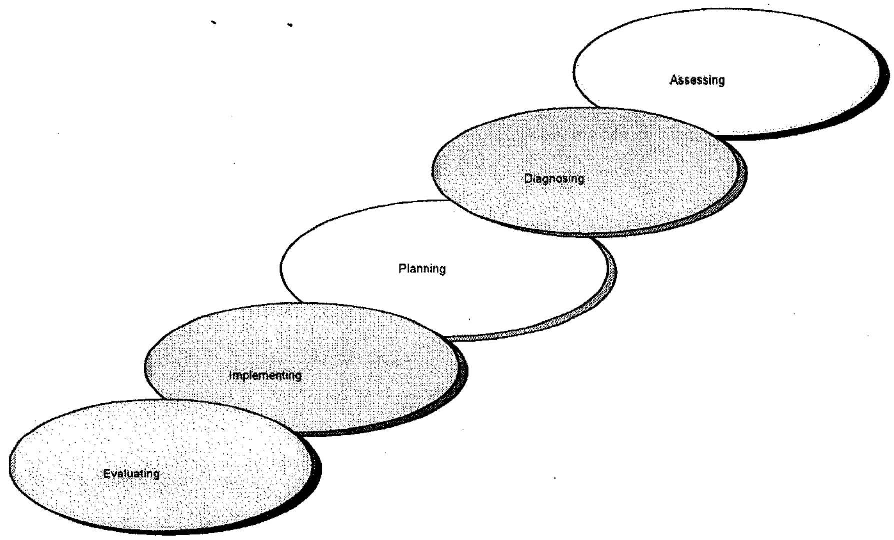


Figure 2. The nursing process (Kozier et al., 2004, p. 258).

Numerous arguments in research and theoretical nursing literature have disputed the assumption that both inexperienced and experienced nurses actually use the nursing process as their primary mode of thinking about patient care problems (Benner, 2004; Benner, Tanner, & Chesla, 1996; Tanner, 1998, 2006b). In a series of critiques, Henderson (1982, 1987) concluded that the nursing process over-emphasizes the importance of rational and scientific thinking and fails to make explicit other ways of thinking and knowing that nurses use when addressing patients' concerns. Aquilino (1997) examined the use of the nursing process by nursing students. She conducted a study that surveyed students to assess their content knowledge related to the childbearing client and then asked students to apply this knowledge using case studies. Results of Aquilino's study suggested that other models of clinical reasoning are better suited to teach students to think like a nurse in order to address the complexity of patient care problems. Aquilino (1997) warned that the nursing process must be presented as an outline for addressing nursing problems. She suggested that nurse educators over-rely on the nursing process as a theoretical model, which undermines the cognitive processes that are actually used by nurses.

Marks-Maran (1998) challenged the relevance of using the nursing process as the predominant problem solving model in a post-modern society. She summarized criticism of the nursing process as the primary model used to teach students in a postmodernist evidence-based practice environment: "Nursing decisions are made in random and sometimes intuitive ways. The world of patient care is not linear and orderly and therefore a linear and orderly framework for explaining it never worked" (p. 386). The nursing process as a theoretical model assumes that the nurse uses primarily objective data to identify one problem at a time using a linear cause-and-effect reasoning pattern. This assumption about the nurse's reasoning fails to explicitly acknowledge the multiplicity, connection, and inter-relatedness of patient care issues and problems (Benner, 2004; Marks-Maran, 1998; Tanner, 2006b).

For example, consider an anxious diabetic patient inflicted with an infected wound that is not healing. In this situation, the patient problems are all interconnected. The pathophysiology of infection increases demands for insulin, the hormone required to metabolize blood glucose. The elevated blood glucose delays wound healing, and delays healing of the infection. This situation develops into a cyclical problem. Anxiety, a state associated with psychosocial distress, further complicates this patient's potential to heal because anxiety increases the release of stress hormones, which interferes with glucose metabolism, thereby further increasing the demand for insulin. In addition to the physiological challenges presented in this scenario, other psychosocial and economic factors often influence a patient's situation. Perhaps the patient has never had appropriate diabetic teaching and is now faced with complex self-care tasks without the requisite knowledge to manage them. Another common problem is the lack of insurance and economic resources needed to purchase required supplies and medication. Financial concerns may be contributing to the patient's anxiety, which compound the physiological problems. The nurse must simultaneously consider the multiple factors contributing to this client's complex dilemma and be able to perceive the interconnectedness of all the variables that are contributing to the lack of recovery from the illness. Addressing each issue described above as separate entities will not solve this patient's complex and interconnected illness-related problems.

The nursing process as a theoretical representation is helpful for very beginning nursing students when they are expected to address one patient care problem at a time. However, this linear model of reasoning does not accurately portray the interconnectedness of physiological, psychosocial, social and economic problems evident in many patient-care dilemmas treated by the nurse. In addition, most clinical encounters involve some level of ethical reasoning, which the nursing process does not address (Benner 2004; Benner & Sutphen, 2006; Tanner, 1998, 2006b).

Research-based Model of Clinical Judgment in Nursing

Tanner (2006b) defined *clinical judgment* as "...an interpretation or conclusion about a patient's needs, concerns or health problems and/or the decision to take action (or not), and to use or modify standard approaches, or to improvise new ones as deemed appropriate by the patients response" (p. 204). This emerging theoretical model is based on a review of over 200 studies in nursing since 1968 (Tanner, 2006b). The Research-based Model of Clinical Judgment in Nursing emphasizes reasoning that includes varying sources of knowledge that nurses use when determining what and how salient problems will be addressed (Benner, 1984; Benner, Tanner & Chesla, 1996; Tanner, 1998, 2006b; Tanner, Benner, Chesla, & Gordon, 1993). An in-depth discussion of this model follows.

The Research-based Model of Clinical Judgment in Nursing emphasizes that clinical judgment incorporates four aspects; noticing, interpreting, responding and reflecting. The first aspect, called *noticing*, is influenced substantially by the nurse's background and which includes pre-existing knowledge and experience as well as a sense of what is good and right in relation to the situation (Benner, Tanner, & Chesla, 1996). The context of the situation and the relationship the nurse has established with the patient also influence what the nurse notices as the salient issues in a situation (Tanner, 2006b). These things combined drive the nurse's initial perceptual grasp of the situation, which then sets up a particular reasoning pattern or integration of more than one pattern, and thereby influences the nurse's *interpreting* of what is happening. Next, the nurse *responds* to the interpretation he or she makes. Responding involves implementing actions designed to remedy the perceived problem or a deliberate decision not to act. The Research-based Model of Clinical Judgment in Nursing also includes reflective thinking process. Tanner identified and described the four interrelated processes of noticing, interpreting, responding, and reflecting as an integrated and iterative model of clinical judgment (2006b, personal communication, June 4, 2008). Figure 3 depicts the Research-base Model of Clinical Judgment. In-depth discussion of each aspect of Tanner's model follows.

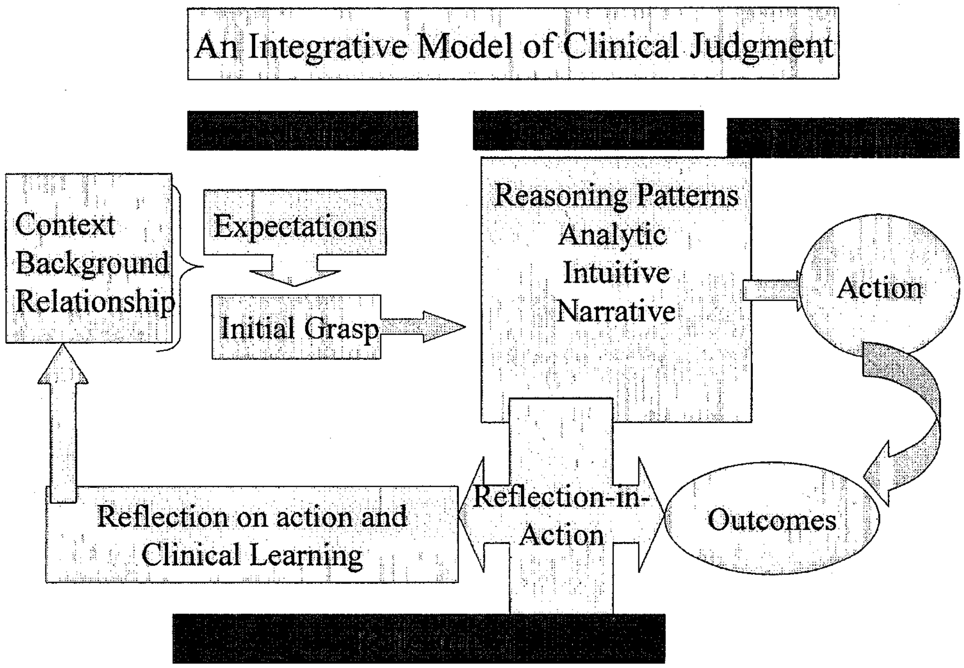


Figure 3. The Research-based Model of Clinical Judgment in Nursing in Nursing. (Tanner 2006b, p. 208)

Factors Influencing Clinical Judgment

The nurse's perceptual grasp of the situation sets up the clinical judgment process and is influenced "…by what the nurse brings to the situation more than the objective data about the situation at hand." (Tanner, 2006b, p. 205). Tanner (2006b) claims clinical judgments require several types of knowledge. These sources of knowledge are derived from science and theory that can be applied in many situations, knowledge that accumulates with experience and is often the tacit knowledge embedded in practice, and knowledge that is situation-specific and individualized. Individualized knowledge is derived from developing an understanding of a particular patient. Tanner (2006b) espouses that knowing the patient as an individual in ways that create expectations of how the patient will respond to physiological changes and to prescribed treatment significantly influences clinical judgment.

Variable sources of knowledge.

Nurses rely on knowledge that Tanner (2006b) refers to as abstract, generalizable knowledge that is applied in many situations. This type of knowledge is derived from science and theory (Tanner, 2006b). Much of this knowledge is learned through formal nursing education courses and required continuing education classes that nurses are required to take after graduation. Student nurses spend enormous effort and time in the classroom learning about disease and treatment. Nursing education also includes courses that support nursing theory. Support courses include knowledge from the social sciences, physical sciences and humanities. Learning derived from all of these sources contributes to the nurse's reservoir of knowledge that is applied to clinical judgments in practice (Tanner 2006b).

As the nurse constructs understanding through experience, he or she develops a repertoire of knowledge that influences clinical judgment. Tanner describes tacit knowledge as understanding that is filled out in practice through experience (Tanner, 2006b). Tacit knowledge "…aids in the instant recognition of clinical states..."

(Tanner, 2006b, p. 205) and is related to pattern recognition. Recent studies have researched pattern recognition theory in nursing (Fonteyn, 1998; Welk, 2002;). Experience seems to have a significant influence on the development of pattern recognition. Fonteyn (1998) observed that pattern recognition involves "identifying characteristic pieces of data that fit together" (p. 20). She suggested that nurses use experience related to similar cases that are based on medical diagnosis, such as heart failure to develop pattern recognition. The research of Benner and associates (1996) addressed the development of pattern recognition in their multi-site study that involved expert nurses. They found that practical knowledge gained through multiple experiences with similar types of patients resulted in the ability to identify qualitative distinctions that influence a nurse's initial grasp of a situation. Benner, Tanner & Chesla (1996) found that through experience the nurse knows what to expect in a patient's recovery. When something about the expected recovery deviates from the expected pattern, the nurse takes notice.

Perceptions of what is good and right.

The nurse's initial grasp of what he or she perceives as important is also affected by what the nurse perceives as good and right (Benner, et al., 1996; Tanner, 2006b). Although these values often are unspoken and perhaps not readily identified but they still influence what a nurse attends to in a particular situation (Tanner, 2006b). Research has demonstrated that certain "goods" regularly show up within exemplars in nursing (Benner, Tanner & Chesla, 1996). Common examples are the intentions of nurses to humanize and personalize care amidst the current high-tech and impersonal health care environment. Another example of what is perceived as good is the ethic of disclosure to patient and families about the quality of care they are receiving. Nurses often insist on authenticity from all members of the health care team when they are communicating with patients about the likely trajectory of recovery from illness, prognosis, and treatment options (Benner, Tanner & Chesla, 1996). Nurses' notion of what is good frequently involves concerns about providing comfort in situations where there is extreme suffering (Benner, Tanner & Chesla, 1996).

Context of the situation.

Clinical judgment is influenced by the context in which the situation occurs (Tanner, 2006b). Research has shown that nursing judgments made during the work day are significantly influenced by the knowledge of the unit, the routine and the workflow (Ebright, Patterson, Chalko, & Render, 2003). The pre-encounter information between nurses known as the change-of-shift report influences the nurses' clinical judgment (Tanner, 2006b). The patient information systems on the unit also contribute to the nurses' perceptions regarding the context of the situation (Ebright et al., 2003). Context of the situation includes the norms of the unit work group. The habits and culture of the unit influence what knowledge is valued and how skills are performed (Benner, Tanner & Chesla, 1996; Ebright et al., 2003).

Noticing

When students and nurses engage in effective noticing, they observe a wide variety of both subjective and objective data, and they monitor the adequacy of the information available (Benner, et al., 1996). This action includes awareness of subtle patterns of data related to what the expected and normal responses to specific illness are (Benner, Tanner & Chesla, 1996). In addition, the act of noticing includes recognition of deviations from what is expected as a normal response to illness and treatment interventions (Benner, Tanner & Chesla, 1996).

Early in an encounter with a patient, the experienced nurse develops a sense of the patient's individual patterns of responses as he or she takes into consideration the "...immediate past, the present, and the likely future course of events..." (Benner, Tanner & Chesla, 1996, p. 147). During the noticing aspect of Tanner's model, experienced nurses rapidly focus their observations, quickly seek required additional information, and are able to grasp important information with relative ease as they identify what is important to notice (Benner, Tanner & Chesla, 1996; Tanner, 2006b). When the nurse recognizes an unexpected or unusual pattern, that perception guides him or her to engage in focused pursuit of additional information as he or she attends to making sense of what is happening with the patient (Benner, Tanner & Chesla, 1996). Making sense of what is happening with the patient transitions the nurse to the next aspect of Tanner's model which is called interpreting.

Interpreting

Research has indicated that experienced nurses use knowledge constructed from at least three interrelated patterns of thinking to interpret or make sense of a patient's dilemma and to develop coinciding responses (Benner, Tanner & Chesla, 1996; Tanner, 2006b). The three reasoning patterns are analytic processes, intuition, and narrative thinking (Tanner, 2006b). The patterns are inter-related and also have distinct characteristics. Each pattern of reasoning identified by Tanner (2006b) is described below.

Analytic reasoning.

The research conducted on expertise in nursing practice by Benner, Tanner & Chesla (1996) found that analytic reasoning is hypothetical-deductive and involves constructing understanding through a process used to break down a problem or situation into separate parts. Nurses use analytic reasoning as one type of thinking in clinical judgment by generating alternative courses of action as they systematically consider the possible outcome of each plausible solution to a problem (Benner, Tanner & Chesla, 1996). Students, novice nurses and experienced nurses often use analytic reasoning when they lack essential knowledge or experience to address a perceived problem (Benner, Tanner & Chesla1996; Tanner, 2006b). For instance, a nursing student engages in analytic thinking when deciding whether to give a pain medication that is prescribed by the physician using a set of parameters instead of exact direction. This common clinical judgment encountered by nurses requires that the nurse make decisions about the amount of a prescribed medication and how often a patient receives it. In this example, pain medication is often prescribed with a range of the possible dose and can be administered within varied time frames. The nurse must weigh the advantages and disadvantages of administering a particular dose of pain medication within a given time frame. A larger dose may fully relieve the patient's pain but can over-sedate the patient. Over-sedation restricts patient movement which leads to complications such as pneumonia. Under-medicating a patient's pain also results in a restriction of mobility. This is an example of analytic reasoning used by nurses.

An experienced nurse may use analytic thinking when there is a mismatch between what is expected and what actually presents. For example, pain resulting from an amputation does not follow the normal pattern of post-operative pain. The novice nurse or student may need to use a variety of resources (e.g., textbook, published research, hospital standard of care) to learn about the characteristics of this kind of pain in his or her effort to effectively plan and implement care for the patient. The nurse with experience treating pain associated with amputation will readily notice deviations from expected patterns without consulting other sources. The nursing process is an influential exemplar of analytic reasoning used in making clinical judgments.

Intuitive reasoning.

A number of studies have identified intuition as a form of thinking that influences clinical judgment (Benner, 1984; Benner, 2004; Benner, Tanner & Chesla, 1996, Tanner et al., 1993). Intuition is characterized by an immediate sense of apprehension in response to something out of place or unusual in a familiar circumstance or experience (Tanner, 2006b). Intuition involves pattern recognition, and is often difficult for nurses to quantify or sometimes even describe (Benner, Tanner & Chesla, 1996). Benner, Tanner & Chesla (1996) proposed that intuitive reasoning "...is not the same as thoughtless and automatic responses..." but involves "...knowledge that is received in an immediate way, perceived as whole, and not arrived at through a conscious, linear analytic process" (p. 10). Benner and associates research (1996) showed that experienced nurses use intuitive reasoning because of prior knowledge and experience as they develop a "...sense of salience..." (p. 10) and are able to notice relevant details without engaging in deliberate and rational calculation about the situation. Studies have described the use of intuitive thinking or reasoning as the nurse's recognition of a patient's early and subtle signs that were evident prior to a catastrophic untoward physiological event. Such signs are often not easily described in objective terms but recognized as a feeling from the nurse that the patient's condition had changed. When the researchers observed nurses engaged in intuitive reasoning, they identified the feeling that something was wrong coincided with very subtle cues such as changes in the patient's movement, posture, tone, and behavior. These changes occur before more objective physiological signs such as changes in heart rate and blood pressure. With experience, the nurse learns to identify the subtle cues that precede the measurable parameters used to monitor patients' conditions (Benner, Tanner & Chesla, 1996).

Narrative reasoning.

According to Benner (1994) narrative reasoning involves considering the patient's story in order to understand the illness experience in a holistic way. Narrative reasoning is rooted in medical anthropology and creates a deep understanding of a particular case or event (Benner, 1994; Tanner, 2006b). Narrative understanding helps the nurse direct his or her attention "...not only to the biological work of disease but to the human world of meanings, values and concerns" (Benner, et al., 1996, p. 11).

Narrative thinking involves reflective practices and creates an inclusive background for understanding a patient and/or family's distinct and unique circumstance (Tanner, 2006b, Tanner et al., 1993). Benner, Tanner & Chesla (1996) proposed that narrative reasoning helps the nurse appreciate the human experience with illness that medical diagnostic labels and objective analytical understanding do not bring forth. Narrative reasoning helps the nurse set up priorities that assure that the patient's and family's perspectives remain central to the clinical judgments being made.

Responding

Responding involves deciding and implementing a course of action that the nurse determines is appropriate for the situation (Tanner, 2006b). The act of responding also involves clear communication about what is happening to the patient, and it includes collaborating with other members of the health care team (Benner, Tanner & Chesla, 1996). Tanner's clinical judgment model emphasizes that the nurse is simultaneously noticing and interpreting as he or she is engaged in responding. For example, consider the previous diabetic patient with the infected wound. The nurse will likely be required to change the dressing on the infected wound as part of the requisite nursing tasks. Dressing changes for an infected wound is generally a complex task involving several steps. The old dressing must be removed (often a painful process) and disposed of properly. The wound must be cleansed, which may require removal of dead tissue using surgical instruments. After cleansing the unclean wound, the nurse will need to establish a sterile field with intent to pack the wound with a specialized dressing. Once the wound is packed using just the appropriate amount of dressing required to promote healing the nurse will then cover the packing with a sterile bandage. Tanner's clinical judgment model (2006b) explicitly acknowledges that the nurse must engage in much more than maintaining the proper technique as he or she changes the dressing. The nurse is required to monitor the patient's physiological and psychosocial response throughout the procedure as he or she attends to noticing and interpreting signs to determine if the infection is healing. In addition, the nurse is expected to determine how the procedure might be modified to promote healing and to contemplate strategies that will provide comfort for the client. In Tanner's model the nurse makes judgments about the patient's wound and response to treatment throughout the task, as he or she interprets multiple sources of information with the intent to adjust, adapt, or invent new interventions designed to provide individualized care necessary to comfort and/or aid recovery (Lasater, 2005; Tanner, 2006b). This scenario describes the integrative character of Tanner's clinical judgment model as the nurse incorporates interpreting, responding and reflection-in-action during an encounter with a patient.

Reflecting

This aspect of the Research-based Model of Clinical Judgment in Nursing in Nursing differs significantly from the nursing process. The focus of reflection in this model includes monitoring the patient's response to treatment and self-analysis of the nurse's own performance and on decision making (Lasater, 2005; Tanner, 2006b). In the nursing process model, the phase labeled evaluation involves engaging in means-end-analysis to determine if planned interventions have provided resolution of previously identified goals that are based on defined nursing problems. The reflecting aspect of clinical judgment in the Research Model of Clinical Judgment in Nursing involves reflection-in-action and reflection-on-action (Schön, 1983). Reflection-in-action includes the nurse's ability to determine how the patient is responding to the nursing interventions and then adjust the interventions based on that assessment (Tanner, 2006b). Reflecting-on-action involves critical self-analysis that includes identification of decision points, and acknowledgment of strength and weakness in both skill performance and reasoning patterns (Tanner, 2006b). Most importantly, this phase of Tanner's model includes intentional plans to eliminate weaknesses in the nurse's performance (Lasater, 2005; Tanner, 2006b). Reflective practices involve thinking about what has happened, how the nurse responded, and anticipating what the implications are for future practice (Benner, et al., 1996; Tanner, 2006b).

Summary

In summary, the Research-based Model of Clinical Judgment in Nursing in Nursing involves thinking that is an integrative synthesis of multiple processes and multiple ways of knowing. The model recognizes that nurses use various patterns of reasoning, where one kind of reasoning (analytic, intuitive, narrative) informs and corrects the other as the nurse engages in understanding the wholeness of the patient, how problems present and connect, and what the best course of action is. Moreover, the inter-related aspects of the Research-based Model of Clinical Judgment in Nursing in Nursing (e.g., noticing, interpreting, responding, and reflecting) occur both intentionally and intuitively, and often simultaneously (2006b).

Teaching and Learning Clinical Judgment

The Research-based Model of Clinical Judgment in Nursing is a new emerging theory. Only two previous studies that have used Tanner's model as a framework for guiding research investigations (Lasater, 2005; Sideras, 2007). Lasater's exploratory dissertation research (2005) resulted in the design of a tool that is used to measure and understand nursing students' development of clinical judgment as defined by the Research-based Model of Clinical Judgment in Nursing. Sideras's research studied the construct validity of Lasater's instrument. The instrument, originally designed to be used in a simulation laboratory, assesses the discreet components (noticing, interpreting, responding, and reflecting) of the Research-based Model of Clinical Judgment in Nursing. In addition to creating the measurement instrument, Lasater's study examined the relationship between critical thinking in nursing students and their development of clinical judgment. This aspect of Lasater's findings validates several other recent findings in the nursing education literature that indicate there is little correlation between the results from tools used to measure critical thinking and clinical judgment.

Staib (2003) conducted an extensive literature review and concluded that there was not a consistent relationship between critical thinking, clinical decision-making, and clinical judgment. This may be partially attributed to Staib's assertions that the construct known as critical thinking is not really well defined (Staib, 2003; Tanner, 2005). Repeated efforts to measure critical thinking in nursing students have been largely unsuccessful (Giddens & Gloeckner, 2005; Stewart & Dempsey, 2005).

Critical thinking and clinical judgment appear to be two separate constructs, and there is insufficient evidence available to declare a significant relationship between the two (Lasater, 2005; 2007a; Tanner, 2005).

While research recently conducted by Lasater and Sideras are the only studies that have specifically examined the Research-based Model of Clinical Judgment in Nursing there is research that has described the development of two concepts embedded in Tanner's model of clinical judgment: development of pattern recognition in nursing students and the effects of reflective learning activities in nursing education.

Pattern recognition is described as an essential cognitive strategy used by nurses in their initial grasp of a patient's situation (Benner, 2004; Tanner 2006b). Pattern recognition also contributes to the intuitive reasoning described in the Research-based Model of Clinical Judgment in Nursing. Welk (2002) conducted a quasi-experimental study that involved 162 sophomore nursing students from five baccalaureate nursing programs. The study used a pretest/posttest design to assess students' ability to differentiate between typical examples and non-typical examples of patients having heart attacks. The results of this study indicated that students needed six to nine examples of patient cases that address the same illness or health problems in order to begin to develop the pattern recognition. According to Welk multiple exposures are required before students begin to identify essential signs and symptoms related to a specific medical diagnosis. Welk recommended that efforts to assist students in developing pattern recognition should include exposure to both typical and non-typical cases.

Since the publication of Schön's (1983) seminal book on reflective practice, nursing education has increasingly integrated efforts designed to engage students in activities that involve reflection both in practice and on practice (Murphy, 2004; Powell, 1989; Richardson, Cert, & Maltby, 1995). Reflective learning activities in nursing education commonly involve guided journaling (Fonteyn & Cahill, 1998; Murphy, 2004; Powell.1989; Wong, Kember, Chung, & Yan, 1995) and concept mapping (August-Brady, 2005; Daley, Shaw, Balistrieri, Glasenapp, & Piacentine, 1999; Kathol, Geiger, & Hartig, 1998; Wheeler & Collins, 2003). The reflective learning activities generally are used to enhance the clinical learning experiences central to nursing education practice. The reflective practice research in nursing education generally focuses on one of two issues. Many studies assess the level of reflectivity exhibited by students (Powell; Richardson, Cert, & Maltby, 1989; Wong, et al., 1995). The second common theme of reflective activity research involves examining the effect of reflective thinking on the development of cognitive skill sets such as critical thinking, clinical reasoning, and clinical decision making (Tanner, 2005).

Recent publications have addressed the integration of reflective activities that promote metacognitive skills in students. Metacognition arises from the constructivist framework (Kuiper & Pesut, 2004) and is generally regarded as an executive cognitive capacity that involves two components: skills used to self-manage and self-appraisal of one's thinking and learning (Cust, 1995; Peters, 2000). Metacognition, which is also referred to as Self-Regulation of Learning [SRL] (August-Brady, 2005; Kuiper &

Persut) has not been investigated in U.S. nursing education (August-Brady). Metacognition is discussed below.

Research-based Learning

The need to reform nursing education is continually fueled by a multitude of converging factors: national nursing shortages, more patients with multiple complex chronic illnesses, and the aging of the baby boom population (Diekelmann & Ironside, 2002; Tanner, 2002). A recent review of literature confirmed that much of the evidence that nurse educators use to design clinical education experiences are derived from their own experience (Ferguson & Day, 2005), and minimal research has been done to study current or new approaches in nursing education (Diekelmann & Ironside, 2002; Tanner 2006a). Moreover, Tanner's model of clinical judgment is based primarily on research conducted on expert nurses; therefore, examining the research on learning and the development of expertise has implications for determining how nursing students develop clinical judgment.

Learning to Think Like an Expert

A revolution in the study of learning (Bransford et al, 2000) provided original insights into how experts across disciplines develop the understanding needed to solve problems in complex and dynamic contexts. This new learning research claimed that consideration of how people develop expertise is beneficial because it provides insight into the nature of expert thinking and reasoning process (Bransford, et al., 2000; Pellegrino, Chudowsky, & Glaser, 2001). Expertise develops over time and is influenced by experience (Ericsson, 2004). However, extensive experience does not necessarily lead people to become experts (Benner, 1984, 2004; Bransford, Brown & Cocking, 2000; Dreyfus & Dreyfus, 1996; Ericsson, 2004). Recent research has extended knowledge about expertise (Barnett & Koslowski, 2002; Bransford, Brown, & Cocking, 2000; Crawford et at., 2005; Ericsson, 2004; Fisher & Peterson, 2002; Hatano and Inagaki, 1986). This Research-based description of expertise emulates much of the same thinking and reasoning described in the Research-based Model of Clinical Judgment in Nursing in Nursing. Therefore, emerging research based on an understanding of how individuals develop expertise provides useful consideration for designing instruction intended to teach clinical judgment in nursing education.

The new science of learning described by Bransford, Brown and Cocking, (2000) acknowledges that experts use factual knowledge in their approach to thinking and problem-solving. However, their research clearly indicated that "...useable knowledge is not the same as a mere list of disconnected facts. Expert's knowledge is connected and organized around important concepts..." (p. 9). Multiple authorities describe the characteristics of expert thinking as follows: (1) experts notice features and meaningful patterns of information that novices do not notice; (2) experts retrieve relevant information and knowledge from memory quickly and with little intentional effort; (3) experts demonstrate routine and automatic performance, thereby increasing speed and efficiency; and (4) experts have rich, complex domain-specific knowledge schemas, that are constructed from extensive experience (Benner, 1984; Benner, Tanner & Chesla, 1996; Bransford, Brown, & Cocking, 2000; Chi, Glaser, & Farr, 1988, Crawford, Schlager, Toyamsa, Riel, & Vahey, 2005).

Routine expertise.

Education is often designed to assist students in developing what Hatano and Inagaki (1986) described as *routine* expertise, which is the ability to retrieve and apply knowledge to address specific problems (Brophy, Hodge, & Bransford, 2004). Routine experts often master a set of routines that are very complex and sophisticated and become proficient at applying them (Bransford, 2001). Bransford (2001) noted that routine experts continue to learn throughout their lifetimes; however, that learning is directed toward becoming increasingly efficient at performing customary tasks. Routine experts excel in situations where the ability to solve predictable problems is expected, and research indicated that routine experts exhibit limited capabilities in dealing with novel problems (Crawford et al., 2005; Ericsson, 2004)

Adaptive expertise.

Hatano and Inagaki's (1986) theoretical model of adaptive expertise proposed that adaptive experts readily make judgments about the conventional application of understanding and skills when confronted with unique problems. In addition, when presented with a situation that extends beyond their experience, adaptive experts devise probable explanations about what is unfamiliar, intentionally make predictions about the possible outcomes related to what is unknown, and use multiple sources of information to develop judgments about the appropriateness of each alternative solution to novel problems (Patel, Glaser, & Arocha, 2000). Adaptive experts develop schemas of well-organized and interconnected facts and procedures that allow them to "...execute a set of procedures in an efficient, yet highly adaptive manner, which is sensitive to shifting contexts" (Patel et al, p. 257). Adaptive experts are acutely aware of the "…assumptive nature of knowing" (Bransford, 2001, p. 2) and are able to identify preconceived notions, and then challenge, test, and let go of or modify their understanding when tested against related criteria. Adaptive experts comprehend why a procedure works (or not) and seek challenges that require them to extend their knowledge and skills in order to develop new innovative solutions (Bransford,2001; Bransford, Brown, & Cocking, 2000; ; Crawford et al., 2005; Fisher & Peterson, 2001). They function well in the midst of ambiguity and perceive themselves as individuals who know a considerable amount, yet they readily acknowledge they know little compared to what is knowable (Bransford, Brown, & Cocking, 2000; Brophy, et al., 2004; Ericsson, 2004; Fisher & Peterson). Adaptive experts acquire "…extensive knowledge that affects what they notice, and how they organize, represent, and interpret information in their environment" (Bransford, Brown, & Cocking, 2000, p. 31).

Expertise in Nursing Practice-The Dreyfus model

The Dreyfus model of skill acquisition has guided three seminal research studies in nursing (Benner, 1984; Benner 1982; Benner, Tanner & Chesla, 1992, 1996. The first study, conducted between 1978 and 1981 (Benner, 1984) was based on 21 paired interviews with newly graduated nurses and their staff nurse preceptors. Study results based on interviews and observations of participants delineated and described different levels of expertise that correlated with years of experience. A second study examined the development of expert skill acquisition demonstrated by critical care nurses (Benner, Tanner & Chesla, 1996). This research studied the application of clinical knowledge by critical-care nurses and was conducted between 1988 and 1994. Data were collected on 130 nurses practicing in critical care units at eleven different hospitals in varied geographic locations throughout the United States. Data sources included small group interviews, individual interviews, and observations of the nurses working in the critical-care units (Benner, 2004). The third study was an extension of the second study, and was conducted between 1996 and 1997 to include 75 nurses working in other critical-care areas such as emergency departments, flight nursing, home health and the operating room (Benner 2004).

The Dreyfus skill model of acquisition applied to nursing practice, predicts that with more experience the nurse develops an increased ability to more accurately grasp salient aspects of clinical situations (Benner 2004). The ability to quickly and accurately grasp the salient issues in a situation then guides the nurse's actions and interactions with the patient (Benner, 1984, 2004; Benner, Tanner & Chesla, 1996). As the nurse progresses from novice to expert, rule-governed thinking used by the new nurse is replaced by an intuitive grasp of the situation. (Benner, 1984; Benner, Tanner & Chesla, 1996; Benner, 2004). Benner's research proposes that expert clinical judgment and practice wisdom develops over time and is rooted in experiential learning from particular cases (2004). Tanner's model of clinical judgment is influenced by her work with Benner. The previous research conducted by Benner, Tanner and Chesla (1996) informs Tanner's description of the noticing aspect of Research-based Model of Clinical Judgment in Nursing (2006b).

Interestingly, the notion of expertise originally described by Hatano & Inagaki (1986) and further described by Bransford, Brown and Cocking, (2000) and Ericsson, (2004) emphasized the role that noticing plays in expert thinking. These theoretical models on expertise that are all informed by research, complement Tanner's model of clinical judgment. In addition, these theories that describe characteristics of expertise, emphasize the notions that effective problem-solving is a flexible and dynamic process, is influenced by what the learner notices as salient by the learner, and involves the organization and interpretation of information. Finally, these theoretical models suggest that an individual's ability to reflect on his or her thinking and learning is an important habit that leads to the development of expertise. Tanner's model of clinical judgment also emphasizes the influence reflective process has on the nurses' ability to make sound judgments.

Research Informing Adaptive Expertise

When considering creating educational practices that promote the development of expertise in nursing, it is helpful to consider research in other disciplines. There is some research available to inform the development of adaptive expertise described by Hatano & Inagaki (1986) and further described by Bransford, Brown and Cocking, (2000) and Ericsson, (2004). Research conducted as of this writing has helped define the characteristics of adaptive expertise, and a few studies have been designed to identify strategies that promote the development of adaptive expertise. Barnett and Koslowski (2002) completed a qualitative study designed to research characteristics of adaptive expertise in restaurant managers and business consultants. The research was designed to determine which group used components of adaptive expertise to develop a solution to a problem. The researchers presented the managers and consultants with a complex problem and found distinct differences between the two groups' approach to analyzing the data and developing solutions. While the restaurant managers had more extensive domain-specific knowledge and related experience, the business consultants designed superior solutions to address the problem. The researchers concluded that the business consultants' thinking process and proposed solutions reflected attributes characteristic of adaptive expertise.

Barnett and Koslowski (2002) study found that the consultants' varied work experience requires problem-solving in a variety of business contexts. The varied work experience thereby facilitated the consultants' ability to examine the problem from the context of multiple varying experiences and several perspectives. This finding reinforced Hatano and Inagaki's (1986) theory that repeated experiences that involve random variation challenge learners to extend and revise previously learned understanding and procedural skill sets. Barnett and Koslowski also pointed out that business consultants often work in teams, which creates environments for collaborative learning. This environment requires the consultants to explain and justify their recommendations, which forces them to develop theoretical reasoning that is transferable to a variety of contexts.

Fisher and Peterson (2001) conducted a mixed-methods study designed to define and measure attributes of adaptive expertise. They developed a survey instrument to measure four constructs that they proposed would define adaptive expertise. The survey was administered to freshman and senior biomedical engineering students and practicing biomedical engineers. In addition to the survey, the study also included interviews to elicit narrative accounts from undergraduate students as they were presented with opportunities to demonstrate the attributes of an adaptive expert. Fisher and Peterson found a positive correlation between exposure to multiple learning encounters that expose learners to ill-structured problems and the development of adaptive expertise. As a result of their findings, they suggested that curricula include multiple exposures to experiential learning activities that promote construction of domain-specific knowledge. In addition, they recommended that curricula include acquisition of skills designed to facilitate metacognition. The combination of multiple exposures to domain-specific knowledge with well-developed metacognitive skills assures that learners develop both comprehensive domain-specific knowledge and flexible understanding (Kuiper & Persut, 2004).

The National Science Foundation (Crawford et al., 2005) is currently supporting a research project designed to study characteristics of and develop ways to measure adaptive reasoning and decision-making in high-school biology teachers. The first-year study results (2005) concluded that individuals who exhibit superior ability to demonstrate adaptive expertise are slow to draw conclusions because they take the time to build a mental model of a situation from evidence by using a systematic process to explore data. In addition, results from this study are finding that adaptive experts are also tentative in drawing conclusions as they continually build understanding in response to new data and experience. Preliminary results from data collected after the first year of the study showed that adaptive experts do not over-rely on prior knowledge and they demonstrate curiosity about novel content and a disposition to learn about it (Crawford et al.).

The "How People Learn" Framework

As a means for teaching students to think like experts, Bransford, Brown and Cocking (2000) put forth a model of learning and instruction known as the How People Learn (HPL) framework. The design of HPL environments assumes that instruction should address the process of learning, transfer of learning and competent performance (Bransford, Brown, & Cocking, 2000). To achieve this end, the HPL framework advocates creating educational environments that are (1) learner-centered, (2) knowledge-centered, (3) assessment-centered and, (4) community-centered.

Learner-centered Environments

Effective learner-centered educational environments begin with consideration of what learners bring to the classroom. Evidence shows that learners use their current knowledge to construct new knowledge and that what they know and believe at the moment affects how they interpret new information (Bransford, Brown, & Cocking, 2000; Cust 1995, Pellegrino, Chudowsky & Glaser, 2001; Peters, 2000). Sometimes learners' current knowledge supports new learning and sometimes it hampers learning (Bransford, 2001). Consequently, learner-centered environments involve practices that attend to the knowledge, skills, attitudes, and beliefs that students bring to the educational setting. Teachers who are learner-centered assess their students' requisite knowledge and also build on the conceptual, experiential, and cultural understanding they bring to the learning environment.

Knowledge-centered Environments

Knowledge-centeredness intersects with a learner-centered approach to instruction. Knowledge-centered environments emphasize sense-making by developing learning experiences that expose students to information and activities that help them develop an understanding of a discipline's body of knowledge. A knowledge-centered instructional practice attends to the depth and breadth of subject matter. Research shows knowledge-centered instruction present concepts in developmentally appropriate ways by linking new learning to current understanding of subject matter. Knowledge-centered instruction helps students' connect and link concepts and avoids presenting disconnected sets of facts and skills. In the exemplar of the diabetic patient described previously, knowledge-centered instruction would include the skills of administering insulin and monitoring blood glucose levels. These skills would be linked with the knowledge related to the pathophysiology, diagnosis, complications and treatment of diabetes. The information and concepts would be presented in ways that help students understand the disease and rationale for treatment.

Assessment-centered Environments

Assessment-centered environments involve checking for congruence between what students are learning and their learning goals (Bransford, Brown, & Cocking, 2000). Feedback is fundamental to learning; however, feedback opportunities are often scarce in many learning environments (Bransford et al, 2000; Pelligrino et al, 2001).

Students receive grades on tests, projects and written assignments, but these are usually summative assessments that occur at the end of a unit or project (Bransford et al, 2000). Creating an assessment-centered environment involves implementing frequent formative assessments completed by teachers, student self-assessments, and peer assessments. Formative assessments provide students with opportunities to revise and improve the quality of their thinking and understanding (Bransford, 2001). The learner-centered and knowledge-centered aspects interconnect with the assessment-centered aspect of the HPL model. See Figure 4 (Bransford, Brown, & Cocking, 2000).

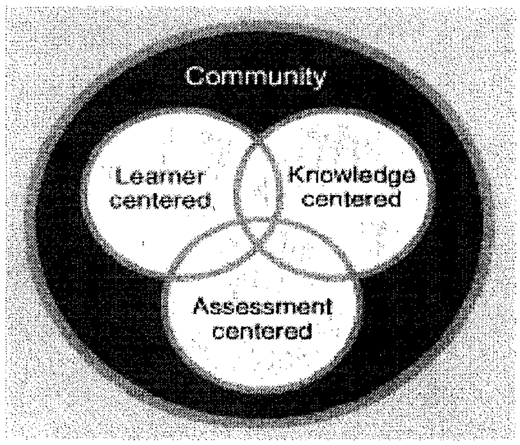


Figure 4 - Perspectives on Learning Environments. (Bransford, Brown, & Cocking, 2000, p. 134)

Metacognition.

Student self-assessments are particularly important as a means of promoting a metacognitive approach to instruction (Bransford, Brown, & Cocking, 2000; Cust, 1995; Hartman, 2001; Kuiper & Persut, 2004; Peters, 2000). Metacognition involves thinking about thinking (Peters, 2000) and can be described as a concept that integrates distinct reflective thinking characteristics that can be measured using qualitative and quantitative methods (Schraw & Impara, 2000). Metacognitive knowledge is multidimensional and domain-general in nature and it facilitates transfer of learning (Bransford, Brown, & Cocking, 2000; Hartman, 2001). Metacognition has been seen as an imprecise term (Cust, 1995), but it is universally regarded as an executive capacity with two components: knowledge of one's own cognition and regulation of cognition (Cust, 1995; Hartman, 2001; Schraw, 2000. According to Imel (2000) knowledge of cognition refers to the learner's ability to evaluate his or her own knowledge and understanding; and regulation of cognition refers to the ability to monitor one's own developing knowledge and understanding.

Bransford, Brown and Cocking (2000) used teacher-made tools called "Metaguides" to assist students in the development of metacognitive skills. Metaguides provide prompts and cues for the teacher to use. These prompts and cues help students engage in reflective practices and assist them with organizing and monitoring their thinking. Hartman (2001) also suggested that teachers use instructional materials that are designed to provide prompts and cues that promote use of metacognitive skill sets.

Community-centered Environments

The fourth essential aspect on learning environments is the degree to which sense of community is promoted and attends to the context in which learning takes place (Bransford et al, 2000). Bransford, Brown and Cocking (2000) refer to the fourth attribute of the HPL framework as a community-centered environment which makes explicit expected behavior norms and supports agreed upon education and learning values. These norms increase the likelihood that learners, teachers and other stakeholders such as future employers and member of the profession interact throughout the learning process. Bransford, Brown and Cocking, (2000) indicates community-centered learning environments connect learning that takes place in the classroom with other settings. The importance of connected communities is significant in nursing education because of the time spent in the clinical environment such as hospitals and other places where people are cared for by nurses. In community-centered nursing education environments, students, teachers, future employers and agencies that regulate nursing practice and education share norms, values and expectations regarding competencies (Benner, 2004).

Designing HPL Learning Environments

An analysis of the most current theoretical and research literature identifies two common recommendations to consider when designing HPL (Bransford, Brown, & Cocking, 2000) instruction. The first recommendation involves designing experiential learning activities that include multiple exposures to situations that require students to solve complex, multi-layered, ambiguous problems (Bransford, et al., 2000; Fisher & Peterson, 2001; Hatano & Inagaki, 1986; Welk, 2002). These exposures must be provided in ways that offer multiple exposures to domain-specific knowledge while including random differences within the multiple exposures so that students adapt and expand understanding and develop the ability to adapt procedural skills to unique situations. In addition, the learning environment must allow students to experiment as well as make and correct errors in procedure, thinking and judgment (Barnett & Koslowski, 2002; Bransford, et al., 2000; Fisher & Peterson, 2001; Hatano & Inagaki, 1986). The assumption is that multiple exposures to similar problems will facilitate the development of the pattern recognition that is essential in the development of expertise in clinical judgment.

The second recommendation involves frequent integration of reflective learning activities designed to develop metacognitive skill sets. These learning activities involve using prompts to assist students in developing self-regulated learning. Prompts are often provided through guided discussion and reflective journaling (Bransford, Brown, & Cocking, 2000; Hartman, 2001; Kuiper, 2002). The assumption is that the development of metacognitive skills facilitates the appropriate reflective practices that become embedded as an essential component of the process used by competent nurses to make clinical judgments

High Fidelity Simulation

As previously discussed in detail, the current clinical learning environment does not offer conditions that allow students to engage in predictable experience-based learning and planned reflective activity. However, new technology called *high fidelity simulation* has been developed. This technology may provide the requisite environment needed to create the four environments described in the HPL framework. The HPL framework holds promise as a means to promote the development of Tanner's model of clinical judgment.

Historically, varying examples of simulated learning have been used as experience-based instruction in professional and nursing education. Simulation has been used to support problem-solving, decision-making, and procedural psychomotor skill development in nursing and other professional education for decades (Garrett & Callear, 2001). Consequently, simulation exists in many forms, and there is not a commonly agreed-upon definition (Hertel & Millis, 2002). Hertel and Millis (2002) defined educational simulation as "…sequential decision-making classroom events in which students fulfill assigned roles to manage discipline-specific tasks within an environment that models reality according to guidelines provided by the instructor" (p. 15). These authors discussed the use of simulations in higher education within a broad range of disciplines including medicine, law, business and architecture (Hertel & Millis, 2002). They explained that simulations in educational settings provide learning environments that incorporate application of discipline-specific knowledge, experimentation, prediction, and integration of both formative and summative assessment. Furthermore, according to Hertel and Miller simulation promotes the goals of knowledge and skill transfer from one setting to another. According to these authors, simulation involves active experimentation followed by reflective thinking and learning facilitated through a debriefing process. As a result of learning in simulation students typically acquire broad discipline-specific knowledge that they are able to transfer to the authentic professional setting.

Simulation as an Emerging Practice in Clinical Nursing Education

High-fidelity simulation provides experience-based learning through active participation which is the signature characteristic of traditional clinical education in nursing programs. Simulation is beginning to be used as both as an alternative to traditional clinical nursing education practices in nursing and as a way to augment clinical experiences. High-fidelity simulation as clinical learning has recently been made possible with the development of affordable life-sized mannequins that have been enhanced to produce what are known as high-fidelity Human Patient Simulators (HPS). Laerdal ™ Sim Man™ is an example of a high-fidelity HPS. It has a functioning mouth and airway, and a chest-wall that expands and contracts to replicate near authentic movements observed when humans breathe. HPS are also equipped with audible heart, lung, and bowel sounds that coincide with real-time displays of physiological monitoring devices used in authentic practice environments. The instructor can manipulate voice activation to make Sim Man verbally respond. Computers are connected to the mannequin and can be programmed to respond to a student's intervention. For instance, the computer can be used to increase or decrease Sim Man's vital signs (e.g., heart rate, blood pressure, respiratory rate) in response to a student's intervention such as administering medication. Tubes and catheters can be inserted so students also have the opportunity to practice performing procedures and simultaneously monitor the patient response to such interventions. Scenarios can be designed to address specific or multiple clinical problems that incorporate important theoretical concepts required for helping students learn to make clinical judgments. Using video or digital recordings, the scenarios can be replayed, allowing students to reflect and decipher thinking, make suggestions for refining actions, and discuss the possibility of using different approaches to solving problems (Hertz & Millis, 2002).

High fidelity simulation as an experience-based instructional strategy allows for the integration of learner-, knowledge- and assessment-centered educational practices in a community-centered environment. Multiple exposures to similar situations with planned random variation challenge learners to extend and revise previously acquired understandings and procedural skill sets. The scenarios can be designed to incorporate multiple concepts or conflicting data often evident in authentic clinical situations. Conversely, simulation can be designed to exclude extraneous data or distraction that will likely divert students from achieving the desired learning outcomes. The complexities of situations that students confront are intentional and designed by the faculty. The scenarios can be interspersed with multiple formative assessment techniques designed to both reinforce development of accurate understanding and correct misunderstanding.

Debriefing in Simulation

Debriefing is the purposeful and guided discussion that facilitates reflective thinking both individually and collectively among learners with the intent of transforming the simulation experience into learning (Baker, Jensen, & Kolb, 1997; Lederman, 1984, 1992; Petranek, Corey, & Black, 1992; Steinwachs, 1992). Multiple authorities have claimed that from the learning perspective, the final simulation activity, the debriefing, is the most important activity (Fanning & Gaba, 2007; Hertel & Millis, 2002; Jeffries, 2005; Rudolph, Simon, Dufresne, & Raemer, 2006).

Through guided discussion, the teacher facilitates analysis and evaluation of the experience with the intent to create more thorough understanding (Lederman, 1984). The teacher guides the discussion to help learners monitor their cognition as they develop an understanding of what has happened, discover what was learned, and identify if the learning is congruent with learning objectives (Lederman, 1992). Multiple styles of debriefing practices are emerging, and various levels of structure are used to guide the discussion (Hertel & Millis, 2002). Lederman (1992) advocated debriefing that is conducted using a series of preplanned open-ended questions. Open-ended questions provide prompts that assist learners to analyze their own thinking known as reflection-on action (Schön, 1983). Debriefing can be facilitated to help students develop the metacognitive skills previously described.

In summary, the simulation setting can be designed to embrace the HPL framework as a means to integrate a learning environment that is learner-, knowledge-assessment-, and community-centered. The simulation lab allows nurse educators to continue the tradition of experience-based education and allows them to intentionally create a predetermined level of complexity within each simulated scenario. This learning environment provides deliberately planned experiential learning and can help students to develop increasingly complex and interconnected understanding used by expert nurses when making sound clinical judgments. Instead of relying on random and coincidental situations found in the real-life hospital environment, simulation assures students can apply theoretical understanding to real problems that are encountered in nursing practice.

Aspects of pattern recognition described previously can be facilitated using simulation (Welk, 2002). Multiple scenarios that expose to students to the same concept, disease or health problem can be implemented. Discussion can be conducted to help students' identify the differences and similarities between cases. Scenarios can be designed to emulate what is expected in a particular disease. Conversely, scenarios can be designed to display a variation from what is expected. Simulation can provide exposure to the 6 to 9 cases that Welk (2002) indicated are required to begin developing pattern recognition related to a particular health problem.

By fulfilling assigned roles in simulated scenarios, nursing students learn to apply discipline-specific knowledge used to solve problems in a near-authentic patient care environment. The simulation scenarios can be designed to create the kind of complex and ambiguous problems that require use of clinical judgment without fear of harming patients. More importantly, the simulation lab provides an environment for experiential learning combined with reflective activities designed to create self-regulated learning. The combination of providing a learning opportunity that involves both experience and self-regulated learning through guided reflective practices provides a venue for the development of clinical judgment.

Conceptual Framework

The conceptual framework that was designed to guide this study incorporates two theoretical models. The Research-based Model of Clinical Judgment in Nursing was discussed in depth earlier in this chapter (Tanner, 2006b). Tanner's clinical judgment model emphasizes the influence the nurses' background, the context of the situation, and the nurses' relationship with their patients as central to what nurses' notice, how they interpret findings, respond and reflect on their thinking and actions.

The second theoretical model that guided this research design is known as the How People Learn (HPL) framework. The HPL framework resulted from the research in the science of learning. This framework was appropriate to use as a theoretical model for designing learning environments that provide an understanding of how individuals develop the reasoning patterns used by experts in a variety of professions (Bransford et al, 2000; Ericsson, 2004). The Research-based Model of Clinical Judgment in Nursing (2006b) is significantly informed by nursing research that studies and described the reasoning process expert nurses use to make sound clinical judgments. Research that was used to create the HPL framework has indicated that the reasoning used by experts is similar to the thinking described in Tanner's clinical judgment model.

There are four attributes of the learning environment that intersect to create the HPL framework. High fidelity simulation is a resource that allows teachers to create a learning environment that emulates the HPL framework. The relationship between the HPL attributes and the four aspects that describe the Tanner's Research-based model of clinical judgment are explored.

Knowledge-centered Environment to Promote Clinical Judgment

Noticing

Tanner's model of clinical judgment assumes that previously learned knowledge influences what the nurse notices. An example of how the knowledge-centered aspect of the HPL framework can be illustrated in the previously discussed case that involved a diabetic patient. Managing the client with diabetes involves both knowing and being able to recognize the signs and symptoms of fluctuating blood glucose levels in the context of the patient care environment. A novice student may be able to list the signs on an exam but research shows novices frequently fail to recognize the same signs when displayed by a patient in the patient care environment (Benner, 2004). The knowledge-centered attribute of the HPL framework can be made evident in the simulation learning environment. The scenario can be written so that the signs and symptoms of fluctuating blood glucose can be displayed through the high-fidelity mannequin. Students must then apply the previously learned knowledge related to fluctuating blood glucose and implement treatment to correct the problem.

This scenario can be designed to facilitate the development of the various knowledge that informs the reasoning processes used by expert nurses to make sound clinical judgments. For example, scenarios can be written so students get to know the individual responses of the patient as portrayed by the mannequin. Through the mannequin's voice the patient can portray preferences and past experiences with illness that Tanner (2006b) describes as understanding that emerges from "knowing the patient" (p. 206).

Responding

The knowledge-centered attribute of the HPL model also informs the responding aspect of the Research-based Model of Clinical Judgment in Nursing. The nurses' response to a given situation is reliant on knowing how to perform needed treatments and skills and also understanding when and why interventions are needed. The knowledge-centered environment allows students to hone the skills used in practice and to identify the knowledge and reasoning that informs appropriate application of those skills.

Learner-centered Environment to Promote Clinical Judgment

Noticing

The learner-centered aspect of the HPL framework can be used to facilitate effective noticing as described in Tanner's clinical judgment model. Deliberate instructional activities can be designed to help students evaluate and organize their pre-existing knowledge which then may influence what is noticed as the salient issues in the simulated scenario. Specific learning activity that emulates the learner-centered attribute can be enacted by providing opportunity for students to discuss and describe the knowledge and skills that will likely be required in the scenario. For example, in the simulation learning environment students would be told in advance that they will be asked to care for a patient with diabetes. This allows students to review previously learned knowledge about diabetes. They can also review the skills such as insulin administration and blood glucose monitoring that are commonly used when caring for the diabetic patient. The teacher can facilitate a group discussion immediately before the scenario that helps the students make connections between what they know, how that knowledge may be applied, and the skills they should rehearse before the simulation. Misunderstandings can be identified and corrected. Incomplete understanding can be recognized and enhanced through discussion before the scenario which allows learners to construct accurate and more comprehensive knowledge that will be applied in the scenario.

Interpreting

The learner-centered attribute of the HPL framework can be used to help students develop proficiency of the interpreting aspect of Tanner's clinical judgment model. Through post-simulation debriefing students can describe the reasoning behind the clinical judgments and actions taken. Teachers can then facilitate discussion to expand the students' interpretations of what they noticed. Inappropriate application of knowledge and misunderstanding can also be corrected as they are uncovered through the students' actions.

Assessment-centered Environment to Promote Clinical Judgment

Reflecting

Feedback is an important function for assisting students to develop the habits required for the reflecting aspect of Tanner's clinical judgment model. Reflecting in-action is the hallmark of expertise in nursing practice (Benner, 2004; Benner, Tanner & Chesla, 1996). Simulation environments can be designed so students have opportunity to describe their thinking and reasoning during the encounter with the patient. This encourages students to assess and monitor their thinking, thereby facilitating reflection-in-action.

The assessment-centered environment promotes the reflection-on-action aspect of Tanner's clinical model through the debriefing activity used in simulation. The debriefing experience provides opportunity for teachers to give formative feedback to students. Debriefing activity also creates opportunity for students to give formative feedback to each other. Other formative assessments such as journal assignments can be designed to promote metacognitive skills that characterize the assessment-centeredness of the HPL model and are central to the reflection-on-action aspect of Tanner's clinical judgment model.

Community-centered Environment to Promote Clinical Judgment

The HPL framework suggests that connected communities of learning have a positive effect on the kind of learning displayed by experts (Bransford, 2001). The community-centered environment can be cultivated to stimulate a venue for students to engage in reflective practices within a community of learners. Furthermore, facilitating the community-centered environment in simulation may help create a setting where students share and construct knowledge and establish the culture and norms that establish the ethical stance of professional values (Benner, 2004; Benner, Tanner & Chesla, 1996; Benner & Sutphen, 2006). Several studies that inform Tanner's model of clinical judgment suggest that the development of clinical judgment is enhanced when learners are situated in environments that include exposure to the thinking and reasoning of other nurses (Benner, 2004).

Summary

Figure 5 illustrates the relationship between the HPL framework and the Research-based Model of Clinical Judgment in Nursing. The simulated environment creates a learning environment that facilitates the application of these two complimentary theories. The high fidelity simulation laboratory allows students to learn the consequences of their responses, and they can function as learners without fear of harming patients. Deliberate and guided conversations during the debriefing sessions provide opportunity for students to participate in reflection-on-action as described in the Research-based Model of Clinical Judgment in Nursing. In summary, designing simulations that integrate knowledge-, learner-, and assessment-centered learning characteristics within a supportive community will facilitate the development of effective noticing, interpreting, responding and reflecting that are used to make sound clinical judgments.

This study used an experimental two-group study design. The research provided data needed to examine the affect of using the HPL framework to promote clinical judgment in a simulated environment. This research study addressed a gap regarding what is known about the instructional practices that can help nursing students develop sound clinical judgment. The methodology presented in Chapter 3 describes the design features that were used in this study to address this concern.

Conceptual Framework

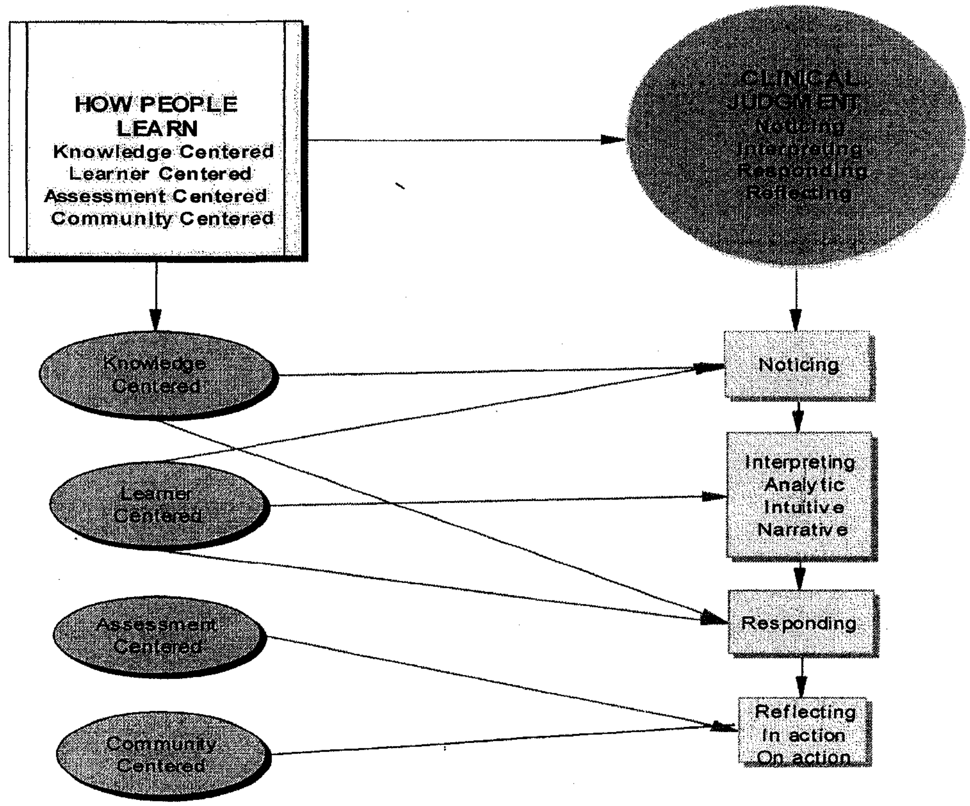


Figure 5 - Relationship between HPL learning framework and Clinical Judgment in High Fidelity Simulation Environment

CHAPTER III

METHODOLOGY

Introduction

Nursing clinical education must change in response to the increased role demands of new graduates. The How People Learn (HPL) framework is a comprehensive instructional model that can be used to design learning activities. The HPL framework emerged from the new science of learning and is based on discoveries related to how experts solve ambiguous problems in complex situations (Bransford, Brown & Cocking, 2000). Instructional strategies that can be used to facilitate nursing students' development of clinical judgment have not been established or validated. In the last five years, the use of high-fidelity simulation has increased in nursing education throughout the country and is being used to as an alternative to tradition clinical education. The HPL framework provides guidance to the design of instructional strategies aimed at facilitating the development of clinical judgment in simulated learning environments.

This chapter presents the research methods, both quantitative and qualitative, that were used to address the purposes of the study and answer the research question. The qualitative aspects of the mixed methodology evolved as the study progressed. The methods used in carrying out the study, providing special emphasis to the analysis of data are described.

The chapter begins with a discussion of the purpose. The research question framing the study is restated. A description of the research design, including instrumentation and the data collection procedures, follows. The chapter includes a description of the research participants, the research context and environment. Next, a detailed narrative description of the experimental high-fidelity learning experience is presented. Methods used to analyze data are also described. This chapter concludes with a discussion on researcher bias and limitations.

Purposes

The purposes of this exploratory study were twofold. The first purpose of this study was to identify instructional strategies that lead to effective learning when using high-fidelity simulation. The study examined the effect of a learning framework as described by Bransford, Brown and Cocking (2000). This framework, known as the How People Learn (HPL) framework, guided the design and implementation of the learning activities that were employed for the experimental group participating in this study. This purpose was fulfilled by examining the participants' experience and their development of clinical judgment as described by the Research-Based Model of Clinical Judgment in Nursing. The second purpose of this study was to contribute to the further development of an instrument designed to measure the Research-based Model of Clinical Judgment in Nursing (Lasater, 2005; Tanner 1998, 2006b). The Research-based Model of Clinical Judgment in Nursing is frequently referred to Tanner's model of clinical judgment.

Research Question

This research study addressed the following question: When using high-fidelity simulation, what effect does incorporating the How People Learn (HPL) instructional design model have on the development of clinical judgment? The research question was framed to clarify the role high-fidelity simulation plays in this study. The high-fidelity simulation lab provided the environment where the study was conducted. The research question was crafted to convey the understanding that the implementation of the HPL framework represents the independent variable in this experimental study.

Research Design

The study used both quantitative and qualitative methods to achieve the purposes and to answer the research question. When strategies derived from qualitative and quantitative methods are used within a single project, the study is referred to as a *mixed methods design* (Tashakkori & Teddlie, 2003). According to Morse (2003), by using more than one method within a research project the researcher can obtain a more complete representation of human behavior and experience. Several rationales exist to explain the advantages of using a mixed method design (Tashakkori & Teddlie), and the researcher chose a mixed method approach for several reasons. First, it was assumed that the mixed method approach would partially compensate for the concerns regarding the small sample size by providing possible explanation of the findings through complementary descriptions of the participants' behavior and experiences. Second, the exploratory nature of this research study incorporated new theories and used a new measurement tool to collect the quantitative data. The mixed method design created an opportunity to consider supplementary qualitative data that provided a deeper understanding of the quantitative results of this exploratory study. Third, Morse maintained that the mixed method design can allow the researcher to hasten understanding of the data and achieve the research goals more quickly. The interpretation of data from both the quantitative and qualitative perspective certainly contributed to the generation of more information regarding the effects of high-fidelity simulation on the development of clinical judgment in nursing students than a single method approach would have. In summary, the quantitative and qualitative data sources provided a more complete perspective and allowed the researcher to better answer the research question and fulfill the study's purposes.

Purpose of Each Paradigm

Quantitative Methods

Multiple research authorities have contended that mixed method studies usually rely on one research perspective as the core methodology (Creswell et al., 2003; Morgan, 1998; Morse, 2003). The quantitative perspective was chosen here as the core theoretical perspective to influence research design decisions. A two-group experimental design reflects the deductive reasoning described as a core theoretical drive in quantitative research (Creswell et al., 2003). A rubric designed in a previous dissertation (Lasater, 2005) was used as the quantitative data instrument. This rubric was developed to measure clinical judgment in simulation. The researcher determined that quantitative data were required to achieve the second purpose of the study, which was to contribute to the further development of the rubric designed to measure the Research-based Model of Clinical Judgment in Nursing (Lasater). Quantitative data are required to establish the inter-rater reliability that had been established as a component of the research process. An in-depth description of the rubric and process used to establish inter-rater reliability is presented later in this chapter.

Qualitative Methods

Morse (2003) noted that the other perspective chosen by the researcher is often labeled as the supplementary perspective. While it's possible to place equal emphasis on both perspectives, most mixed method designs used in a single research study rely on one perspective as core and the other as supplemental (Creswell et al., 2003; Morgan, 1998; Morse). This study used several qualitative data sources to provide supplemental information and insight as to what was happening in the data. Data sources included transcripts from the debriefing sessions, field notes, and an open-ended question survey completed by students at the end of the course.

Two-Group Design

This exploratory study used a two-group design (Creswell, 1998; Wiersma, 2000). Both cohort groups participated in the same simulation scenarios. The simulation sessions lasted three hours. Each student participated in four simulation sessions, which included nine or ten students. The three-hour sessions involved three or four different scenarios. Typically, three students performed in each scenario, and usually two of them acted as nurses and one assumed the role of a family member. The scenarios were digitally broadcast live into an adjacent room called the "debriefing room." The other six or seven students watched the live simulation as the scenarios were being enacted. After the scenario was completed, all of the students met with the course faculty and researcher in the debriefing room for the post-simulation discussion. The debriefing sessions lasted about one hour.

The established practice for simulation lab sessions before the study was implemented involved several scenarios that were based on the same concept. For instance, if students were learning how to manage patients who are having problems with the respiratory system, the students participated in three to four different scenarios involving this concept. In this example, one scenario involved respiratory system compromise in a young patient who had an asthma attack. Another scenario involved respiratory failure due to a blood clot in the lung of an older post-surgical patient. The final scenario involved respiratory problems in a patient with chronic lung disease that was in serious condition due to symptoms associated with pneumonia. This already-established practice was continued for the research study and remained constant for both the control and the experimental cohorts.

Experimental Group Activity

Cohort A served as the control group and Cohort B served as the experimental group. Cohort B's experience was based on a model of learning and instruction as described by the HPL framework (Bransford, Brown, & Cocking, 2000). The HPL framework posits that learning environments that integrate four attributes of learning centeredness, knowledge centeredness, assessment centeredness and community centeredness will significantly enhance learning, facilitate the transfer of learning to new situations, and facilitate competent performance, The experimental group known as Cohort B, participated in learning activities developed to emulate the HPL framework.

The treatment for the experimental group primarily focused on activities characteristic of the assessment-centered attributes of the HPL framework. The knowledge-centered attributes of the HPL framework were incorporated through the pre-simulation discussion as well. During this discussion, the knowledge students would need to apply in the scenarios was discussed. The researcher assumed the community-centered attributes of the HPL framework would be enhanced in the experimental group because of the extra discussion that was facilitated by the researcher. The pre-briefing discussions were facilitated as a way to help student share their individual knowledge and past experiences that were related to the scenarios.

The first phase of activity for the experimental group included two preparatory learning activities. These activities was designed to help students consider what patient care problems they were likely to encounter, and to identify pertinent existing knowledge they would probably use to make clinical judgments in the simulation scenarios. First, students were asked to journal as a reflective learning activity to prepare for the simulation. The journaling questions were created to promote the metacognitive thinking skills essential for the development of expertise used in clinical judgment. In addition, the pre-simulation journal assignment included prompts designed to help students forecast and consider what they would need to know and be able to do in each scenario. The act of forecasting was thought to positively affect what was noticed about the patient in each scenario and thereby influence the student's initial grasp of the situation. The notion of noticing what is important and the nurse's initial grasp of a situation are important components of the Research-Based Model of Clinical Judgment in Nursing (Tanner, 2006b).

Using the college's distance-learning platform, all students from both the control and experimental cohorts were provided with a preparatory information sheet for each of the patients they would encounter in their simulation sessions. The preparation documents were made available to the students one week prior to the scheduled simulation sessions. The preparatory information included suggested topics to review related to the patient's medical diagnosis and nursing problems. The patient preparation information also included a brief history of the current reason for hospitalization and listed previous significant health-related problems. For instance, if the simulated patient had a history of hypertension, that information was included with any related medications or treatment used prior to the hospitalization. An example of the patient preparation information is included in Appendix A.

The experimental group students were asked to complete a journal assignment before the simulation session using the preparatory patient information. Initially, the plan was to provide students in the experimental group with the journal questions along with the patient preparation information. Students were then going to bring the completed journal with them to the simulation session. However, the course faculty determined that they wanted all of the students to prepare for each scenario. Since the plan was to include three separate simulation scenarios in each 3-hour simulation session, the faculty felt it was not realistic for students in the experimental group to be required to complete three journals for each simulation session. Therefore, the original plan was modified. Shortly after arriving for the simulation session the experimental group students (Cohort B) were divided into three groups. They were then informed for which scenario they would play the role of the nurse. This procedure assured the faculty that students had prepared to participate in each scheduled scenario. This was assumed because the student did not know which scenario they would be assigned to be role playing before coming to the simulation session.. The experimental group students (Cohort B) were given 15 minutes to complete the pre-simulation journal assignment. They were encouraged to use the preparatory patient information sheet they had received the week before as a resource. The students in the experimental group each completed one of the preparatory journal assignments associated with each simulation session. Students were asked to complete the pre-simulation journal assignment only for the scenario in which they actively participated.

The pre-simulation activity for the experimental group also involved a pre-simulation discussion. Immediately before the simulation, the researcher facilitated a discussion using the journal questions. The intent was to share knowledge and understanding among students. The researcher guided the discussion with intent to uncover and correct misunderstandings.

Table 1 illustrates the correlation between each pre-simulation journal question and the pre-simulation discussion questions, and it describes the relationship to the various concepts of the Research-Based Model of Clinical Judgment in Nursing. This table also integrates the HPL strategy that informs each pre-simulation journal/discussion question. The actual pre-simulation journal question template provided to the students can be found in Appendix B.

Table 1

Pre-simulation reflective guide

Pre-Simulation Reflective Guide Pre-Simulation Journal and Discussion Questions		
Question	Relevant Phase(s) of Clinical Judgment Model	HPL Strategy
After reviewing the case, which health concerns seem most important?	Effective Noticing • Focused Observation Effective Interpreting • Prioritizing Data • Making Sense of Data	Assist students to construct new knowledge resulting from the preparation and/or revise misunderstanding. Help students to organize knowledge and skills for transfer to a new situation.
Have you encountered a clinical situation like this before? • If yes, what did you learn from that encounter? • How will you apply that learning to this	Effective Noticing • Focused Observation Reflecting • Reflection-on-action • Commitment to	Help students make connections between their previous constructed knowledge and the current academic task. Assist students to consider previous experience that may influence their clinical judgments and actions.

case?	Improvement	
If no, what are your thoughts at this point?		
What possible nursing assessments and interventions will you likely use to address the health concerns of this patient?	Effective interpreting • Making sense of data Reflecting • Reflection-on-action	Help students anticipate what information they might seek out and what skill they may need to be prepared to implement. Help students to organize knowledge and skills for transfer to a new situation.

The post-simulation debriefing format was designed to vary significantly between the control and the experimental group. Debriefing for the experimental group (Cohort B) involved using a debriefing discussion guide that was designed to facilitate dialogue that encouraged students to identify the clinical judgments that they made in the simulation. The debriefing questions were also developed to incorporate the learner-centered, knowledge-centered, and assessment-centered aspects of the HPL framework. Table 2 illustrates the integration of concepts from the Research-Based Model of Clinical Decision Making in Nursing and strategies from the HPL framework that guided the development of each post-simulation discussion question.

Table 2

Post-Simulation Debriefing Guide.

Debriefing Guide Post-Simulation Discussion Questions and Rationale		
Question	Relevant Phase(s) of Clinical Judgment Model	HPL Strategy
What were the key concepts you used to care for this patient during the scenario? Discuss any key concepts that you would use if you were going to run through this scenario again, or if you confronted a similar situation in the hospital.	Effective Interpreting • Prioritizing Data • Effective Reflection-on-action • Reflective self-analysis • Commitment to improvement	Help students make connections between their previous knowledge and the current academic task. Assist students to construct new knowledge resulting from the simulation experience and/or revise misunderstanding. Help students to organize knowledge and skills for transfer to other situations.
Describe any clinical judgments you made. Discuss your thinking that led to the judgment(s). What evidence and/or knowledge did you use to make the clinical judgments?	Effective Reflection-on-action • Reflective self-analysis	Facilitate the development of metacognitive skills required for self-directed learning and self analysis of own knowledge and performance.
Describe the important or significant data that led you to pursue your clinical judgment(s) and subsequent course of action.	Effective Noticing • Focused Observation • Recognizing deviations from expected patterns Effective Interpreting	Assist students to construct new knowledge resulting from the simulation experience and/or to revise misunderstanding.

Describe anything you failed to notice or anticipate.	• Prioritizing Data • Making sense of data Reflection-on-action • Reflective self-analysis • Commitment to improvement	Facilitate development of metacognitive skills required for self-directed learning and self-analysis of own knowledge and performance.

The researcher conducted the experimental group debriefings and used verbal prompts to uncover the clinical judgments made during the simulation. The questions prepared by the researcher were designed to help students identify the multiple sources of knowledge used to make their clinical judgments. During the debriefing learning activity for Cohort B students, the researcher guided the discussion to reinforce accurate application of knowledge and eliminate misunderstanding in students' thinking.

The researcher designed a debriefing guide for each scenario. In addition to the debriefing questions, each debriefing guide included a list of the scenario's learning objectives and a critical action checklist that helped the researcher identify whether the student response to the scenario reflected standards of nursing practice. The critical action checklist also helped the researcher identify whether the students demonstrated appropriate responses in the simulation scenario. In addition, the debriefing guide was designed to allow the researcher to take observational notes during the scenario enactment. This allowed the researcher to identify clinical judgments made during the simulation and provided reminders of appropriate prompts to use when facilitating the briefing. An exemplar of a debriefing guide used in one of the scenarios can be found in Appendix C.

Students in the experimental group (Cohort B) completed a journal assignment at the end of the 3-hour simulation session. The journal questions were designed to be completed in about 15 minutes. The post-simulation journaling was guided by questions designed to help students reflect on aspects of the clinical judgment model and the HPL framework to help them develop metacognitive skills used to monitor thinking and reasoning. The post-simulation debriefing questions and relevant theoretical rationales are presented in Table 3. The post-simulation journal template used by students can be found in Appendix D.

Table 3

Post-Simulation Reflective Journal

Student Post-Simulation Reflective Journal		
	Questions and Rationales	
Questions	Relevant Phase(s) of Clinical Judgment Model	HPL Strategy
Describe the logic you used to organize and implement your actions during simulation. Discuss anything you would do different when confronted with a similar situation.	Effective Noticing • Focused Observation • Recognizing deviations from expected patterns Effective Interpreting • Prioritizing Data • Making sense of data Effective Reflection-on-action • Reflective self-analysis • Commitment to improvement	Help students to organize knowledge and skills for transfer to other situations.
Discuss your performance of the required psychomotor skills. Describe anything you would do differently to perform more efficiently and accurately next time.	Effective Reflection-on-action • Reflective self-analysis • Commitment to improvement	Facilitate the development of metacognitive skills required for self-directed learning and self-analysis of own knowledge and performance.
What do you need to learn more about to effectively care for patients with similar problems in the future?	Effective Reflection-on-action • Reflective self-analysis • Commitment to improvement	Help students to organize knowledge and skills for transfer to other situations. Facilitate the development of metacognitive skills required for self-directed learning and self-analysis of own knowledge and performance.

How will you prepare for simulation next time?	Effective Reflection-on-action • Reflective self-analysis • Commitment to improvement	Facilitate the development of metacognitive skills.

Control Group Activity

The primary difference in learning activity between the control group and the experimental group involved the process used to conduct the associated reflective learning activities that complimented the actual simulations. The reflective learning activity for Cohort A, the control group, was designed to model the previously established practice for debriefing the scenario. This practice involved an unstructured debriefing process as the only reflective learning activity. This debriefing process was a 10- to 15-minute procedure occurring immediately after each simulation scenario. The process was developed by a faculty member and was adopted by the rest of the teachers involved in providing simulation experiences.

The debriefing process involved three phases. During the first phase, the instructor posed a few open-ended questions designed to elicit the emotional responses that students experienced while participating in the simulation. The second phase included a discussion to help students identify a rationale for their decisions and actions. The debriefing sessions were led by faculty and used the nursing process as a framework to guide the faculty and student discussion. The third and final phase involved discussion that prompted students to identify and summarize what they had learned from the scenario.

The previously established debriefing practice was fairly informal and did not involve an intentional plan to address the outcomes of the scenario. The debriefings were often held at the bedside in the simulation room instead of in the debriefing room, and the dialogue was dominated by the instructor as a means to provide information regarding discipline-specific knowledge central to the scenario. The intended design of the study was to continue this established practice for the control group.

Context of the Research Setting

The Nursing Program

The study was conducted at Mt. Hood Community College in Gresham Oregon. Typically, community-college registered nurse education involves two years of study after completion of 45 credits of general studies that include several rigorous science courses. Students are awarded an Associate of Science degree in Nursing upon completion of required courses. The program is accredited by the Oregon State Board of Nursing, and the curriculum complies with mandatory regulations. It is designed to prepare graduates for the Registered Nurse licensing exam. The six academic quarters of nursing curriculum include didactic courses that present theoretical content in the college classroom setting. The curriculum also includes integration of campus-based nursing lab courses where students learn and practice psychosocial interventions, such as motivational interviewing; psychomotor skills associated with nursing practice such as giving an injection, and other interventions involving technology used in clinical settings. Students also participate in clinical courses each quarter, which involve taking care of patients under the supervision of faculty and/or staff nurses at a hospital or other healthcare facility. At the time of this study, student participants had completed 25 credits (250 class hours) of nursing theory and participated in 22 credits (660 hours) of lab and clinical hours. The study occurred in the final quarter of the six-quarter program and students were scheduled to graduate two weeks after the final study's simulation session was implemented.

The Course

During the study, student participants were completing the final 4-credit didactic course and a 6-credit clinical course. The theoretical course focuses on leadership and professional practice issues. The clinical course involves 180 hours and is considered an internship experience as it integrates all prior learning as students prepare to assume the role of the nurse in an actual healthcare setting. The nurse interns are mentored and supervised by a designated staff nurse and the faculty function as facilitators to assure that students are meeting the course outcomes and demonstrating proficiency in the competencies required to graduate. Of the internship hours, 128 occurred in a healthcare setting and were arranged according to course outcomes and each student's professional goals. Most students completed this internship experience in a hospital. A few internships were held in long-term care facilities, and one student was assigned to work in a home hospice program. The remaining 40 hours involved project-based activities in long-term care with a focus on the nursing leadership role. The 12 hours that students spent in the simulation experience were considered a component of the internship activity, and students were required to participate in order to pass the course. The simulation experiences were not graded as this was the established practice at this community college at the time of the data collection. Simulation was viewed as a learning experience that often incorporated formative assessment but did not involve summative evaluation that could affect student grades. There were policy and conduct codes that students were expected to comply with in all course activities associated with the internship course. These policy and conduct expectations were also integrated into the simulation experience. Examples of these policies include student dress code, patient safety standards such as handling needles appropriately, and professional communication and deportment when interacting with patients, family members, faculty, and peers.

The setting provided an ideal situation for the study for several reasons. First, the state-of-the-art high-fidelity simulation laboratory and debriefing room provided the environment necessary for both conducting the simulations and for data collection. The lab is equipped with two Laerdal™ Sim Man™, which are high-fidelity mannequins. In addition to the mannequins, the surrounding environment emulates a near-authentic hospital room with access to equipment such as intravenous infusion pumps, heart monitors, a defibrillator used in cardiac emergencies, and a well-stocked hospital supply room. The digital recordings are also managed in the control room. The debriefing room is equipped to allow for viewing of the digital recordings, which allows students to view the unfolding simulation live. The simulations used in the study were recorded, which facilitated the scoring of the rubric used to collect the quantitative data.

Another advantage of the setting involved the students' and faculties' familiarity with high-fidelity simulation. The nursing program began integrating high-fidelity simulation into the curriculum 18 months before the study. All students involved in the study had participated in seven to ten high-fidelity simulations in previous lab or clinical courses. This previous experience allowed the students to become familiar and comfortable with simulation as a learning activity. They had learned to work with the mannequins and were familiar with assessing the mannequin's physiological characteristics such as pulse, blood pressure, and heart and lung sounds. In addition, students were accustomed to viewing their own performance and observing their peers via the digital recordings. This provided opportunity to help them to be comfortable with the process of being observed in action by faculty and peers.

The faculty enthusiasm and commitment to participate in the study also contributed to making the setting ideal for the study. The entire program faculty members voiced enthusiasm towards integrating simulation more fully into the curriculum. The project proposal was presented to them in a faculty meeting by the program director, and faculty voted unanimously to integrate the 12 hours of simulation activity into the final clinical course. The two faculty members assigned as instructors for the simulation activity were eager to participate in creating high-fidelity simulation experiences that integrated clinical judgment, and they were committed to planning and implementing scenarios designed to meet this criterion.

Most of the students' previous simulation experience involved activities that focused on students' development of physical assessment skills, various psychomotor skills, professional communication, and the nurse's role as a member of the healthcare team. For instance, students had practiced listening to lung sounds so they could identify normal and abnormal findings within the context of a particular case scenario such as caring for a patient with pneumonia. In addition to completing the assessment, the interactive component of the high-fidelity mannequin required that students talk to the mannequin and explain their actions and findings as they would with a real patient. Previous simulation experiences also included psychomotor skill development such as initiating and calibrating intravenous therapy in response to Laerdal™ Sim Man's™ deteriorating condition and inserting tubes or changing complex dressings. The scenarios used previously in simulation were often created by faculty a few minutes before the scenario was actually enacted. The scenario focus was usually on either assessing the patient or performing a psychomotor skill on a mannequin that talked and responded to the intervention being carried out. The scenarios used before this study were not deliberately designed to provide a complex or ambiguous problems that required students to make one or more clinical judgments. Consequently, debriefing primarily addressed the physical assessment findings and the students' psychomotor skill performance.

Study Participants

The study's participants were selected on the basis of access and convenience and involved 36 nursing students enrolled in their final courses at the community college described above. There were 39 students enrolled in the course; two indicated they did not want to participate in the research and one student was excused from the course due to serious health problems.

Participants' rights and welfare were protected through the Portland State University (PSU) Office of Research and Sponsored projects. The study's protocol met the criteria for a Waived Review and was approved by the PSU Human Subjects Research Review Committee on April 12, 2006. The PSU Human Subjects Research Review Committee granted an extension of the approval on March 13, 2007.

Admittance to this nursing program is based on a competitive process using a point system that ranks applicants according to predetermined criteria that include academic performance, prior related work experience, and an interview. The applicant pool is extensive with over three times as many potential candidates as available positions. All students are well prepared academically, having completed rigorous college-level biological science, social science, and writing classes before being eligible for consideration as a candidate. The mean grade point average among the study participants was 3.45, with a range between 3.04 and 4.00.

There were 31 female participants and 5 males; thus, 13.9% of the participants were men. Because men are underrepresented in nursing, this number is above the national average of 6%. The remaining 36 students were divided into two cohorts.

Students in Cohort A were designated as the control group, and Cohort B was designated as the experimental group. The cohort groups were further divided into two subgroups so that each simulation session accommodated 8-10 students. There were two subgroups of 8 students in the experimental cohort (Cohort B). The control group (Cohort A) was divided into two groups of 10 students each. There were no absences for any of the sessions.

The placement of students into each group was managed by course faculty. The students were provided with a sign-up sheet and told there could be a maximum of 10 students per group. The students were not allowed to change groups between sessions. The group composition was based on student preference and largely driven by their schedules.

The simulation sessions were held on Wednesdays and Thursdays during four designated weeks throughout the academic quarter. There were two to three weeks between each simulation session. The control group, Cohort A, had their sessions in the morning; the experimental group, Cohort B, had their sessions in the afternoon. The faculty member designated to conduct the debriefing sessions for the control group was only available to teach in the mornings so the control group sessions were scheduled to accommodate this situation. In summary, designation of which students were in the control group and which were assigned to the experimental group was based on student preference and faculty schedule.

Faculty Participants

Two faculty members were assigned to function as instructors. The 12 hours spent directly in contact with students was calculated into their workload. Both faculty members who functioned as instructors for these simulated learning experiences were experienced nursing faculty. One had been an instructor for 12 years at the college, and the other had been a nursing faculty member for 6 years. Both had been participating in simulation for the previous 18 months. Neither instructor had participated in any formal simulation training designed for faculty. Their experience with the high-fidelity simulation lab and debriefing was learned by doing and was limited to their experience at MHCC. In addition, a laboratory assistant was assigned to help with the simulations. The duties assumed by this individual involved setting up props, assisting with the technology in the control room and the debriefing room, and assuring that all the simulations were recorded.

High-Fidelity Simulation Learning Activity

Scenario Development Process

Each simulation scenario integrated one or more key concepts that had been presented in previous courses. In addition, a rudimentary gap analysis was used to determine which scenarios should be implemented. The researcher reviewed the most recent findings presented by the National Council of State Boards of Nursing (NCSBN) and found that research indicates new graduates nationwide are deficient in several key areas (NCSBN, 2003) Specifically, new graduates are under-prepared to respond to emergency situations, supervise care provided by others, and perform complex psychomotor skills. The researcher also reviewed the MHCC graduate surveys results completed by the program's most recent graduates. This analysis indicated that graduates felt under-prepared to communicate with physicians regarding a patient's condition. Hospitals are reluctant to allow nursing students to discuss a patient's condition over the phone because the physician is likely to give a verbal order regarding a treatment that must be implemented. Nursing students cannot legally receive physician orders over the phone. Graduate surveys also indicated that the graduates felt under-prepared to prioritize care and were not confident in their ability to delegate and supervise the care provided by un-licensed assistive personnel. In addition, faculty voiced concern that students had decreasing opportunities to care for patients in an obstetric unit because of overcrowding in these clinical sites. These findings and the lack of exposure to the obstetric practice area influenced the topics and outcomes that were integrated into the scenarios used in the study.

The literature was reviewed regarding simulation design. Recent articles indicated that learning objectives should be developed first as the foundation that drives the scenario storyline (Henneman & Cunningham, 2005; Jeffries, 2007; Salas, Wilson, Burke, & Priest, 2005). Salas and associates observed that scenario design should begin by determining what knowledge and skills are held by the participants. Next the faculty should identify learning outcomes that reflect the gap between what the participants know and can do and what they need to learn. Learning in high-fidelity simulation environments creates the opportunity for faculty to design learning experiences that fill in the gap between what students know and what they need to learn. The mannequin emulates symptoms that serve as trigger events, thereby allowing participants to practice and receive feedback regarding their ability to apply what they know and can do in a near-authentic environment without risk to patient safety or well-being.

Jeffries (2005, 2007), the lead investigator in a multi-site study that involved implementing simulation in nursing education, proposed several guiding principles regarding scenario development. First, the scenario storyline should be constructed with the learning objectives in mind. As students progress in their knowledge and skills, the simulation scenarios should become more complex and include a level of uncertainty that triggers the participants' need to make clinical judgments. The amount of relevant information given to the participants before the scenario should increase over time during the scenario enactment. The complexity of the scenario and amount of relevant information provided before the simulation experience begins are dependent on the participants' experience and level of proficiency with a problem (Jeffries, 2007).

Jeffries (2007) posited that patients in real life are not likely to exhibit all the textbook signs and symptoms for a particular problem when the nurse first encounters a situation. Therefore, the clinical information should be given over time just as it is likely to occur in reality. Thus, scenarios should be designed so that participants are allowed to investigate freely and employ questions in any sequence. If participants become stuck and cease to gather additional information or to employ the clinical reasoning needed to make a judgment about what to do, Jeffries recommended that faculty provide a prompt that fits within the scenario storyline. Most prompts occur through the voice of Sim Man as means to direct the students to focus on the priority problem at hand. For example, one simulation in this study featured a patient going into hypovolemic shock due to blood loss. The students were not responding to the early subtle signs of shock exhibited by the mannequin so the faculty member speaking as the patient voice told the students she felt very wet under the bedcovers. This prompted the students to look under the covers and find significant amounts of blood (seedless raspberry jam) from the surgical site. This finding did indeed prompt the students to grasp the situation at hand and make a judgment about how to respond.

Henneman and Cunningham (2005) also suggested that if students do not respond appropriately to the cues provided by the mannequin, the faculty may assume the role of another healthcare provider, such as the charge nurse or physician, in an effort to redirect the students' thinking and action. The use of prompts and cues becomes an educational judgment by faculty on behalf of the students' learning. There can be a tendency to redirect the student when he or she is about to make a mistake in order to avoid the consequences. However, understanding the consequences of mistakes are powerful learning experiences. Salas and associates (2005) advocated that teachers resist the temptation to rescue students from untoward consequences of their errors. Jeffries (2006) suggested that prompts be considered when students are stuck or immobilized to make any decision at all and that students be allowed to make mistakes in simulation.

Henneman and Cunningham (2005) created a Framework for Developing Simulations (p. 174), resulting from their experience with scenario development and implementation of high-fidelity simulation. They identified principles that should be included in scenario development that are derived from Crisis Resource Management principles. Crisis Resource Management principles have been integrated into anesthesia training, including simulated learning experiences, for several years with the intent of facilitating team functioning and improving patient safety (Gaba, Fish, & Howard, 1994). These principles suggest that scenarios be developed to assure that participants have an opportunity to be prepared for what they may encounter in practice. Henneman and Cunningham designed their scenarios to assure that students had some information by simulating a change-of-shift report from the outgoing nurse immediately before the simulation begins. This report provides a summary of the patient's condition and progress towards meeting goals towards recovery. The nurse reports any new physician orders and issues of concern that were identified during the past shift. Tanner (2006b) suggested that the nurse's initial grasp of the situation at hand is often influenced by what he or she heard in the change-of-shift report.

Henneman and Cunningham (2005) also noted that the scenario storyline should be created to help students meet learning objectives. In addition, the storyline should provide opportunities for the students to prioritize and implement actions that result in immediate outcomes for the patient. For example, if the student appropriately provides supplemental oxygen to a patient, the oxygen saturation measurement should improve. Finally, scenarios should be designed so that students are encouraged to assign the appropriate tasks to the most qualified member of the team. Scenarios should be designed to challenge students; however, students should be encouraged to acknowledge when situations are unfamiliar and be allowed to ask for help.

Key content and concepts described above were integrated into the scenario development process. The researcher and faculty members also agreed that there should be an element of complexity and uncertainty integrated into each scenario. The complexity or uncertainty was described as a competing priority because students had to make a judgment about what issues at hand should be attended to first. As described in Tanner's model of clinical judgment, the priority that a nurse attends to is set up by his or her initial grasp of the situation. That initial grasp is influenced by multiple factors such as the change-of-shift report, the nurse's experience with a similar case, and knowledge of the patient's medical problem.

Table 4 lists each scenario used in the study and the competing priorities that created the complexity or ill-defined situation that required students to make a clinical judgment. The scenario storylines were all designed to include a trigger that provided the participants with the appropriate information needed to make a clinical judgment and to enact a response congruent with the judgment. The faculty also decided that they wanted the scenarios to include multiple opportunities for nurse/physician interaction so most of the scenarios involved at least one phone or face-to-face interaction with a physician. The role of the physician was played by a faculty member or the researcher. The faculty and researcher agreed that the mannequin would not die as a result of a mistake or treatment omission. The agreement was to rescue students through prompts or even direct intervention by a faculty member playing the role of a provider. However, we agreed to let a patient experience a full cardio-pulmonary arrest if the students' failure to appropriately intervene. We wanted to illustrate the consequences of errors, and also avoid a potentially distracting emotional ordeal that could ensue if we allowed the mannequin to die. This agreement was made as we were uncertain how students would respond to "killing the dummy." We were concerned that the emotional impact could distract from the goal of sustaining the simulation lab as a safe place to learn. Therefore, we agreed to let the mannequin survive despite egregious error. We agreed to assist the students in reviving the patient and then planned to transfer the patient to the critical care unit once the patient had stabilized. Finally, and most importantly, we agreed that the scenario objectives would guide the storyline.

As a result of these agreed-upon principles, the researcher and the faculty met before each scheduled scenario session. The purpose of these sessions was to fully develop the scenarios and plan the session to assure that the agreed-upon principles were evident in each simulation experience. The researcher developed five of the scenarios used in the study and also collected others from nurse educators working at other schools of nursing. This group of educators met monthly to share simulation experiences and scenarios. The schools involved in this collaborative simulation user group all use the same scenario template. All of the scenarios used in the study were developed using this template. An exemplar of one of the scenarios can be found in Appendix E. In addition to the scenarios provided by the researcher, one of the course faculty members wrote a scenario. Three scenarios previously used in the program were revised to integrate complexity and uncertainty into each storyline.

The scenarios were reviewed in a group meeting involving the researcher and the two faculty members. These meetings were held a week prior to the scheduled simulation and lasted two to three hours. The scenario review process involved reviewing and revising the objectives and refining the storyline of each scenario. The faculty members each took responsibility for tasks required to implement the scenario such as preparing medical records and acquiring props needed to make the scenarios more realistic. The faculty member conducting the control group debriefings was actively involved in all aspects of developing every scenario that was used in the study.

Scenario Implementation

The students each participated in four simulation sessions, and a total of 16 sessions were held. This assured that the groups were small enough so that every student was able to play the role of a nurse at least once during each session. The students were divided up into four groups of 8-10 students per group. The simulation sessions were held every two to three weeks between April 18 and June 6, 2006.

Developing and planning each simulation session involved identifying the needed props and supporting equipment that were required to implement each scenario. Large bins were purchased for each scenario and props such as mannequin clothing and wigs were gathered and stored. Medical equipment such as foley catheters, and recipes used to create matter the simulated body fluids were also stored in the bin designated for each scenario.

The nursing program employed a simulation technician who prepared the equipment for each simulation session. She was given a list of props and equipment a few days before each simulation session and she used the written directions and lists to prepare the bins. The simulation technician was also present during all sessions and managed the preparation of the mannequin and surrounding simulation environment immediately before each scenario. She also provided technical assistance during the actual simulations. The simulation technician made sure all the scenarios were digitally recorded, and double checked to make sure the live digital recording of each scenario was being displayed appropriately to the students who were viewing simulation in the debriefing room. Finally, the simulation technician initiated the scene turnovers between each scenario. While faculty were debriefing the students, the simulation technician changed the mannequin's clothing, set out equipment, medication and medical records that would be required in the next scenario and programmed the computer to emulate the physiological state the mannequin was to display at the beginning of the next scenario. The simulation technician role was critical in assuring each simulation session ran smoothly and allowed the researcher and faculty to fully attend to debriefing between scenarios.

During the scenario, one student was identified to play the role of the primary nurse and his/her role was to assume the leadership role and direct the secondary nurse during the scenario. The faculty usually designated which student would play the primary nurse. A second student played the role of the secondary nurse who typically performed the technical skills such as administering medication or inserting tubes or catheters. The primary nurse usually communicated with the physician but sometimes delegated that task to the secondary nurse. A third student played the role of a family member. Faculty quickly cued the student actor immediately before the scenario began. The instructions provided a brief description of how the family member should interact with the patient and the nurses.

The faculty and researcher were all in the control room during each scenario. One faculty provided the patient voice and responded to the students' actions. Another faculty managed the computer program which required changing the mannequin's vital signs and other physiological responses as the scenario unfolded. The researcher performed the role of scenario manager which involved observing the overall environment throughout each scenario through the one-way mirror and watching the four video screens in the control room. Each video screen provided a different camera angle and allowed the researcher and faculty to view the action from multiple viewpoints.

There was a phone at each simulation bay and students could make simulated phone calls to various hospital departments as needed. The phone calls were routed into the control room. The researcher usually answered the phone calls students made and assumed the role of the hospital staff in response to whoever the students indicated they wanted to speak to. Most phone calls involved speaking to other hospital personnel to get information such as lab and diagnostic test results or requests for equipment. The faculty who was managing the computer usually assumed the role of physician by speaking to the students over the phone.

Occasionally, one of the faculty or the researcher assumed the role of a physician or nursing supervisor and would physically enter the scenario by introducing ourselves in the role and asking the students to explain the dilemma at hand. This occurred when the students requested consultation, when they became overly frustrated with the situation and were not making progress toward problem solving, or when the faculty and researcher determined a direct prompt or cue would likely redirect the scenario towards meeting the objectives.

Each scenario took between 15- 20 minutes to complete. The faculty and researcher made a joint decision to end the scenario when they collaboratively determined that either the objectives had been met of that they couldn't be met because of the students' responses. Debriefing was directed to assure discussion incorporated both met and unmet objectives. Before ending the scenario the faculty and researcher spent 1-2 minutes identifying the key issues that should be addressed in debriefing. We also made a decision about whether or not to use the digital recording to replay parts of the scenario as a means to enhance the debriefing. The scenarios were ended by the faculty providing the voice of the mannequin. At a break in the action, she would state "Nice job nurses, the scenario is over".

The 6-8 students in the debriefing room were not monitored during the scenario. They watched the scenario on a large screen which included both audio and visual display. In addition to the live action, the mannequin's vital signs that were displayed on the bedside monitor were also displayed on the screen in the debriefing room. This meant that students in the debriefing room were receiving the same vital sign information as the students participating in the actual scenario. For instance, the students' in the debriefing room could see that the pulse rate was increasing and the blood pressure was decreasing during the shock scenario.

Table 4

Simulation Session Dates and Scenario Topics

Session Date	Session Concept	Scenarios	Competing Priorities
April 18/19	Problems with oxygenation -	Callie Mae – Complex cardiac problems due to low serum potassium	Difficult family dynamics between patient and daughter. Patient refuses prescribed treatment
		Ivan Schmoker – Low oxygen saturation due to pneumonia; permanent tracheotomy.	Establishing trust with wife at bedside, who cares for client at home. Communication with patient who cannot speak.
		Grant Taylor – Pulmonary embolism (PE); progresses into full cardiac arrest defibrillate.	Patient's fluid balance is also serious and physician is fixated on fluid balance even though patient is exhibiting classic signs of PE.
May 2/3	Trajectory of illness of an oncology patient – This was a progressive scenario and the session involved	Alyce Nyman **Scene 1** Pre-operative. Students must prepare the patient for a diagnostic procedure; involves completing the pre-op check list under time constraints and includes	Patient is anxious and is demanding anti-anxiety medication ordered as a pre-operative medication to be given when the operating room calls. Technically this can't be given until the OR calls. Patient expresses fear about probable cancer diagnosis.

	caring for the same patient in each scenario.	getting operative permit signed. **Scene II** Patient receiving chemo and needs nausea control with many options for medication. Students must recognize fluid volume deficit; provide report to oncology nurse and physician. **Scene III** Patient is dying. Students interact with patient and family at bedside and provide appropriate pain medication among several options.	Patient is questioning the utility of treatment. Asks nurse how to tell her family she wants to stop treatment. One family member is asking nurse to do everything possible to save patient's life. Change-of-shift report indicates the DNR. DNR sign is over the bed yet students can't find the signed form. Patient's sister calls for a condition report and advice about travel. Students practice giving bad news.
May 23/24	Managing the patient with hypovolemic shock due to hemorrhage	Karen Mitchell – Post-partum patient develops post-partum bleed and develops early s/s shock. The same scenario was repeated three times in a row with different students participating in each. One debriefing was held at the end of all three scenarios.	Baby at bedside is fussy and crying. Patient worried about being able to breastfeed. Students must differentiate between patient's concern and anxiety r/t to fussy baby and breast feeding and the anxiety associated with shock.
June 5/6	Common problems on medical/surgical unit 4-5 scenarios ran each session	Potter Chang – Uncontrolled post-operative pain; multiple medication options available.	Nasogastric tube has been dislodged and needs to be replaced. Patient is vomiting. Students must decide what to treat first, pain or nausea. Patient remains anxious about

	so there were only two students playing role of each nurse during data collection.	Grant Taylor – Recovering from PE. Lab values provided to students indicate that heparin dose needs to be changed STAT. Students must recognize abnormal value, call doctor and give report, and recalculate the infusion rate.	hospitalization due to uninsured status. Has lots of questions regarding long-term treatment with anticoagulant therapy. Asks nurse for help arranging for required lab draws on the road, which will allow him to continue employment as truck driver.
		Karen Mitchell – Prepare for surgery (D&C), possible hysterectomy. Pre-op check list.	Patient verbalizing concern about possible hysterectomy. Questionable whether she understands the informed consent already signed.
		Margaret Washington – Uncontrolled post-op pain and high blood sugar. Students must prioritize to effectively address both problems.	Patient doesn't understand disease and needs diabetic teaching. Doesn't understand the need for continued insulin injections; somewhat resistant to treatment.
June 5/6	Common problems on medical/surgical unit	Margaret Washington – Hypoglycemia – Students must recognize and treat s/s hypoglycemia.	Patient was also medicated heavily for pain. Students must differentiate between hypoglycemia and effects of narcotics on mental status.

Instruments

As previously discussed, this mixed method study used both quantitative and qualitative data sources to answer the research question and fulfill the purposes. The

Lasater Clinical Judgment in Simulation Rubric (LCJR) was used as the instrument to collect the quantitative data for this study.

The qualitative data were collected to provide supplemental information and insight as to what was happening in the quantitative data. These data sources included transcripts from the debriefing sessions, field notes that described the simulation sessions and informal conversations with participants, and a questionnaire completed by students at the end of the course. The LCJR data collection instrument is described below. A discussion describing the qualitative data sources follows.

Quantitative Data - Lasater Clinical Judgment in Simulation Rubric

The LCJR was used to address the research question: When using high-fidelity simulation, what effect does incorporating the How People Learn (HPL) instructional design model have on the development of clinical judgment? This question was answered by comparing student scores from the LCJR between the control group and the experimental group. Comparison included both overall rubric scores and subscale scores from the four aspects of the rubric: noticing, interpreting, responding, and reflecting. Results are discussed in the next chapter. The LCJR was also used to address the second purpose of this study: To contribute to the further development of an instrument designed to measure the Research-Based Model of Clinical Judgment in Nursing.

The LCJR was developed as a component of a recently completed doctoral dissertation (Lasater, 2005). The instrument uses a 4-point ordinal scale and is designed to measure the four aspects of the Research-Based Model of Clinical

Judgment in Nursing (i.e., noticing, interpreting, responding, and reflecting). Each of the four aspects includes subscales that provide detailed description of behaviors that define varying levels of performance. Students are assigned a score based on the evaluator's assessment of their performance during simulated experience. The subscale scores are added to a total of 44 possible points. The rubric and scoring guide are presented in Appendix F.

Lasater's (2005) dissertation incorporated development and refinement of the LCJR. She used an extensive and thorough process to develop the rubric, which included 53 observations representing 39 different research participants. Tanner, the theorist who developed the Research-Based Model for Clinical Judgment in Nursing theory, consulted through the development phase of the instrument. In addition, Katims, an expert in authentic learning assessment, also consulted in the development of Lasater's tool.

Lasater's (2005) research included preliminary efforts to establish acceptable content and construct validity for the rubric. However, the study involved a small sample size, and Lasater's concluding recommendations suggested that further study was necessary to establish both validity and reliability of the tool. Lasater specifically indicated that studies to test for inter-rater reliability in a wide-variety of settings were needed. As the developer of the rubric, Lasater was the only individual who had used the instrument to assess clinical judgment as described by the Research-Based Model of Clinical Judgment in Nursing. Verifying the dependability of the LCJR is extremely important, as the tool has been disseminated to several of Oregon's nursing programs that are currently developing high-fidelity simulation programs. In addition, the model of clinical judgment is beginning to be integrated into the practice setting within staff development programs. The model is also receiving national recognition. Many of Oregon's nursing schools are already using the tool for student self-assessment and as an instrument for teachers to evaluate students' clinical judgment in simulation.

Qualitative Data

Digital Recordings of the Scenarios

Each scenario was recorded digitally using the simulation control room equipment. The recordings were then transferred to an electronic storage devise and were used by the raters who collected data. The raters reviewed the digital recordings when they were unsure of the reliability of their initial scores. This process is discussed in detail below.

Transcriptions of Debriefing Sessions

Debriefing sessions were recorded using digital audio recording devices. Ten of the recordings were transcribed for data analysis. Five of the transcriptions were from the control group debriefings and five were from the experimental group debriefings. Selection of which recordings were transcribed was driven by two factors. There were some technical difficulties and failures with the recording equipment, which eliminated the ability to transcribe all of the debriefing sessions. Furthermore, once the transcription process was initiated, it became apparent that transcribing all of the available debriefing recordings would result in an unmanageable amount of data and the transcription process would also be very expensive. Therefore, ten of the available recordings were selected for transcription. The audio tapes were reviewed and selection was made to assure there that each simulated patient was represented by a control group debriefing and an experimental group debriefing. The two selection criteria included best available recordings, and assurance that there was transcription of the same scenario for both the control and experimental group. Consequently, there are two debriefings from both the control and experimental group from the first simulation session. There are two debriefings for each group from the second simulation session. There is one debriefing from both the control and experimental session from the third simulation session.

Debriefings from the final simulation sessions were not recorded for two reasons. The researcher did not facilitate the experimental debriefing because the scenarios and debriefing occurred simultaneously to facilitate the collection of the post-intervention quantitative data. The researcher was busy participating in running the scenarios and facilitating the data collecting using the rubric. Table 5 describes the recordings that were transcribed for data analysis purposes.

Table 5

Transcribed Scenario Debriefings

Session Date	**Cohort/Group**	**Scenario**
4/18/06	Control/Wed	Callie Mae
4/19/06	Control/Thurs	Grant Taylor
4/18/06	Experimental/Wed	Callie Mae
4/19/06	Experimental/Thurs	Grant Taylor

5/2/06	Control/Wed	Alyce Nyman-Scene 1
5/3/06	Control/Thurs	Alyce Nyman-Scene 3
5/2/06	Experimental/Wed	Alyce Nyman-Scene 1
5/3/06	Experimental/Thurs	Alyce Nyman-Scene 3
5/23/06	Control/Wed	Karen Mitchell
5/24/06	Experimental/Wed	Karen Mitchell

Field notes

Field notes were used as an important data source for understanding the quantitative data results and for addressing the first purpose of the study. Patton (2003) wrote that field notes are derived from personal, eyewitness observation. The observational field notes documented what the researcher heard, saw, experienced, and thought about during the course of collecting and reflecting on the data. As recommended by Bogdan & Biklin (1998), the notes also included descriptions about unplanned and informal interactions and communication between the researcher and students and the researcher and course faculty.

Field note process

The researcher's brief handwritten field notes were used to create detailed typed notes that were developed and filed within 48 hours of the observations of the simulations and debriefings. The procedure for creating the field notes involved several steps. During the simulations, the researcher jotted notes down using a few words to serve as a reminder of an event or action. The same process was used during the debriefings. Because the researcher was a full participant in the simulations and debriefings, it was not practical to take detailed notes during these activities. At the end of a simulation day, the notes were used to write a summary of each group's simulation session noting significant events that had occurred. This step was completed before leaving the simulation site. The next step involved developing detailed recollections of the simulation sessions using the hand-written notes. This was completed within 48 hours of the simulation session using a computer. These accounts were written according to guidelines that suggest that the notes provide a deep, detailed description of the setting, people present, and behaviors and responses of the participants (Bogdan & Biklen, 1998; Patton, 2002). The researcher incorporated these recommendations and attended to describing the events using objective language; she attempted to avoid the insertion of generalizations and judgments about what was observed. The researcher used field notes to document observations regarding student actions and responses during the simulation. Relevant topics that emerged during the debriefing were also noted. Specific concerns verbalized by students and faculty were described.

Patton (2002) noted that "field notes also contain the observer's own feelings, reactions to the experience, and reflections about the personal meaning and significant of what has been observed." (p. 303). As part of the field notes, the researcher recorded ideas, strategies, reflections, and hunches that emerged regarding the data interpretation (Bogdan & Biklen, 1998). Efforts were directed toward recording observations, thoughts related to the Research-Based Model of Clinical Judgment in Nursing (noticing, interpreting, responding, and reflecting). In addition, observations that encompassed the HPL learning environment were also recorded (learner-centered, knowledge-centered, and assessment-centered aspects of the environment). The researcher designated a reflection section of each field note entry, which was used to capture the feelings, reactions to the experience, and personal reflections identified by the researcher.

The final step involved reviewing and revising the field notes after the draft of the comprehensive notes was developed. The researcher found that her feelings, personal interpretations of what had happened, and judgments sometimes crept into the objective reporting section of the notes. The notes were revised to assure that these subjective aspects of the field notes were moved to the reflective section.

In addition to the field notes that documented observations of the simulation sessions, many of the unplanned informal conversations regarding the study were recorded. The researcher kept a journal noting dates and times of events, notes from meetings, and reflective thoughts regarding work and personal life. The researcher was in the habit of carrying the journal at all times. Notes regarding encounters related to the study were also recorded in this personal journal. Those notes were then developed in more detail, transcribed electronically, and filed as field notes. An example of such a recording is a description of a hallway conversation between the researcher and one of the course faculty members.

Student Journals

Students' post-simulation journals completed by the experimental cohort were also used as a data source to address the first purpose of the research: Identifying instructional strategies that lead to effective learning when using high-fidelity simulation. The process used to complete this journaling activity was described above. The post-simulation journal questions can be found in Appendix D.

End-of-course Survey

The course faculty were accustomed to assessing students' responses and recommendations to new instructional strategies. The faculty and researcher agreed that an end-of-course survey would be helpful to improve the simulation experience for future students. The faculty and researcher designed a short survey to include open-ended questions. The students anonymously completed the survey after their final simulation experience. The comments were transcribed so that each cohort could be identified. The survey data were also used to address the first purpose of the study and offered the student perspective towards identifying instructional strategies that led to effective learning in the simulation environment. The end-of-course survey can be found in Appendix H.

Data Collection

Pilot Study

A two-step pilot study was conducted as the first phase of the data collection process. The first step involved two days observing simulation sessions. The two sessions observed included students in the fourth term of nursing curriculum. As a result of the observations, the researcher determined that it would be best to change her role from Onlooker Observer to Participant Observer (Patton, 2002).

The researcher was granted permission to conduct a pilot study for the research during the last simulation session scheduled for the group of students who were observed. The faculty who were teaching this course were the same faculty involved in the actual study and indicated they were agreeable to participating in the pilot study. The process used to conduct the pilot study was comparable to the activity the experimental group participated in the actual study. A detailed account of the intervention in which the experimental group participated in was described previously.

In summary, 42 students participated in the pilot study. The faculty and researcher used the same process described previously to prepare and plan the simulation session. The pilot session involved the three scenarios that were also used in the first session of the actual study. There were four simulation sessions held over two consecutive days. The pilot-study students were provided with preparation information for each of the scenarios and completed pre-simulation journal activities for the scenario that were designed by the researcher. The researcher also conducted a pre-simulation discussion that addressed the journal questions. The researcher conducted the debriefing for the scenario using the debriefing guide developed for the study and also incorporated deliberate efforts to incorporate the HPL perspective into the discussion. At the time of the pilot study, the researcher's approach to debriefing differed significantly from the process used by the faculty. The researcher included all students in the debriefing and assured that the students who had just observed the scenario and the participants acting as nurse in the scenario were all seated around a large table, which was positioned in the middle of the debriefing room. In addition, effort was made to include all students in the discussion through eye contact, asking questions, and exploring brief statements to elicit more information about the thinking from students who had observed and acted in the scenario. This approach contrasted with the process that faculty were using prior to the pilot study. The faculty debriefings were 10-15 minutes long and involved a process wherein the faculty did a most of the talking. The debriefing discussions were largely focused on task performance with faculty providing information regarding appropriate protocols and details about how to do something and explaining the rationale for doing a particular task or skill. The faculty also usually only addressed the two or three students who had acted in the simulation and ignored the students who had been watching the scenarios live on screen. The two or three students who were involved in the simulation sat in a semi-circle in the corner of the room with the faculty while the remaining eight to ten students who had observed the scenario sat around the large table. Prior to the study many of the debriefings were held in the simulation lab at the bedside. These conversations included only the two or three students that were acting in the scenario. The remaining students observed the bedside debriefing on the screen in the debriefing room. In summary, the students who had watched the scenario maintained the role of observers throughout the debriefing as they had during the actual simulation.

Pilot Study Results

The two study faculty were both present at the debriefing conducted by the researcher during the pilot study debriefing. After the pilot study, the faculty began positioning all of the students around the table and began including the students who had observed the simulation in the debriefing discussion. This change became the standard process used by the faculty after the pilot study. Thus, the pilot study created an unintended change in the debriefing process for the control group.

The researcher made a few changes to the debriefing guide as a result of the pilot study. The guide was repositioned to a landscape format and the margins were modified to allow for more note-taking space.

The journals completed by the students were reviewed after the pilot sessions were conducted. The researcher was satisfied that the responses were complete and that students had communicated the reflective thinking process the questions were designed to elicit. Many students completely filled the spaces provided, so the spaces between the questions were enlarged.

Establishing Inter-Rater Reliability

The study design required that inter-rater reliability of the LCJRS be established before the tool could be used as an instrument for data collection.. The goal was to minimize the likelihood that students' scores would vary from rater to rater. It was important to verify inter-rater reliability so the tool could be used with confidence to measure the development of clinical judgment in the context of high-fidelity simulation. According to Moskal and Leydens (2000) establishing inter-relater reliability when using rubrics to assess student performance begins by posing the following questions regarding the rubrics clarity: (1) Are the scoring categories well defined? (2) Are the differences between the score categories clear? (3) Will two independent raters arrive at the same score for a given response based on the scoring rubric?

Upon careful review of the LCJR, the researcher believed that the instrument included well-defined scoring categories and that the differences between score categories were clear. The answer to the third question was unknown. Therefore, efforts were planned and implemented to determine if two independent raters arrived at the same score for each scoring category.

Background

Use of rubrics to assess student performance is increasing in post-secondary education environments (Simon & Forgette-Giroux, 2001; Stevens & Levi, 2005). Redder (2003) conducted research to explore the effect of rater training when using rubrics to assess student performance. Her research affirmed the importance of training raters as a means to establishing inter-rater reliability. The final analysis of Redder's multiple method study found that training had a positive affect on inter-rater reliability, on validity, and on the scoring process when using rubrics to score essays that were assigned to illustrate attributes of critical thinking. Redder's study showed that training has a positive affect on inter-rater reliability primarily because trained raters construct a mental image of the rubric text and scoring guide. Redder found that trained raters take a more iterative approach to scoring and tend to make multiple evaluative decisions, whereby each decision is fluid and becomes a revision of the prior one because of additional information. Conversely, untrained raters tend to use a more linear approach to scoring student work when using rubrics. Untrained raters are more likely to base their scores on personal experience and their individual understanding of constructs guiding the rubric.

Moskal and Leydens (2000) asserted that establishing inter-rater reliability uses two distinct activities. One activity involves using anchor papers and projects that are attached to the rubric. Anchors are scored responses that illustrate the nuances of the scoring rubric (Moskal & Leydens, p. 8). Raters review the student performance and then study the anchors to become acquainted with the scoring criterion differences between score levels. Raters are encouraged to refer to the anchor performances throughout the scoring process. Wiggins (1998) reinforced the notion of anchor performance and suggested that rubrics should always be accompanied by exemplars of student work to assist raters in developing a mental schema of the knowledge and concepts that the rubric aims to assess. The second activity proposed by Moskal and Leydens (2000) involves the opportunity to practice scoring sessions and follow-up discussion between raters regarding any discrepancies between scores. Differences in interpretation are discussed and appropriate adjustments to the rubric are negotiated.

In preparation for the rater training session, the researcher identified five previously recorded simulations to serve as anchor performances. The simulations came from the library of recorded scenarios used previously in nursing courses. The five scenarios that were chosen included varying levels of students. Two recordings were selected as scenarios to use as the anchor rubrics. The researcher viewed the recordings and then completed the scoring using the rubric (Appendix F) and scoring sheet (Appendix G). The researcher used the LCJR to assess the previously recorded simulations and provided written comments regarding the rationale for each score assigned. A scenario featuring beginning students and another recording featuring students who were enrolled in the fourth term of the program were selected as the student performances that served as anchors.

The two raters were both faculty from the community college program. They had attended a half-day workshop on the Research-Based Model of Clinical Judgment in Nursing and were familiar with the model and with the rubric. An overview of the study was provided using oral explanation, and a summary document of the study was developed to orient the raters. The summary used excerpts from the Human Subjects application and included an overview of the study's conceptual framework. The strategy used to orient the raters to the concepts embedded in the study is congruent with Redder's (2003) claim that tactics are needed to assist scorers to develop a mental map/picture of the constructs and criteria that the rubric aims to assess.

Once the two participating faculty verbalized that they understood the constructs related to the Research-Based Model of Clinical Judgment in Nursing, the second activity to establish inter-rater reliability was implemented. The researcher and the two faculty members who performed as raters viewed the previously recorded simulations that served as anchor performances. The rubrics scored by the researcher were used as reference points while the faculty scored the first two rubrics. Once the researcher and raters viewed the recorded simulations and completed the rubric scoring sheet, results were shared and compared. The researcher facilitated dialogue that promoted a think-aloud format that encouraged the raters to describe the reasoning related to each assigned score. There was little need to clarify terminology used in the rubric as the raters' demonstrated shared understanding of the rubric language beginning with the first rubric that was scored. A total of five recordings were assessed using the LCJR to evaluate the clinical judgment performance of students in the recordings. Comparison of rater scores after scoring each recorded scenario indicated that they were almost always identical on all items and they verbalized similar rationales for scores given. The procedure lasted about three hours, and after the fifth scoring, the researcher was satisfied that adequate inter-rater reliability had been achieved. Statistical analysis using SPSS confirmed this assessment as the alpha coefficient was .87. An alpha coefficient of .70 or above is considered acceptable (Wiersma, 2000). Therefore, because inter-rater reliability was sufficient, further discussion of the rubric or subsequent rater training was not required and the rubric was not altered.

In conclusion, the LCJR met important criteria for inter-rater reliability because the scoring categories are well defined and the differences between the score categories are clear. Inter-rater reliability was established by providing a rater training session and examples of a scored rubric anchored by digital recordings of students performing in simulation. Scored rubrics from the first data collection session using the rubric were evaluated, and inter-rater reliability was maintained throughout the study.

Data Collection Using the LCJR

The LCJR provided quantitative data that were analyzed to answer the research question and fulfill the two purposes of the study. Two faculty members volunteered to serve as raters received the rater training. The rubrics were completed by both faculty on every student as they performed as the nurses during the first and final simulation session.

The raters found that they were best able to complete the rubric when they were close to the scenario action, so they were both situated at opposite sides of the patient room during the simulation enactment. During debriefing, they also sat in opposite sides of the room in a corner. The raters functioned as spectator observers (Patton, 2002) and did not participate in the scenarios or debriefings while collecting data. Students were accustomed to being evaluated by faculty in a similar manner in both the lab and the clinical setting and did not seem to be affected by the raters' presence.

In addition to observing the scenarios and debriefings to complete the rubric, the raters also viewed the digital recordings before finalizing their assessment. Immediately after each simulation session, the technician replayed each scenario for the raters in the control room. The raters watched each scenario through and affirmed or adjusted their ratings accordingly.

The students were assigned to function as a nurse in specific scenarios at the beginning of the simulation sessions. Students were expected to be prepared to assume the role of the nurse for any of the scenarios scheduled for each simulation session.

Data using the LCJR was collected during the first and the final time each student functioned in the role of the nurse.

In summary, data sources include quantitative data obtained from the Lasater Clinical Judgment in Simulation Rubric. Qualitative sources of data include field notes and transcriptions from selected debriefings, student journals, and end-of-course surveys as previously described. Table 6 provides the dates and times of data collection activity to depict the timeline and plan for data collection.

Table 6

Data collection schedule

Dates	Quantitative Data	Qualitative Data
March 8/9, 2006 Pilot Study		• Student journals
April 18,19,2006	LCJR	• Student journals • Field notes • Transcriptions of debriefings • Digital recordings of scenarios
May 2/3, 2006		• Student journals • Field notes • Transcriptions of debriefings • Digital recordings of scenarios
May 23/24, 2006		• Student journals • Field notes • Transcriptions of debriefings Digital recordings of scenarios
June 5/6, 2006	LCJR	• Field notes • Digital recordings of scenarios • End of Course Survey

Data Analysis

The mix of qualitative and quantitative data required a variety of analysis methodology to answer the research question: When using high-fidelity simulation, what effect does incorporating the How People Learn (HPL) instructional design model have on the development of clinical judgment? The research design also used both research paradigms to address the two purposes of the study: 1) Identify instructional strategies that lead to effective learning when using high-fidelity simulation and 2) Contribute to the further development of an instrument designed to measure the Research-Based Model of Clinical Judgment in Nursing (Lasater, 2005; Tanner 1998, Tanner, 2006b). Table 7 provides a summary of the methods used to complete the data analysis and delineates the analysis method used to answer the research questions and to fulfill the study purposes.

Table 7

Data Analysis Methods

Research Question	**Instrument**	**Data Analysis Method**
When using high-fidelity simulation, what effect does incorporating the How People Learn (HPL) instructional design model have on the development of clinical judgment?	• LCJR	• Frequencies • One-way ANOVA

Identify instructional strategies that lead to effective learning when using high-fidelity simulation	• Debriefing transcripts • Field notes • End-of-course questionnaire	• Constant comparative coding procedures o Open coding o Identifying patterns and themes o Seeing plausibility o Counting and Summarizing
Contribute to the further development of an instrument designed to measure the Research-Based Model of Clinical Judgment in Nursing	• LCJR	• Reliability statistic- Cronbach Alpha

Data Analysis Procedures

The study used a sequential analysis mixed method model (Onwuegbuzie & Teddlie, 2003). The quantitative data were analyzed first as it had been identified as the core data source, and the primary rationale for collecting the qualitative data were to help explain the results of the quantitative data. A decision was made to wait until the quantitative data results were available before beginning the qualitative analysis. In addition, the results from the LCJR rubric were available within a short time after the data were collected. The text derived from the audio tapes took six weeks to transcribe. The coding process used to analyze the qualitative data were implemented once the written transcriptions from the recordings became available. The coding process was completed over several months due to the laborious nature of the task and a commitment to use a second coder, here referred to as the co-researcher.

Quantitative Analysis

Quantitative analysis was used to answer the first research question. A Microsoft ACCESS spreadsheet was developed for quantitative data input. The results from the LCJR data collections were input into the spreadsheet. The data were then uploaded from the spreadsheet SPSS 11.5 for statistical analysis.

A two-group research design drove the decisions regarding the tests used in the quantitative data analysis. The LCJR data were analyzed for changes in the mean scores and standard deviations. A one-way ANOVA was used to test the mean scores between the control group and the experimental group, and comparisons between LCJR scores from the first day of simulation and the final simulation were calculated. Analysis included both the cumulative student scores achieved on the rubric as well as the scoring related to the subscales of the instrument that were designed to assess the four aspects of the Research-Based Model of Clinical Judgment in Nursing. This analysis answered the study's research question. The results of the quantitative analysis are discussed in chapter 4.

Qualitative Analysis

The qualitative data sources included field notes that incorporated the simulation planning session involving the researcher and the faculty, events from the scenarios, and important observations that occurred in debriefing. Relevant unplanned and informal conversations were also included in separate field notes. Selected transcripts from the debriefing sessions were used in the data analysis. Journal entries from one of the sessions were used to address the first research purpose. The qualitative analysis also included review of some of the digital recordings of the actual scenarios. Results from the end-of-course survey completed by students were also included as a data source.

Patton (2002) posited that qualitative research most always involves a small sample size and therefore can be considered a case study. There are always people involved in the study. In this research, the unit of study or case was the 36 students involved in the study.

The qualitative data analysis used coding processes described by Miles and Huberman (1994). The researcher was committed to assuring that the qualitative data provided an explanation for the quantitative results. The coding strategy used in the constant comparative process provided the rigor needed to substantiate the findings and to inform discoveries regarding simulation as a means to promoting the development of clinical judgment (Patton).

Organizing the data.

Discussion of a data analysis process often make a "...hard-and-fast distinction between data collection and analysis" (Patton, 2002, p. 436). Multiple authorities on qualitative analysis have claimed that because of the emergent character of naturalistic inquiry associated with qualitative research, the distinction between data-gathering and analysis is not well defined (Bogdan & Biklen, 1998; Lincoln & Guba, 1985; Miles & Huberman, 1994; Patton, 2002; Wolcott, 1990). Bogdan and Biklen (1998) indicated that qualitative data analysis in education should begin in the field as an ongoing part of data collection. Creating field notes exemplifies this premise as the researcher is prioritizing what is important to describe and record as a data source, which really involves the beginning analysis process (Bogdan & Biklen, 1998; Patton, 2002). Wolcott (1990) warned that "the critical task in qualitative research is not to accumulate all the data you can, but to 'can' (i.e., get rid of) most of the data you accumulate" (p. 35). Towards that end, the researcher made a decision to use a sample of the audio recordings using the criteria for selection described earlier.

Early into the data collection process, the researcher determined that the students' journals were not providing as rich a data source as anticipated. There may have been several reasons why the journals were not working as planned. First, the researcher found early on that the students were rushing to complete the journals. The journaling activity occurred at the end of each simulation session and the time was often cut short because the debriefings were lasting longer than anticipated. Second, the questions may have been too prescriptive. The researcher also discovered early into the study that what happened during simulation and debriefing was unpredictable, and the journal questions were not eliciting the level of reflection evident in the dialogue that was occurring in the debriefings. Third, the timing of the journals may have been too close to the active experience. Students may have needed more time to think after the simulation and debriefing in order to produce the reflective writing that the researcher had hoped for. Fourth, ideally the journal assignment would have provided an opportunity for students to integrate what they were learning in simulation with their clinical experiences involving real patient care. A few students offered those reflections through email conversations and other informal encounters. The students were also completing journals as part of their clinical experience, and these journals were graded, which may have contributed to perceptions that the non-graded journals were of lesser value. Finally, the students were not getting any feedback on the journals. In order to promote student recording of their thinking and reasoning, they may have needed feedback regarding their reflections. Feedback would have validated or challenged their reflective thinking and verified that the assignment was worthwhile and important.

While the journals were eliminated as a data source during the initial data organization phase, the researcher also decided to include the results from the end-of-course questionnaire that was completed by the students. Upon reviewing the results from the questionnaire, the researcher found that the student responses provided insights that would contribute to fulfilling the first purpose of the study.

In addition to determining what data to eliminate, the researcher began the data analysis process by organizing the various sources of data. Transcripts were identified and labeled. Field notes were also organized into chronological order. The student responses to the questionnaire were organized according to which students had completed them (i.e., control group or experimental group) and then typed. The researcher also determined that the coding would be completed by hand. The qualitative data were prepared for coding by reformatting to allow for margin notes and code identifiers. Multiple copies of each document were made to accommodate for several sessions of coding procedures.

Establishing trustworthiness

Experts in the field of qualitative research have provided explanations regarding the issues of trustworthiness that must be addressed during data collection and data analysis (Lincoln & Guba, 1985; Patton, 2002). Trustworthiness refers to the notion that the findings of the inquiry are "…worth paying attention to, worth taking account of" (Lincoln & Guba, p. 290). Patton indicated that triangulation strengthens the trustworthiness of a study through several processes. Three types of triangulation were employed in this study to strengthen the trustworthiness. First, the study employed several sources of qualitative data. Second, the study used both qualitative and quantitative data to study the research questions and address the study purposes. Third, "investigator triangulation" (Patton, p. 247) was implemented in the data analysis phase. The investigator triangulation activity involved a co-researcher. The co-researcher was an experienced doctoral nurse researcher and she participated in three of the four phases involved in the coding process which is described later in this chapter.

As a mechanism for establishing trustworthiness of the study, the researcher's relationship with participants must be transparent and considered during data collection and analysis (Patton, 2002). Patton (2002) identified these variations as dimensions. These two dimensions describe the researcher's role and perspective as a continuum between two poles. The researcher's position on each continuum can be used to organize the description of how the data collection is affected as the process unfolds during the course of the study (Patton).

The first dimension describes the role of the observer. The researcher functioned as a participant observer in this study. Patton (2002) explained that the polarity of this dimension is "full participant" (p. 277) at one end of the spectrum and "onlooker observer (spectator)" (p. 277) at the other. Patton also noted that the researcher often moves along the spectrum as the research progresses. At the beginning of this study, the researcher functioned towards the middle of the spectrum in relation to the control group and more towards the full-participant end of the spectrum with the experimental group and with the faculty. By midway through the data collection, the researcher's role is best described as a full participant in all of the activities associated with implementing the study for both cohorts.

The second dimension described by Patton (2002) has been labeled "insider versus outsider perspective" (p. 267). Again the researcher began the data collection process positioned in the middle of the spectrum. Though not fully an insider, by the end of the study the researcher's position on this spectrum had transitioned toward the insider end of the pole. This was evident through the numerous informal conversations that occurred as the study progressed. These conversations increased in frequency between the researcher and both student participants and the faculty. As the study progressed, conversations and electronic communication were initiated by several student participants reporting application of what they were learning in simulation to what they were experiencing in clinical. The faculty also began including the researcher in many discussions regarding simulation as an instructional tool and their plans' regarding future simulations after the study was completed.

Coding Procedure

The coding activity involved four phases. The researcher and co-researcher, an experienced colleague in qualitative research methodology, worked together closely during this phase of the data analysis. Once the documents were prepared for analysis the researcher and co-researcher met three times to review and compare findings. A summary of each session is described and includes the process that was used to identify coding descriptions, patterns and themes.

Phase 1 -Open coding.

The open coding process (Miles and Huberman, 1994) was begun by reading the data thoroughly two times. The intent of this activity was to develop a sense of the whole of the data in order to begin to identify pertinent concepts that were emerging. This was accomplished by asking questions about the data and making comparisons between the simulation sessions. After the two readings, both researchers independently studied the data in chunks of several consecutive sentences or paragraphs. The two researchers met and shared impressions about the transcripted data as a whole. They also compared the chunks of data they each had identified. At this point, a provisional start list of codes was identified to provide preliminary guidance in the analysis (Miles & Huberman, 1994). As suggested by Miles and Huberman (1994), the start list was derived from the conceptual framework that was guiding this study. Similar events were labeled and codes were assigned. Chunked data that had codes assigned were compared and grouped to form categories. Categories were then assigned properties that described them, and dimensions of the properties were considered. For example, the category with clear dimensions was identified as peer-to-peer challenge. There were several times when students challenged each other's actions or decisions during the debriefing.

Phase 2- Identifying patterns and themes.

The next phase involved identifying patterns and themes (Miles & Huberman, 1984). The open coding process "fractures the data" (Strauss and Corbin, 1998, p. 97) and allowed the researchers to identify some categories and their defining properties. The researchers worked with the data independently and used the preliminary categories that were identified to understand patterns and themes within the data. The researchers met to compare findings and created a list of codes to use in the next phase of data analysis. During the second meeting the researchers discussed the characteristics that defined each pattern. Effort was made to view the criteria for each identified code with skepticism. Each identified code was considered carefully to assure it accurately represented a reoccurring pattern that appeared throughout the data. The identified patterns were considered conceptually and compared with the research question and second purpose of the study. At this point the researchers identified that the fours aspects of Tanner's clinical judgment model would be used as the primary organizational schema. They honed the criteria required to assign each of these codes to a chunk of text.

Phase 3 – Seeing plausibility.

The two researchers initially worked independently and each used the agreed upon list of codes as the primary organizer to assign meaning to chunks of data. As described by Miles and Huberman (1994), during this phase the researchers attempted to make connections between the codes. Context of the chunks of coded data were also considered. The chunks of coded data were attended to in terms of cause and effect and the researchers focused their analysis to specify the conditions that influenced chunks of coded data. The researchers used a combination of inductive and deductive reasoning to connect the data. The researchers met a final time and compared their data analysis. The coded data were painstakingly reviewed and findings between the researchers were compared. This was a very iterative process as the analysis of one chunk of data influenced the interpretation of another. Codes that addressed clinical judgment and the HPL learning framework and the relationship between the two were studied in depth and the researchers came to agreement about the findings through this process. Patterns of cause and effect between chunks of data were also agreed upon between the two researchers and the relationships between various codes were established. The concluding findings at this phase of the coding resulted in the identification of themes and are presented in Chapter 4.

Phase 4- Counting and summarizing.

The final coding phase described by Miles and Huberman (1994) involved counting and summarizing the coded data. The primary researcher used the computer program called ATLAS.ti ™ to complete the final phase of the data analysis which involved counting the number of times each code was assigned to lists of data, organzing and sorting. The program was also used to record the researcher's reflective thoughts as the data were reviewed a final time. The results from the previous phase of analysis were entered into the computer program. Once the data input was completed, the researcher used ATLAS.ti ™ to sort the data according to the codes that were assigned. For example, the researcher was able to bring up all chunks of data that were coded as peer to peer conflict. This allowed the researcher to look for differences and similarities between incidences as they occurred. The researcher was also able to count the number of times the code was assigned to chunks of data. The results of these findings are presented in Chapter 4. As the researcher counted and compared the chunks of data, she used the memo writing feature of ATLAS.ti ™. The memos described the researcher's interpretive and reflective thoughts about the data and the data collection process. These memos were used to inform the study findings described in Chapter 5.

Limitations

The study was confined to a convenience sample of nursing students from an associate-degree nursing program. The site was chosen for convenience. The study examined one aspect of clinical education activity in nursing education. This study's conclusions inform the use of high-fidelity simulation as a means of promoting the development of clinical judgment in nursing students.

Researcher Bias

The limitation known as "researcher effect" must be acknowledged as the researcher was well known to both faculty and students (Patton, 2002). The researcher had previously been a fellow faculty member for over ten years. In addition, until three months before the study, the researcher was the dean responsible for supervising the faculty and accountable to students. Patton (2002) described four ways that the presence of the researcher may potentially impact or distort a study's findings: (a) the responses of the participants and/or faculty to the presence of the researcher, (b) changes in the researcher during the study timeframe, (c) the biases the researcher brings to the study, and (d) lack of researcher knowledge and/or preparation.

To address the first issue, the researcher maintained an overt participant observational role. The students were told that the researcher was on an unpaid leave of absence from the college during the course of data collection and did not have any supervisory obligations concerning students or faculty. The researcher's previous roles were overtly acknowledged, and every effort was made to assure the study participants that the researcher was functioning solely as a doctoral student. By the second simulation session, students seemed to accept this premise as they frequently approached the researcher regarding questions and added information about their perceptions and responses to simulation. The researcher made an effort to be aware of the possible effects that her presence might be having on participants' behavior. Concerns did not arise during the study. In fact, several interactions suggested that both faculty and students perceived that the study provided a value-add to simulation practices.

The second concern was addressed as the study progressed. As previously discussed, the researcher functioned as a participant observer in effort to assure that the HPL learning strategies were fully implemented for the experimental group. This role change was noted in the data collection and is addressed in the analysis. The researcher was immersed in this project as a doctoral student during data collection and was not performing any other role in the environment. This role consistency established the researcher's position among the study participants. In addition, this role consistency created role clarity regarding the researcher's expected function among participants during the course of data collection.

In response to the third concern, the researcher brings significant bias to the study. The researcher has over 15 years experience as a nurse educator and has recently been immersed in the development of high-fidelity simulation as a teaching tool. The researcher has been at the forefront of an effort to reform nursing education in Oregon and strongly believes that clinical education must change in response to the increasing demands of new graduates. In addition, the researcher also posits that high-fidelity simulation is one means to facilitate such needed change. The researcher designed the simulation center where the data were collected and has consulted on the development of other simulation centers throughout the Oregon and other states. The perceived value of the researcher's extensive experience as a nurse educator and leader in the implementation of simulation as an emerging educational strategy contributes to a well-informed study. Every effort has been made to identify and acknowledge researcher bias throughout the study.

In response to the fourth concern, it is important to note that the researcher does have some experience with educational research. She did complete a rigorous qualitative study to fulfill the requirements for a Master's degree. In addition to the required research courses for this degree, the researcher also completed a comprehensive course on phenomenology and assisted with coding narratives for a study conducted by a local hospital system using the open coding strategy. The researcher uses educational research in her daily work. She analyzes institutional data and collaborates frequently with the research and planning staff from her educational institution to make evidence-based decisions. To address the fourth concern, the researcher attended to planning and implementing data collection methods to assure that they were carried out according protocols described in the research proposal. . Changes to the original plan were discussed and have been described. Rigor during the data analysis process was assured by requesting assistance with the validation and interpretation of data. An experienced doctoral-prepared colleague who is employed as an institutional researcher assisted with the statistical interpretation of data from the LCJR. The co-researcher, who is an experienced nurse researcher, coded the qualitative data and assisted with the analysis. The theorist who developed the Research-Based Model of Clinical Judgment in Nursing reviewed samples of the data and then discussed the researcher's interpretation in an effort to establish the confirmability and dependability (Miles & Huberman, 1994) of the researcher's conclusions.

Sample Size

Another limitation of the study is the small sample size. The population studied was nearly homogenous, and minorities were underrepresented in comparison to the local community college constituency and demographic characteristics of the local district. Generalizability may be limited due to the small sample size.

Instrumentation

The use of a newly created instrument for data collection represents another possible limitation. The Lasater Clinical Judgment in Simulation Rubric did not have established reliability. The tool was developed through a comprehensive and exhaustive process that included assistance from an expert educator with extensive experience in authentic assessment and rubric development. The researcher was able to establish inter-rater reliability but these findings may be limited because of the small sample size.

Chapter Summary

Clinical judgment is an important competency in the development of nurses and other healthcare providers as they learn to care for patients who are experiencing increasingly complex health problems. Prior research assumes that clinical judgment in nursing develops as a result of experience. Many educators and theorists assume that nursing students learn to make clinical judgments through use of an analytical reasoning procedure known as the nursing process. Educational theory has not been adequately considered as a possible means of promoting the development of clinical judgment in nursing students. Findings from this study are described in the next chapter and make a significant contribution to our knowledge of how to assess clinical judgment and practices in high-fidelity simulation that can be used to promote its development.

CHAPTER IV

STUDY FINDINGS

Introduction

The primary focus of this exploratory study was to better understand the development of clinical judgment in nursing students when using high-fidelity simulation. A two group study design was applied to differentiate between two groups of students. Data sources incorporating both quantitative and qualitative methodologies were used in this study. This chapter presents findings that were used to address the research question: When using high-fidelity simulation, what effect does incorporating the How People Learn (HPL) instructional design model have on the development of clinical judgment? Since reliability of the instrument used to measure clinical judgment needed to be established, the first section of the chapter reports the findings used to verify the reliability of the instrument. These findings addressed the second purpose of the study: Contribute to the further development of an instrument used to measure clinical judgment. Quantitative data are also presented to answer the research question as stated above. The qualitative data findings are provided in the second section of this chapter and address the first purpose of the study: Identify instructional strategies that led to effective learning when using high-fidelity simulation. Specifically, the qualitative data were used to examine the effect of the HPL learning framework as described by Bransford, Brown and Cocking

(2000). To provide clarity, this chapter is organized by presenting the two research methodologies that were used to address the research purposes and question.

Quantitative Data Findings

Study Findings- Reliability of the Lasater Clinical Judgment Rubric

Answering the research question is dependent on fulfilling the second purpose of the study. The second purpose of this study was to contribute to the further development of an instrument designed to measure the Research-based Model of Clinical Judgment in Nursing (Lasater, 2005; Tanner 1998, 2006b). Further development of the rubric was done by establishing inter-rater reliability and internal consistency of the instrument. As defined by the Research-based Model of Clinical Judgment in Nursing (Tanner 2006b), the LCJR was designed to measure student application of Tanner's clinical judgment model. Data collected throughout the study was used to establish inter-rater reliability and internal consistency of the LCJR. The findings are described below. The data that addressed the reliability of the rubric is organized by describing the data findings related to Tanner's four clinical judgment aspects: Noticing, Interpreting, Responding and Reflecting (2006b). The eleven performance indicators from the LCJR are integrated into the discussion according to the clinical judgment aspect each performance indicator represents.

Internal Consistency - Noticing

Data analyses using the Cronbach coefficient alpha method was used as the indicator for establishing internal consistency. According to Wiersma (2000) the desirable reliability coefficient should be close to 1.0 as possible. The Cronbach alpha coefficient as an indicator for internal consistency was $\alpha = .886$ for the Noticing aspect of the rubric. In addition, findings indicate this there was good internal consistency for each of the performance indicators included in this component of the rubric. Table 8 provides the values that demonstrated this finding.

Table 8

Noticing – Findings for Internal Consistency

Item Total Findings	Cronbach Alpha if Item Deleted
Noticing 1- Focused observation	.783
Noticing 2 – Recognizing deviations from expected patterns	.838
Noticing 3 – Information seeking	.884

Internal Consistency – Interpreting

Internal consistency for the performance indicators that measure the Interpreting aspect of clinical judgment was also good as the Cronbach coefficient alpha value was $\alpha =.931$. There were two performance indicators included in this aspect of the rubric: Prioritizing Data [$\alpha =.872$] and Making Sense of Data [$\alpha = 1.0$] Because there were only two performance indicators, statistical findings for internal consistency for the two items for this aspect of the rubric are inconclusive.

Internal Consistency – Responding

Findings indicated there was good internal consistency for the Responding aspect of the LCJRS with a Cronbach coefficient alpha method of $\alpha =.887$. There were four items used to measure this aspect of the clinical judgment model as depicted in the rubric. Internal consistency was also good for the Responding aspect as depicted in Table 9.

Table 9

Responding – Findings for Internal Consistency

Item Total Findings	Cronbach Alpha if Item Deleted
Responding 1– Calm, confident manner	.863
Responding 2 - Clear Communication	.882
Responding 3 – Well-planned interventions/flexibility	.854
Responding 4 – Being skillful	.862

Internal Consistency - Reflecting

Using the Cronbach coefficient alpha method, results for this aspect of clinical judgment was $\alpha = .914$ indicating there was very good internal consistency. The two performance indicators that were used to measure this aspect of the clinical judgment model were labeled Reflective/Self Analysis [$\alpha = .841$] and Commitment to Improvement [$\alpha = 1.0$] Quantitative statistics do not offer findings that can establish internal consistency for each performance indicator independently because there are only two items provided in the instrument for Reflecting. In summary, reliability statistics indicated internal consistency for the four aspects of Tanner's Clinical Judgment Model as measured by the LCJR were very good according to accepted standards (Wiersma, 2000).

Inter-rater Reliability

Inter-rater reliability of the LCJR was assessed pre- and post-test. Pre-test findings indicated there was 92% agreement between raters when the eleven performance indicators were compared. Inter-rater reliability improved as post-test findings indicated there was 96 % agreement between raters. Findings from one-way ANOVA were also completed to assess for significant differences between raters on each of the eleven performance indicators. The *F ratios* for each performance indicator were all less than 4.84 and all *p* values were greater than .05. These findings confirmed that acceptable inter-rater reliability was established and that the LCJR was a reliable instrument to use for answering the research question.

Research Question - Development of Clinical Judgment

Statistical analyses using SPSS 11.5 were used to analyze the quantitative data that were collected to address the research question: When using high-fidelity simulation, what effect does incorporating the How People Learn (HPL) instructional design model have on the development of clinical judgment? Details regarding the methods used to gather and analyze this data were described in Chapter Three.

Descriptive statistics were used to describe demographic data and account for possible differences between the control and experimental group. Thirty-six students participated in the study. There were 31 (86.1 percent) female and 5 (13.9 percent) male subjects. The study's subjects were homogenous in terms of ethnicity. Thirty-four (94.4 percent) of the students identified themselves as white, there was one Asian student (2.8 percent) and one student (2.8 percent) identified herself as being African

American. Descriptive statistics were used to describe academic achievement by analyzing cumulative grade point average (GPA). GPA's were collected after the students completed the final course of the nursing program. Therefore, the students' GPA represented all college level work completed. GPA findings are described in Table 10 below.

Table 10

Grade Point Averages

Students (n = 36)					
Mean	Mode	Median	Standard Deviation	Minimum	Maximum
3.45	3.47	3.51	.197	3.04	4.0

One way analysis of variance (ANOVA) measures were applied to determine if there were differences between the groups' performance on the LCJR pre- and post-test. ANOVA results were also used to control for the effect of gender, ethnicity, and GPA. According to Wiersma (2000) when using ANOVA the significant computed *F*-ratio using a α-level .05 for the data used in the study is 4.84. Therefore, data results with a *F*-ratio greater then 4.84 and a $p < .05$ indicate significant findings. ANOVA's were completed to compare the control group and the experimental group for each of the LCJR eleven performance indicators which measure Tanner's four aspects of the clinical judgment model. These findings are described below.

Clinical Judgment - Pre-test Findings

Analysis of variance (ANOVA) indicated the pre-test rubric score findings were significant between the control and experimental group in three of the eleven clinical judgment performance indicators. The experimental group performed higher in three performance indicators: Noticing 1: Focused Observation [F ratio = 5.38, p= .023]; Noticing 2: Recognizing Deviations from Expected Patterns [F ratio = 6.03, p=.017]; and Responding 1: Calm, Confident Manner [F-ratio 5.25, p= .025]. Results indicated there were no pre-test differences in the remaining eight performance indicators between the control and experimental group. Table 11 displays the complete results from pre-test ANOVA analysis.

Table 11

Pre-test ANOVA findings

	Students (n = 36)	
	F-ratio	*p* value
Noticing 1-Focused Observation	*5.38	**.023
Noticing 2 – Information Seeking	*6.03	**.017
Noticing 3 –Noting Deviations from Expected Patterns	1.77	.187
Interpreting 1 – Prioritizing Data	.203	.654
Interpreting 2 - Making Sense of Data	.026	.873
Responding 1 – Calm Confident Manner	*5.52	**0.025
Responding 2 – Clear Communication	.136	.713
Responding 3 – Well Planned Intervention/Flexibility	.758	.387
Responding 4 – Being Skillful	.213	.646
Reflecting 1 – Evaluation/self analysis	2.97	.089
Reflecting 2 – Commitment to Improvement	1.42	.236

*significant *F ratio* > 4.84 **significant *p value* <.05

Post-test Findings

ANOVA were also conducted to compare post-test findings between the control group and the experimental group. The results indicated there were no significant differences between groups for any of the eleven performance indicators that represent the four aspects of Tanner's Clinical Judgment Model as measured by the LCJR. Table 12 presents the ANOVA analysis for post-test findings.

Table 12

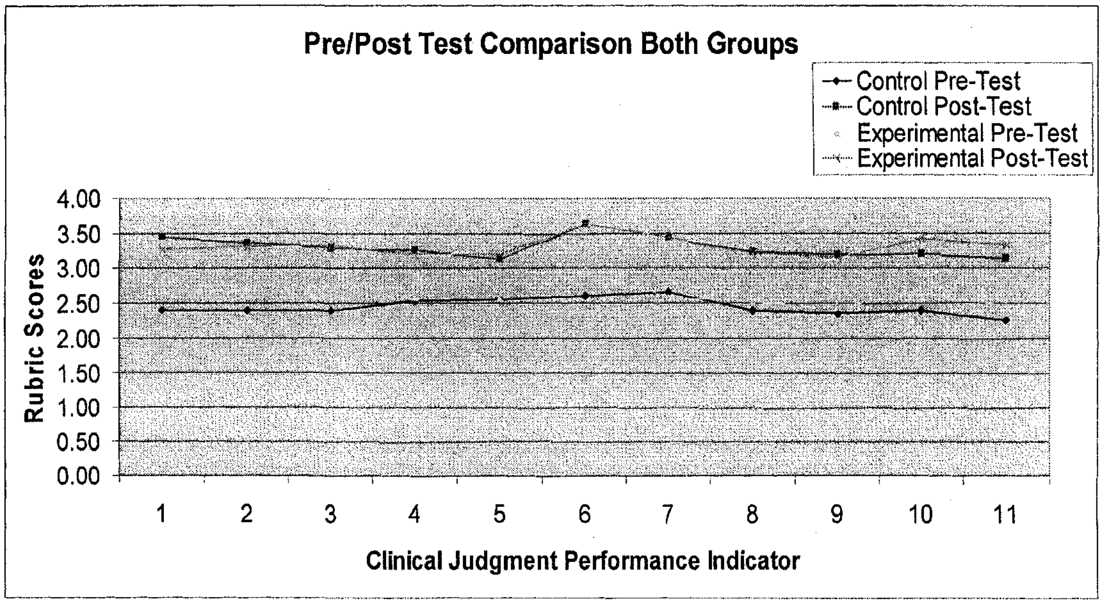
Post-test findings between groups - ANOVA findings

	Students (n = 36)	
	F-ratio	*p value*
Noticing 1-Focused Observation	2.072	.155
Noticing 2 – Information Seeking	.263	.610
Noticing 3 –Noting Deviations from Expected Patterns	.122	.727
Interpreting 1 – Prioritizing Data	.152	.698
Interpreting 2 - Making Sense of Data	.331	.597
Responding 1 – Calm Confident Manner	.001	.971
Responding 2 – Clear Communication	.002	.961
Responding 3 – Well Planned Intervention/Flexibility	.017	.896
Responding 4 – Being Skillful	.041	.841
Reflecting 1 – Evaluation/self analysis	2.979	.089
Reflecting 2 – Commitment to Improvement	1.428	.236

The Lasater Clinical Judgment Rubric (LCJR) indicates a score of 1 reflects a student at the beginning level, a score of two reflects the developing level, a score of three reflects accomplished performance and a score of 4 is exemplary. Findings indicated that all students in both the control group and experimental group improved their clinical judgment during the study period. Analysis of mean scores indicated students moved from the developing level of performance to accomplished level as measured by the eleven dimensions of the LCJR. Figure 5 illustrates these findings.

Figure 6

Mean Score Comparison Pre and Post Test



Students: Control Group (n = 19); Experimental Students (n = 17)

In summary, there were no significant differences in results in the development of clinical judgment between the control and experimental group. However, the findings from the scored rubrics as depicted in Table 13 illustrated that One-way ANOVA results show students in both the control and experimental group improved in all eleven clinical judgment performance indicators that were used to measure the four aspects of Tanner's Clinical Judgment.

Table 13

Combined Group Results Pre and Post Test Comparisons-One Way ANOVA Findings

Students (n = 36)		
	F-ratio	*p*-value
Noticing 1-Focused Observation	*92.215	**.000
Noticing 2 – Information Seeking	*87.469	**.000
Noticing 3 –Noting Deviations from Expected Patterns	*59.908	**.000
Interpreting 1 – Prioritizing Data	*52.730	**.000
Interpreting 2 - Making Sense of Data	*36.875	**.000
Responding 1 – Calm Confident Manner	*77.113	**.000
Responding 2 – Clear Communication	*48.778	**.000
Responding 3 – Well Planned Intervention/Flexibility	*64.559	**.000
Responding 4 – Being Skillful	*46.758	**.000
Reflecting 1 – Evaluation/self analysis	*50.55	**.000
Reflecting 2 – Commitment to Improvement	*49.886	**.000

*significant *F ratio* > 4.84 **significant *p value* <.05

Summary– Quantitative Data

Data collected from quantitative data sources indicated the inter-rater training as described in Chapter 3 facilitated acceptable inter-rater reliability. In addition, quantitative findings showed the LCJR demonstrated good internal consistency as measured by Crohnbach coefficient alpha method. Analysis of Variance findings indicated there was no significance statistical difference in the development of clinical judgment between the control group and the experimental group as measured by

LCJR. ANOVA findings validate that both groups improved significantly between the pre-test and the post-test in all aspects of clinical judgment (Tanner 2006b) as measured by the LCJR.

Qualitative Data Findings

Qualitative data sources included transcripts of ten debriefing sessions. Five transcriptions of debriefing sessions from each group (i.e. 5 from the control group and 5 from the experimental group) were analyzed. Field notes that were completed throughout the data collection process by the researcher were included as a qualitative data source. The student comments from the end-of-course survey that was constructed and administered by course faculty were also used as a source of qualitative data.

The qualitative data were collected and analyzed for three important reasons. As discussed in Chapter 3, studies that use mixed methods often position one method as core and the other research perspective as supplemental. This study used the quantitative data as the core measure that was used to answer the research question. The qualitative data were used as a supplement to the quantitative data for several reasons.

The sample size was small and the instrument that was used to measure the dependent variable had no documented reliability or validity at the time of the study. Additionally, the theoretical concepts of clinical judgment (Tanner 2006b) and the How People Learn framework (Bransford, Brown, Cocking, 2000) are also new and have not been applied and studied in nursing education. Finally, at the time of the study, high-fidelity simulation was just beginning to be used as a learning experience in nursing education and best practices were not established. The intent was to provide a deeper understanding of the quantitative data by using qualitative findings to describe the unpredictable experiences that occurred during data collection. The qualitative data provided depth and detail as to what actually occurred, and also described the difficulties with implementing the planned treatment for the experimental group during the study period.

In addition, the qualitative data were used to address the first purpose of the study: Identify instructional strategies that led to effective learning when using high-fidelity simulation. The study examined the extent and effect of the HPL learning framework as it was applied through planned reflective learning activity for the experimental group. Qualitative data, specifically the debriefing transcripts were used to make the students' thinking visible about the clinical judgments they made during the scenarios. The quantitative data collected through the scored rubric was completed by trained raters. These scores reflect the interpretation of observed behaviors. Qualitative data were used to provide the first-person perspective as students discussed and described the thinking behind their actions and decisions that were observed by the raters in the simulated scenarios. The qualitative data were used to describe what students learned and documented their responses related to the actual implementation of the HPL framework. Additionally, the qualitative data provided detailed description of what the faculty, students and the researcher actually experienced throughout the course of the study.

Finally, this study occurred in a setting that could not be completely changed, manipulated or controlled by the researcher. In controlled experimental inquiry, the researcher enters the program at two points in time, pre-test and post-test and compares the treatment group to the control group by using standardized measures (Patton, 2002). Such designs assume there are identifiable, distinct, isolated, and measurable treatments that are easily controlled. Such designs assume that the treatment remains relatively constant, is easily manipulated and is unchanging. Because of the dynamic nature of high-fidelity simulation and the commitment that the simulation scenarios would likely reflect individual student responses to the problems presented, the researcher identified from the beginning of the study it was assumed there would likely be significant variations in the actual participants' experience that could not be controlled. The qualitative research perspective was used to describe these variances and differences between what was planned and what actually occurred for both the control group and experimental group experiences throughout the study period.

Debriefing Transcripts

The process used to identify the predominate themes identified for analysis of the qualitative data is discussed fully in Chapter 3. During the early coding process the researcher and co-researcher determined the major themes in the debriefing conversations involved three of the four aspects of Tanner's Clinical Judgment Model (2006b). Several other patterns emerged and were eventually condensed into three themes independent of the Tanner's Clinical Judgment Model. The following discussion presents findings on the themes related to clinical judgment and is followed with a description of the other relevant discoveries. Table 14 provides a numerical account of the prevalent themes related to clinical judgment and gives a comparison of the control group and the experimental group.

Table 14

Coding Themes: Clinical Judgment Aspects of Noticing, Interpreting and Reflecting

Coding	Control		Experimental	
Comments related to :	Made by Instructor	Made by Students	Made by Instructor	Made by Students
Noticing	13	33	44	54
Interpreting	69	107	37	102
Reflecting	9	77	24	71
Total comments related to aspects of the Clinical Judgment Model	99	217	105	227

Table 14 documents the number of comments related to the Noticing, Interpreting, Reflecting aspects of Tanner's Clinical Judgment Model (Tanner 2006b) that were made by both students and facilitators. Coding results indicated that the number of the comments representing an aspect of clinical judgment made by students were about equal between the control [217] and the experimental group [227]. The total number of prompts and cues coded as an aspect of clinical judgment made by facilitators were also fairly equivalent [control = 99; experimental = 105]. A description of qualitative results specific to each aspect of the Tanner's clinical judgment model follows.

Noticing

The LCJR provides three performance indicators that capture the aspect of Noticing from Tanner's Clinical Judgment Model. Table 15 provides an account of the number of narratives from the control group and the experimental group that addressed each performance indicator used in the aspect of Noticing (Tanner 2006b).

Table 15

Noticing – Comparison of students' comments related to the Noticing performance indicators

Coding Category	Control Group Student Responses	Experimental Group Student Responses
Noticing 1 Focused Observation	11	20
Noticing 2 Information Seeking	11	15
Noticing 3 Pattern Recognition	11	19

Upon careful examination of the debriefing transcripts, it became evident that students' discussions that incorporated the Noticing aspect of the Clinical Judgment Model usually was predicated by a prompt or cue from the facilitator. The facilitators' questions and prompts most often encouraged the students to focus their observations, which is one of the performance indicators of Noticing. Coding results indicated the experimental group facilitator provided more prompts that elicited the students' thinking and discussion about Noticing. Consequently, the experimental group conversations demonstrate the group moved back and forth between Noticing and Interpreting during the debriefings. The excerpt below (Table 16) from the transcripts provides an example of a typical dialogue that incorporates the Noticing and Interpreting aspect of the Clinical Judgment Model. This transcript documents an experimental group debriefing discussion.

Table 16

Experimental Group Dialogue

Clinical Judgment Dialogue	Transcription Dialogue
on seeking	**Facilitator**: So let's talk about what happened in the scenario.
Noticing	**Student 1**: We thought we were going to have a shock situation.
Noticing	**Facilitator**: OK, so you had a patient in shock, right?
Noticing – Recognizing deviations from expected patterns	**Student 1**: Well, we thought she was really going to go down fast, but I was surprised she didn't.
Noticing-Focused observation	**Facilitator:** OK, so what do you see? As far as, this is exactly the way you left the patient when it was all over, so what do you see?
Noticing-Focused observation/Interpreting-Making sense of data	**Student 2**: She was agitated. **Facilitator**: OK, she was agitated. What does that mean? What do you think that's a sign of?
Interpreting-Making sense of data	**Student 3**: Not enough oxygen. (good, ok) Anxiety (OK) Sense of impending doom, every single one of them. (mm, humm)
Interpreting-Making sense of data	**Facilitator**: OK, she kept saying 'something's wrong'. Good, OK so you had some signs, what are those signs of?
Interpreting-Making sense of data	**Student 1**: Well, her BP dropped.
Noticing- Recognizing deviations from expected patterns	**Student 2**: She looked like she was having PVCs (she was having PVCs)
Noticing- Focused Observation	**Student 3**: A little hypoxic maybe?
Interpreting-Making sense of data	**Facilitator**: Maybe. What do you see as far as how you left the patient and her condition? So you identified that you had some stuff going on. You

	talked about agitation,
Noticing-Focused Observation	**Male**: She had a non-rebreather on.
Interpreting-Making sense of data	**Facilitator**: Why, did she have a non-breather instead of nasal cannula?
Interpreting-Making sense of data	**Student 3**: Because she was still, her saturation was still fairly low on 4.
Interpreting-Making sense of data	**Facilitator**: OK
Interpreting-Making sense of data	**Student 3**: She still seemed anxious.
Interpreting-Making sense of data	**Student 4**: As her blood pressure goes down, you want a bigger bang for the buck on the oxygen.
Interpreting-Making sense of data	**Facilitator**: OK, anybody else have any other thoughts about that idea?
Interpreting-Making sense of the data	**Student 2**: I have a question on it, in that, it said in the book if you think someone is going into shock, the feet should be up and head down, but everybody kept wanting head up, and I just don't know enough to say well, (noise), is it worth fighting for?
Noticing-Focused observation/Recognizing deviations from expected patterns	**Facilitator**: It is a great question. Think back to your scenario. Think back about what happened, if you can remember, because I don't know what it was like for you, but it always feels like things happen pretty fast from where we're sitting, so think back to your scenario, because you all , except for the third group, you all put the head of the bed up.

Findings from the coding process illustrated that frequently the dialogue moved back and forth between the noticing and interpreting aspects of Tanner's Clinical Judgment Model. The experimental group facilitator encouraged the students to seek more information by asking them to recall what happened in the scenario and prompted them to consider the meaning of their findings. As students began to make sense of the data the experimental facilitator frequently provided another prompt to help them focus on what else was important to notice.

Interpreting

The number of times codes for Interpreting were assigned to debriefing discussion were about equal between the control and experimental group. There are two performance indicators in the rubric that are used to identify the student's level in the Interpreting aspect of the Tanner's model (2006b). Table 17 shows a comparison between the two groups.

Table 17

Interpreting– Comparison of students' comments related to the Interpreting performance indicators

Coding Category	Control Group Student Responses	Experimental Group Student Responses
Interpreting - Prioritizing Data	22	24
Interpreting - Making Sense of Data	85	78

Most of the students' conversations coded as Interpreting began with a question or a comment posed by the facilitator. This pattern that involved a prompt or cue by the facilitator was similar in both groups. The control group facilitator frequently prompted students by first asking specific questions to help them uncover previously learned knowledge in theory courses related to the situation at hand. She rarely initiated the dialogue by asking questions to help students identify what they noticed before they began interpreting the data. Below is an exemplar of a debriefing transcript that illustrates the Interpreting aspect of Clinical Judgment Model. This conversation features students and the facilitator from the control group.

Table 18

Control Group Dialogue-Interpreting

Clinical Judgment Dialogue	Transcription Dialogue
Interpreting- Making sense of data	**Facilitator**: So what do you think is going on with her?
Interpreting- Making sense of data	**Student 3**: Probably potassium levels.
Noticing – Focused observation	
Interpreting-Making sense of data	**Student 2**: I thought the biggest thing was that she was
	having a lot of anxiety and being the fact that she said
	she hadn't been to a hospital in a long time, she didn't
Interpreting- Making sense of data	really feel safe… But she did have a lot of health issues.
Noticing-Seeking information	She was overweight, she, you know, her CBG at the
	time was fine, but she's on Lasix, her potassium was in
Noticing- Recognizing deviations	the toilet, her cardiac issues, I mean.
from expected patterns	**Facilitator**: So what do you think about her potassium
	level after you got the labs back, you alluded to her
	potassium issue?
Interpreting- Making sense of data	
Interpreting- Making sense of data	**Student 2**: We were going to give her, um
Interpreting- Making sense of data	**Student 1**: What was her lab like?
Interpreting- Making sense of data	**Student 2**: It was two and a half.
Interpreting- Making sense of data	

Interpreting- Making sense of data	**Student 3**: So it should be up to 3.5 to 5 **Student 2**: And so could have thrown her rhythms off, because potassium could knock her tructility off a lot **Male**: It could also cause some of the nausea and all this... **Facilitator**: Some of the symptoms (definitely) she was exhibiting that was maybe inconsistent (yeah) with what maybe was going when you got the lab work. **Facilitator**: So you thought she was hypokolemic? **Students:** Mmm huh, yeah **Facilitator**: OK, So she had a lot of med and funky stuff going on with her heart? **Student 2**: And she has, she had a history of hypertension, so that could cause the nausea and vomiting.

As illustrated in the conversation documented in Table 18, the control group facilitator usually began the debriefing by asking questions that encouraged students to think about how they were interpreting data. Consequently the control group students spent slightly more time engaged in conversations that incorporate the characteristics of the Interpreting aspect from Tanner's Clinical Judgment Model. As documented in the above conversation, the students attempted to cluster the related data they observed which is the process used to create pattern recognition.

Findings illustrate the primary distinction between control group and experimental group conversations that were coded Interpreting involved differences in the sequence of comments that represent the various aspects of the Clinical Judgment Model. The experimental group transcripts typically began with a discussion that focused on the Noticing aspect of the Clinical Judgment Model. The conversation then transitioned into a discussion about the students' thinking related to the Interpretation aspect of the Tanner's Clinical Judgment Model. Frequently, once the students made accurate sense of the data they first noticed, the experimental facilitator redirected them back to the Noticing aspect of Tanner's model (2006b) and prompted them to further refine their focused observations. Conversely, the control group facilitator primarily provided cues and prompts that focused the conversation on the Interpreting aspect of the Clinical Judgment Model and rarely used questions to help students uncover what was important to notice.

Reflecting

The analysis of transcripts indicated there was minimal difference between the control group and experimental group related to the conversations that involved the Reflection aspect of Tanner's Clinical Judgment Model. The control group actually engaged in more conversation that involved the Reflecting aspect. Table 19 shows the number of times the transcripts were coded for Reflecting.

Table 19

Reflecting– Comparison of students' comments related to the Reflecting performance indicators

Coding Category	Control Group Student Responses	Experimental Group Student Responses
Evaluation and Self Analysis	57	58
Commitment to Improvement	20	13

The experimental group conversations that incorporated Reflection were usually prompted by the facilitator. Coding findings demonstrated that while students were engaged in the Reflecting aspects of the Tanner's model they continued to engage in Interpretation. Often these conversations included dialogue references that indicated students where trying to make sense of what happened and the meaning of what they noticed in the scenario. The conversation below is a continuation of the experimental group transcription presented in the previous discussion related to Noticing and Interpreting. This conversation exemplifies the typical sequence of exchange involving the Reflection aspect in the experimental group.

Facilitator: OK, so what's the take away here, what will you think about if your patient is in shock?

Student 2: It's kind of like I was more focused on trying to get her to breast feed, I was going to help her breast feed, so that's why I sat her up and that was the wrong thing to do.

Student 3: YOU should put the head down to keep the blood going to heart and the brain, where you want it, think about possibly where you're losing volume somewhere else.

Facilitator: OK. Good. Head down, feet up and treat the cause of the shock. Naturally we've gone over ABCs over and over, and so you think, "Head up" to stabilize the airway and facilitate breathing. Right, so shock is a little different then a problem related to cardiac and respiratory problems even though the symptoms are similar. Because the etiology of the symptoms are different, your response is different.

Examination of the transcripts indicated the control group tended to engage in Reflective conversation more without prompting from the facilitator. The control group facilitator rarely directly asked the students to talk about what they had learned and how they would apply it to future practice. Yet the coding findings indicated the control group students frequently identified specific things they should have noticed or ways they should have responded. The dialogue below exemplifies an exchange between control group students as they reflected on their thinking and action. The findings identified through the coding illustrated that the students demonstrated they were committed to applying what they had learned in simulation to their practice as professional nurses.

Facilitator: Just one second, so in terms of that, dealing with the family member was a key component in providing care for your patients?

Student 1: Yeah

Student 2: For this scenario...I was just thinking like what I could have done better or what would have given her better care. I didn't check the monitor soon enough. She was already verbalizing to me that her heart felt like it was skipping a beat before I looked, and sometime... I kind of focused on her and forget about the other pieces of information I needed to be paying attention too.

Student 2. I have to stop thinking linearly.

Student 1: You need to be aware of your goals and melding them with the patient needs, like, be able to have a couple different scenarios in your head. Ok, if a patient goes this way, this is what I say, and I think that comes with practice. Different ways to reassure different people and you can get your job done in a timely fashion.

In summary, the analysis of the debriefing transcripts indicated that there was minimal difference between the control group and the experimental group related to conversations that involved the Noticing, Interpreting and Reflection aspects of Tanner's Clinical Judgment Model. The experimental group engaged in more dialogue that involved characteristics of Noticing. These conversations were usually prompted by the experimental group facilitator. The control group and experimental dialogue focused on the Interpreting aspect of the Clinical Judgment Model equally. These conversations where often influenced significantly by the facilitators questions and prompts. Results from the coding indicated the control group engaged in Reflection more readily then the experimental group. Many of the control group reflective comments were spontaneous and emerged without direct prompts or cues from the control group facilitator. Finally, coding analysis indicated debriefing conversations rarely involved just one aspect of the Clinical Judgment Model and moved back and forth between the Noticing, Interpreting and Reflecting aspects. The experimental groups' conversations demonstrated more integration of the four aspects of Tanner's model (2006b) because of the experimental group facilitator's prompts and cues.

Other Themes from Transcripts

Three other major themes from the debriefing transcripts were identified through the coding process. The first theme was labeled Peer-to-Peer support. Dialogue from the transcripts received this label when students offered positive reinforcement for something a peer had done or said, or provided a compliment.

There was a difference in the number of times this occurred between the control group and the experiential group. The control group engaged in Peer-to-Peer Support for each other 18 times. The experimental group engaged in conversations that received these codes only nine times. The comment below illustrates the kind of peer- to-peer support the control group offered each other. Findings from the transcript analysis indicated this code was applied three or four times in each debriefing transcription.

> Student 4: I thought that it was good that she specifically asked the patient to say in her own words what they were going to do and then clarify that back to the patient so that the patient knew that she understood what she was saying as well. (Mm, hmm). I thought it was really good.

The second theme identified in the debriefing transcripts was labeled Peer-to - Peer Challenge. There was also a difference in the frequency of this theme between the two groups. The experimental group engaged in these kinds of conversations twenty times and the control group only had two dialogues that were coded as Peer-to -Peer Challenge. Half of the dialogues from the experimental group involved the same two individual students. The following conversation illustrates one example of the kind of conversations that took place. The student who provided the feedback to her peer was watching the scenario as an observer. She provided feedback based on what she perceived when watching the scenario. The name of the student referenced in the dialogue was changed in the transcript.

> Student 1: One thing I saw, that is really kind of minor, but Susan, you asked me your questions, but you asked a question and then you start to give them the answer. And my nurse precept has caught me on that. Don't ask how it feels and then you start giving the patient the adjectives if they don't answer right away. That sense of waiting to let them describe what they are feeling.

The coding process also identified confrontational conversations that frequently involved another student. Peers initiated discussion of this particular student's behavior during the debriefing and expressed concern with how he interacted with the patient and family members. The conversation below from one of the experimental group debriefing transcripts provided an example of a conversation labeled Peer-to Peer-Challenge. The name of the student referenced in the transcript has been changed.

Paul: That is one thing that the daughter being in there was more of a distraction, than was a help psychosocially and it wasn't only affecting the interaction between her and the mom, but it was affecting the interaction between her and the other nurses and what we were doing.

Student 3: But take that idea, Paul. How do you turn it to a teachable moment?

Paul: If you have time, and again, we were in there for three or four minutes before she started to have couplets pretty quick, and at that point we didn't have time , to have a really good, ta dah, ta, dah.

Student 3: What I am saying is, you don't need be mean to the daughter to get her to settle down and cooperate.

Paul: You might. I'm just saying you can address her verbally however you want, but depending on the situation you may not have time to talk to her for five minutes.

Student 3: Ok, can I just disagree with you, really strongly? There is a mother-daughter relationship there, and if you were to kick me out of the room not only would I be screaming, but mom would be screaming, and then what have we done to mom?

Paul: Again, not saying just kick them out of the room, but you could quickly explain to the daughter, your arguing is something that we can't have, it really is something is really detrimental to your mom and we can't...

Student 3: Yeah, ok that approach I can live with. That is not how you came across to me.

The third theme identified in the debriefing transcripts was labeled Facilitator Sharing Practice Knowledge and Expertise. The frequency of this theme was nearly equal between the control and experimental groups. The control group facilitator provided her practice expertise 72 times and the experimental group facilitator engaged in this kind of conversation 75 times. A segment of the transcripts was labeled with this code when the facilitator told the students about some relevant knowledge related to the scenario or described the proper way to perform a procedure. Often this sharing involved tacit practice knowledge and involved system issues such a working through hospital protocol and communicating with physicians to get the treatment plan implemented or changed. The difference between the two facilitator's engagement in Sharing Practice Knowledge and Expertise was related to the topics that they shared with students. The control group facilitator tended to talk to talk about how to perform a procedure such as mixing a medication to be administered in an intravenous line. The experimental group facilitator described the pathophysiology of the disease in question or described recent research that was informing current practice standards.

Field Notes

The process used to analyze the transcripts was also used to examine the field notes. There were four comprehensive field notes that were completed by the researcher. The process that was used to develop the field notes is described in Chapter Three. The following themes arose as the field notes were analyzed.

The field notes described the researchers concern regarding the application of the research design. The documented concern consistently addressed in the field notes related to the time spent between the faculty involved in the study and the researcher. Many hours were spent in planning each simulation session and developing the scenarios. One of the course faculty members involved in the simulation planning and scenario design was also the control group debriefing facilitator. The researcher and faculty worked together closely throughout the study period to assure the scenarios reflected content the faculty wanted to include in each scenario. The field notes record several incidental conversations between the researcher and faculty participants that document an excitement that occurred as a result of learning to teach using new simulation technology. Recorded conversations documented that the faculty became very engaged with learning to teach in a simulation environment. The field notes indicated faculty initiated frequent conversations with each other, colleagues from other colleges and with the researcher regarding how the students' were responding and what they learning about teaching. There were other concerns documented in the field notes that identified problems with the planned treatments in the proposed study design. These descriptions addressed concerns about the planned interventions that were designed to differentiate the experimental group experience in pre- and post-simulation learning activities. The field notes identified the following three problems. The first problem involved the pre-briefing experience that was designed for only the experimental group. One unique characteristic of the experimental group experience was a guided discussion that was led by the experimental group debriefing facilitator.

The second concern involved the use of the Metaguide. The researcher found the Metaguide was difficult to use and subsequently didn't use the questions or format the debriefing discussion as intended in the research proposal. The third problem addressed the reflective journaling activity for the experimental group that occurred before each scenario and after each debriefing session. Each of these themes is described in more detail below.

The field notes reported that the control group created pre-scenario discussion sessions on their own. They simply arrived early for the simulation scenarios and studied together. The field notes document that the students used a common study area and came with texts and other resources. Typically they spent an hour studying together in preparation for each case. The field notes indicated the researcher was concerned that this student activity was duplicating the guided discussions that were facilitated by the experimental group debriefing thereby diluting one important difference between the control and experimental group.

The second concern described in the field notes indicated the researcher had difficulty using the Metaguide which was also a treatment fot the experimental group. The scripted questions designed for use in debriefing were too broad to help address what actually unfolded during the scenarios. The field notes indicated the questions in the Metaguide provided a linear approach to debriefing and often the questions were not relevant because they didn't apply to what actually happened during the simulation. Field notes document that the Metaguide did help the researcher assure all the learning outcomes were addressed either in the scenario or during debriefing. The

Metaguide was formatted in a manner that proved to be an effective tool for taking notes during the scenario. The field notes indicated that the broad categories of questions presented in the Metaguide did prompt the researcher to keep the dialogue flowing so that major aspects of Tanner's Clinical Judgment model were addressed in each debriefing. Review of the transcripts verify that each experimental group debriefing addressed what the students noticed, asked them to describe their thinking about interpreting what they noticed, and reflect on their performance and describe the future application about what they had learned.

The third concern related to study design described in the field notes addressed the pre- and post- simulation journals that were to be completed by the experimental group participants. Chapter 3 provides a detailed description of the problems that emerged. In summary, the field notes indicated that the participants did not complete the journals as planned. There were a variety of observations recorded in the field notes that described the problem. The purpose of the pre-simulation journaling was to influence the initial grasp of the situation that was presented in each simulation scenario and provide individual time for reflection-on-actions related to experiences students may have had with similar patients during the course of their clinical education. The intent of the pre-simulation journaling was to help students recall and identify previously learned information that were applicable to the clinical judgments they would be required to make in the scenario. The post-journaling questions were designed to help students monitor their own knowledge and needed areas for improvement. In summary, most journal entries were short, one sentence factual statements and rarely demonstrated the reflective thinking the researcher had intended.

The field notes documented another concern the researcher described throughout the study. Field notes indicated the researcher was concerned about a possible untoward effect the two students from experimental group were having on the experience for all of the students. These two students, called Paul and Susan (not their real names) were both in the experimental group and their behavior in the simulation scenarios were often of concern to the faculty and the researcher. Most of the dialogue coded as Peer-to-Peer Challenge involved these two students. During one scenario Susan's behavior was described by faculty as unethical and unprofessional. The faculty intervened based on their academic and professional responsibility. Once Susan was confronted by faculty, her behavior changed in simulation and her clinical instructor reported a positive change of behavior in the hospital environment as well.

Field notes described an incident with Paul during the study period that was not recorded in the debriefing transcripts. A student who was playing the role of a family member during a simulation scenario described how angry Paul's approach made her feel as she engaged in role playing. Paul was confronted during the debriefing session by several students. At the conclusion of the simulation session he asked to review the recording of the scenario in private. After watching the digital recording he shared with the faculty that he didn't know he was behaving so aggressively and understood that some patients and family might be offended.

The field notes documented concern that these interactions coded as Peer-to - Peer Challenge might be affecting the group process during debriefing and may be adversely influencing the conversations and the students' experience. However, review of the debriefing transcripts revealed that students' responses to these two peers did not dominate the experimental group debriefings. None of the end-of-course survey comments referenced these interactions.

The field notes described the faculty and debriefing facilitators' participation in conversation during the post-simulation debriefings. The field notes reported discussions when faculty and the debriefing facilitators offered what is described as tacit practice knowledge during the debriefing session. The end-of-life scenario elicited discussion whereby the faculty and debriefing facilitators sharing their own experience with providing patient-centered care at the end-of-life and included an in-depth conversation about common ethical concerns nurses frequently face in practice. Much of the discussion described how the faculty would have responded to a dilemma regarding patient confidentiality law that was scripted into the scenario. During the scenario a family member called and asked to speak to the nurse. The family member asked for a condition report in order to make a decision about when to come to see the dying patient. The patient's death was imminent and every student who took the phone call refused to provide the needed information. Two of the students even refused to acknowledge the patient was in the hospital during the phone call in adherence to the strict interpretation of the patient confidentiality law. During debriefing the students cited the patient confidentiality law as the rationale for their response.

Field notes described how faculty and the debriefing facilitators addressed the students' actions during debriefing, explaining they would have given the condition report despite the mandated law that is currently driving the practice of sharing information with family members about patient condition. The conversation progressed with faculty and the debriefing facilitators sharing other times they have or would suspend the rules in order to provide patient-centered care at the end-of-life.

The field notes described incidents when faculty shared other tacit practice knowledge during the debriefing. Sometimes this information was described as "tricks of the trade" on how to perform a procedure efficiently. Field notes document instances that described how the facilitator explained to students the best way to make a case when calling the physician with a condition report and a request for change in treatment. Field notes described a discourse provided by the control group debriefing facilitator that addressed strategies used by experienced nurses to manage a pre-operative patient's anxiety. One strategy included a common work-around related to hospital rules when administering a timed medication in order to respond to the patient's immediate need. The conversation also described circumstances when a work-around is inappropriate. The debriefing transcripts also documented some of these conversations and were coded as Facilitator Sharing Practice Knowledge and Expertise.

End-of-Course Survey

The final source of qualitative data used in the study findings were the students' comments from the end-of-course survey. The faculty designed instrument is described in Chapter 3 and can be found in Appendix H. Analysis of the students' responses indentified several themes that are relevant to this research study. Each theme identified through the researchers' analysis is described below.

Thirty-six surveys were reviewed and the student responses to every question were positive in 34 of those surveys. One student responded to every survey question with a comment that was coded as a negative response and one student's responses were a mix of positive and negative comments. The majority of student responses indicated that the simulation experience was a very positive experience.

Students were asked to respond to a question about debriefing. There were 32 positive comments made related to debriefing. The other two students simply addressed the statement by noting "yes" and two students responded negatively to this question. Twenty-eight students indicated debriefing was the most important part of the simulation experience. The following response provides an example of the kind of positive statement students provided.

> I feel a lot came out of debriefing and it was very helpful, especially providing teaching to patients. Debriefing provided information about what went well as well as what didn't and everyone was very supportive and I definitely learned form the feedback and the time debriefing gives you to reflect.

Findings from the surveys indicated students perceived simulation helped reinforce prior learning. There were a total of 15 comments that indicated there was value in simulation because of the opportunity to revisit topics from past theory courses and use psychomotor skills previously learned in lab. The following quotes from three student surveys summarize these findings.

- This simulation experience allowed us to pull it all together at the end of the day.
- I really enjoyed the opportunity to participate in these simulations; it was a good opportunity to discuss topics learned throughout the program.
- This experience stepped up the bar and was thought provoking. Great and realistic scenarios that pulled in prior content allowing us to apply and practice it in a safe environment.

The survey comments suggested that the simulation experience provided students with assessment of their knowledge and skill performance. Students indicated the assessment information was valuable. There were 25 statements that were coded as assessment related findings. These findings demonstrated students valued the feedback they received from each other and from faculty. Moreover, fourteen of twenty-five statements indicated the simulation experience prompted self-reflection as means to provide assessment about their own practice. The following three statements provide examples of statements that students provided.

- Hearing the student's feedback gave me some new perspectives.
- I received wonderful feedback from knowledgeable instructors.

- I would go home and reflect and then refer to my books. I learned a lot from the feedback and it has given me more confidence in my practice.

The survey analysis also uncovered a significant criticism related to the simulation experience. Thirty-two comments were identified related to this criticism. The criticism documented statements students made that described dissatisfaction related to not having authentic equipment and accurate medical records available during the scenarios. The comments indicated students were frustrated that equipment was very different from what they are accustomed to working with in the hospital and seemed out of date. The comments suggested that this created a sense of annoyance and sometimes compromised their ability to engage in the scenario. Some students indicated they felt like they were being set up to fail and many indicated the lack of authenticity created a sense that the simulation scenario was not realistic. The lack of available medical records also created dissatisfaction as students believed that they didn't have ready access to background information about the patients that they needed to make decisions.

Summary of Findings

Quantitative Data

Quantitative data findings were collected to answer the research question: When using high-fidelity simulation, what effect does incorporating the How People Learn (HPL) instructional design model have on the development of clinical judgment? One-way Analysis of Variance was used to analyze the results of Lasater

Clinical Judgment Rubric (LCJR) that was completed by two raters using a pre- and post-test design strategy. Results of this two-group study showed there was no difference between the development of clinical judgment between the control and the experimental groups. In addition, ANOVA results indicated both groups improved significantly between the pre- and post-test ratings using the LCJR.

Quantitative data were also used to establish reliability of the LCJR and addressed the second purpose of the study: Contribute to the further development of an instrument used to measure clinical judgment. Findings from the study indicated the instrument demonstrated internal consistency. Study findings illustrated that inter-rater reliability was established easily with rater training. Additionally, inter-rater reliability was consistent in the pre- and post-test findings.

Qualitative Data

Qualitative data provided descriptive findings related to the planned treatment for the experimental group. Descriptive qualitative data provided insight into the quantitative findings and provide some explanation to related the outcome of the research question. As planned in the dissertation proposal, qualitative data were used to address the first purpose of the study: Identify instructional strategies that led to effective learning when using high-fidelity simulation. Specifically, the qualitative data were used to examine the implementation and effects of the HPL learning framework as described by Bransford, Brown and Cocking (2000). Unexpected findings were also uncovered through the analysis of qualitative data.

Qualitative data results indicated there was minimal difference in terms of treatments between the two groups. Findings illustrated that through the course of the study, the planned treatments for the experimental group could not be distinguished as a significantly different learning experience. In addition, the analysis of the debriefing transcripts indicated both groups engaged equally in conversation involving clinical judgment as described by Tanner (2006b). The planned use of scripted questions that were to be used with the experimental group was actually used infrequently. The scripted questions were used broadly to assure aspects of Tanner's Clinical Judgment Model were addressed during the experimental group debriefing.

Other findings emerged through the qualitative analysis process. There were other differences between the control and experimental group that involved peer-to-peer support and several conversations that involved confrontational conversations between students. The implications of these unexpected findings will be discussed fully in Chapter 5.

The other finding that was uncovered through the qualitative analysis of debriefing transcripts identified the level and character of the facilitators' involvement in the debriefing conversation. Both facilitators frequently provided discipline specific knowledge during debriefing. The control group facilitator tended to focus on sharing procedural knowledge; the experimental group facilitator shared theoretical knowledge and relevant nursing research. The number of times the facilitators engaged in this kind of dialogue was nearly equal. The implications of this finding will also be discussed in Chapter 5.

Field notes documented ongoing concerns about study design and indicated the reflective pre- and post-simulation journals were ineffective. The findings from field notes indicated the intent of the pre-briefing experience designed for the experimental group may have been duplicated by the control group as they created their own informal pre-briefing process. In addition, the field notes described the simulation scenario development process that involved the course faculty and both facilitators. The field notes document apprehension that this process created a very similar experience for both groups of students as faculty discussed both the actual simulation scenarios and reached detailed agreement regarding student performance expectations in both the simulation and debriefing. This activity created diffusion of the debriefing approaches between the control group and experimental group facilitator.

Field notes also describe incidents when the faculty and facilitators shared practice knowledge and expertise. Several of these discussion involved tacit practice knowledge. The implications of these finding will be presented in Chapter 5.

End-of-course surveys were used as a qualitative data sources. Findings indicated overall that students viewed the simulation and debriefing experience as very positive. Students appreciated the opportunity to practice in the simulations and reported they had an opportunity to confront authentic clinical problems in a safe practice environment. Findings indicated the majority of students found the post-simulation debriefing was the most important aspect of the entire simulation experience. Findings from the end-of -course surveys described students' irritation over the lack of authentic equipment and medical records. Findings suggested this was a distraction during the scenario, may have created a sense that students were being set up to fail. Several comments reported the distraction of not having ready access to needed equipment sometimes compromised students' ability to be highly engaged in working through the practice problems presented in the scenario.

In summary, the qualitative data provided possible explanation for the results derived from the quantitative data used answered the research question. The qualitative data also addressed the second purpose of the study which was to identify effective instructional strategies when using high-fidelity simulation. The implications of the findings summarized above and the relationship between the quantitative and qualitative results will be discussed further in Chapter 5.

CHAPTER V

IMPLICATIONS OF FINDINGS

Introduction

The primary goal of this exploratory study was to better understand the development of clinical judgment in nursing students when using the How People Learn (HPL) framework (Bransford, Brown, & Cocking, 2000) to guide the design of instructional experience in high-fidelity simulation laboratories. This chapter briefly describes the problem and restates the research question and purposes. The major section of this chapter examines the implications of the study results. This portion of the discussion is organized according to the research question and study purposes. The final section of this chapter proposes recommendations for practice and suggestions for further research.

Summary of the Problem

The enormous changes occurring in health care and nursing practice require that graduates from nursing programs attain competences that were unfamiliar just a few years ago. Nurses must use high-level cognitive skills to function in increasingly complex health care environments. The clinical teaching environment has also become more complex and less predictable. That complexity requires that students achieve a high level of proficiency before they engage in learning experiences that involve actual patients. Furthermore, it is no longer appropriate to rely on unstructured and unpredictable learning activities in the hospital that often focus on task development in lieu of experiences that facilitate the development of clinical judgment. Clinical education practices must emphasize experiences that help students develop the clinical judgment that is used to address the ambiguous and complex problems found in today's practice environments.

Research in nursing and nursing education has led to the development of a theoretical model that describes the kinds of clinical judgments required by nurses in all practice settings. This model, the Research-Based Model of Clinical Judgment in Nursing (Tanner 2006b), is being used extensively in Oregon's undergraduate nursing education programs. (The Research-Based Model of Clinical Judgment in Nursing is also referred to as Tanner's clinical judgment model throughout this chapter.)

A broad base of research on learning provides some guidance for the development of learning experiences that can be designed to facilitate the development of clinical judgment in nursing students. The HPL framework of Bransford, Brown and Cocking (2000) is based on research that described the thinking used by experts in a variety of practices and disciplines, and it arose from research that studied thinking used by experts when faced with complex problems. The HPL framework was thus used for this study because it arose from studies of the kind of expertise that provided a link to Tanner's model. The HPL framework guided the design instructional activities intended to facilitate the development of clinical judgment that, according to Tanner (2006b), is used by expert nurses.

High-fidelity simulation is one mechanism that is increasingly being used in nursing education to enhance and complement traditional clinical education. The simulation environment creates an opportunity for experiential learning that presents the kind of complex and ambiguous problems that nurses confront in practice. The simulation laboratory provides a means for nursing students to practice in a near-authentic work environment without the fear of harming patients. Learning in simulation occurs through experiential and reflective activities. Students practice confronting real problems in a near-authentic environment as they assume the role of the nurse in simulated scenarios. Pre- and post-scenario discussions facilitate reflective learning. The HPL framework provides guidance for designing the experiential and reflective learning activities that are used in high-fidelity simulation.

Discussion of Findings

This section provides a discussion of the study findings. The discussion is organized by addressing the research question and purposes of the study. This research study addressed the following question: When using high-fidelity simulation, what effect does incorporating the How People Learn (HPL) instructional design model have on the development of clinical judgment? The Lasater Clinical Judgment Rubric (LCJR) was used as the data collection instrument to answer the research question. This discussion addresses the study results derived from the LCJR by proposing possible explanations. The extent to which each of the four attributes of the HPL framework was implemented is considered in the discussion.

LCJR Scores: Why No Difference?

The lack of statistically significant difference between the control and experimental group scores on the LCJR may have occurred for two possible reasons. First, important aspects of the planned treatments that characterized the attributes of the HPL framework as the independent variable were actually experienced by both the control and experimental groups. Second, as described in previous chapters, some aspects of the planned interventions that were designed for the experimental group were not implemented as intended; in the next discussion, such discrepancies concerning each of the four HPL attributes are discussed. The reasons why the treatments designed to emulate the HPL framework were compromised are also considered in more detail.

Knowledge-Centeredness

In retrospect, it is clear that the original study design did not include a significant difference in the knowledge-centered treatment between the control and experimental groups. In fact, that attribute of the HPL framework was implemented in a nearly identical manner for both the control and experimental groups. The knowledge-centered attribute was visible for both groups through the scenario development process.

The research proposal intended to address the HPL knowledge-centered attribute through the pre-simulation discussion and journaling exercises that were designed for the experimental group. The pre-briefing discussions provided for the experimental group was designed to focus on the knowledge related to medical diagnosis and treatment that students would need to apply in the scenario. Experimental group students were also prompted to consider prior related experience or encounters with patients with similar problems. The intent of this activity was to influence the students' initial grasp of the situation by helping them retrieve previously learned knowledge. The assumption was that the opportunity to retrieve such knowledge would positively influence the students' understanding of the situation at hand. Tanner's model of clinical judgment posits that the nurse's initial grasp is affected by previously learned knowledge derived from a variety of sources.

As described in earlier chapters, the control group replicated this treatment on its own. They spent an hour before each scheduled simulation session preparing as a group for the scenarios. The possibility for the emergence of this student-directed group study had not been anticipated but could have been. Students were encouraged to organize and participate in study groups throughout their program of study. They were provided with guidelines for developing productive study groups through the college's learning resource center during the first term of the program. In addition, all students involved in the study were expected to spend time preparing for their clinical experiences by researching the medical diagnosis, treatments, and possible complications likely to be encountered during the simulation. This kind of preparation is expected throughout the program beginning with the first clinical experience and is described in the program handbook. Faculty coach and assist students with the preparation until they learn to retrieve the needed information independently.

This self-directed group learning activity by the control group generated another important question that cannot be answered by the available data. Was the preparatory student-facilitated activity more effective than the pre-simulation discussions facilitated by the researcher? Students involved in the voluntary activity certainly demonstrated characteristics of self-motivation and self-directed learning.

Perhaps the control group students engaged in more active learning as they independently worked together to identify the knowledge and skills they would need to apply in each simulation session. Consequently, control group students were just as prepared or perhaps even better prepared than the experimental group.

The second strategy that was designed to address the knowledge-centered attribute involved the Metaguide that was designed to guide the post-simulation debriefing. The Metaguide was created to assure that the debriefing discussion made the students' thinking about their clinical judgments visible. The assumption was that this explicit attention to discussing aspects of the clinical judgment model would help students develop the thinking, skills, and attitudes described in Lasater's rubric. The Metaguide was designed to keep the scenario learning objectives visible as the experimental group facilitator guided the debriefing discussions. Finally, the Metaguide was designed to guide the experimental group facilitator during the debriefing sessions. The Metaguide included questions that were to be posed by the experimental group facilitator. These questions were designed to help students understand the relationships between knowledge and concepts involved in the clinical judgments addressed in each simulation scenario.

As described in Chapter 4, the Metaguide was not used as intended during the debriefing. The discussion prompts were too prescriptive and often did not allow for the flexibility needed to address what had actually happened during the simulation scenario. The debriefing discussion often focused on uncovering student misunderstandings and on facilitating more in-depth understanding of concepts. Often the researcher and faculty assumed that students had previously mastered knowledge that was presented in the scenario; however, frequently students did not accurately apply that knowledge as the researcher and faculty predicted.

For example, the faculty and researcher assumed that the students had an adequate understanding of concepts related to hypovolemic shock. Students had recently completed a lecture-based experience and all had passed a test addressing the physiology and treatment of shock. However, their performance in the simulation that featured a patient in early shock was below expectations. A real patient would have likely died because the students failed to notice important cues about the patient's deteriorating condition and therefore did not respond with appropriate interventions. Consequently, in this instance the questions on the Metaguide became irrelevant, and the experimental group facilitator began the debriefing at the patient's bedside so that the signs and symptoms that the students had failed to notice and the interventions that were not carried out could be made explicit. The field notes described problems with the relevance of the discussion questions from the Metaguide throughout the study.

As previously described, both groups participated in the same scenarios. Therefore, all study participants received nearly equal exposure to the knowledge embedded in each scenario. The course faculty and researcher painstakingly developed detailed simulation scenarios that challenged students to apply previously learned and relevant nursing knowledge commonly required in practice. Furthermore, the scenarios were designed so there was a complex or ambiguous problem that required students to make a clinical judgment. Therefore, both the control and the experimental groups were exposed to the same knowledge and concepts embedded in each scenario. Consequently, there was likely significant diffusion of the knowledge-centered attribute of the HPL framework between the two groups.

In summary, the study treatment related to implementing the knowledge-centered attribute of the HPL format may have contributed to the lack of statistical difference in the development of clinical judgment between the control and experimental group. Students from both the control and experimental group were exposed equally to the simulation scenarios that emulated the knowledge-centered attribute of the HPL framework. In addition, the control group duplicated one planned difference related to the knowledge-centered attribute by creating their own pre-simulation preparation that focused on reviewing the knowledge that would likely be applied during the scenarios.

Learner-Centeredness

The planned treatment for the experimental group included learner-centered attributes in the design of the pre-simulation briefing. The pre-simulation discussion was designed to uncover students' previous knowledge, and the conversation was facilitated to help them identify what they knew about the knowledge needed in the scenario. Students were given opportunity to ask questions, explore their hunches, and seek advice from each other and the researcher. Review of the field notes revealed that the pre-briefing activity may have actually compromised a learner-centered approach. The pre-simulation journaling questions were designed by the researcher and were used for each simulation session. The questions may have not helped students to retrieve prior knowledge, anticipate what knowledge would be applied in the scenario, or consider what they didn't know or had experienced that might be addressed in the scenario. The pre-planned activity stifled the flexibility that is needed to create a learner-centered environment as the study used pre-designed questions that did not take into consideration the dynamic nature of the simulation environment as the study progressed.

Bransford, Brown, and Cocking (2000) noted that learner-centered environments consider the individual needs of each student. The study treatment was not designed to accommodate this HPL characteristic. The pre-briefing discussion questions and process did not adequately assess the knowledge and learning needs of individual students in the experimental group. The group discussion format may have made it difficult for some students to articulate their misunderstandings and incomplete understandings because of the group setting.

The journaling activity also did not promote the learner-centered attribute or the HPL framework. The journals that experimental group students were asked to complete were anonymous and were not graded. Consequently, the researcher was unable to recognize the needs of individual learners and did not provide feedback that addressed the unique needs of those individual.

Bransford, Brown, and Cocking (2000) also noted that the learner-centered attribute of the HPL framework takes into account the knowledge that students have when they come to instructional setting. Learning activities are then constructed to help students build on that previously learned knowledge. This was not done on an individual basis. The knowledge that was presented through the simulation was embedded through the content in the scenarios, and that knowledge was determined by speculating what knowledge the students had previously been exposed to as an entire class. The process used to design scenarios did not consider the knowledge of individual students.

Assessment- Centeredness

The original proposed study design emphasized the assessment-centered attribute of the HPL format. The planned treatment for the experimental group included discussion questions in the pre-briefing and debriefing sessions that were designed to help students assess their own knowledge. The questions were developed to help students forecast how they might apply what was learned in future practice situations.

Pre- and post-simulation journaling questions were another important aspect of the planned treatment for the experimental group. Journal questions were designed to help student assess their own knowledge and to facilitate reflective practices. Helping students develop reflective practices is an important component of the assessment-centered attribute of the HPL framework. Additionally, reflection-in-action and reflection-on-action (Schön 1983) are integral to Tanner's model (Tanner, 2006b). The journal questions were carefully crafted to facilitate the development of metacognitive skills used in reflection. They asked students to assess their own knowledge. Post-simulation journal questions were worded with the intent to help students monitor the application of knowledge used during simulation. Students were asked to reflect on the knowledge they used in the clinical judgments they made and upon which they acted. As described in Chapter 4, the journaling questions failed to elicit the desired reflective thinking and self-evaluation.

There may be several explanations for the failure of this treatment for the experimental group. First, timing may have been a problem. Experimental group students were asked to journal immediately after the pre-briefing discussion, which was just right before beginning the simulation sessions. Frequently, there was minimal time for this pre-scenario journaling activity. Moreover, the students consistently verbalized feelings of apprehension before simulation began. Early in the study, students verbalized feeling uncomfortable about being filmed and about being watched by peers. The students' focus related to this apprehension may have distracted them from engaging fully in the reflective thought process necessary for meaningful completion of the pre-simulation journals.

The timing of the post-simulation journal may also not have been appropriate either. Students were asked to complete the post-simulation journals at the end of the debriefing sessions, which usually took longer than anticipated. Most students had commitments that didn't allow them to stay longer than the allotted time. Students were encouraged to submit the post-simulation journals via email within 48 hours after the session. Only one student did this and his answers were brief and didn't embody deep reflective thinking.

Other circumstances also likely contributed to the failure of the post-simulation journaling as a treatment for the experimental group. Another possible explanation for the poor outcomes related to journaling was that the assignment was not graded, nor did students receive feedback on their journal submissions. In addition, students had journaling requirements associated with their hospital clinical experience. That journal assignment was evaluated and faculty provided weekly feedback on their entries. Students may have devoted their resources used for independent reflective thinking towards the assignment that was being evaluated and for which they received feedback. In contrast, students who participated in the pilot session were one quarter behind the actual study participants in the progress of their studies, and they were not required to complete reflective journals for another course at the time of the pilot study. Thus, the students who participated in the pilot study may have been more open to the reflective thinking presented in the journal activity because the circumstances differed.

Another possible explanation for the lack of participation in the journals may have been format and procedure. Students were asked to use pen and paper to address the reflective questions. More then half of the students carry lap top computers with them and are accustomed to completing assignments using a word-processing program and submitting them electronically. The paper-and-pen format may have been viewed as a nuisance.

The debriefing discussions associated with the assessment-centered attribute of the HPL framework were evident in both the experimental and control groups through the debriefing activity. As described in Chapter 3, the original study design included a very different approach to debriefing for the experimental group than the debriefing practice that actually occurred during the study. The change in practice occurred because the faculty and the control group facilitator observed the pilot study debriefing. The faculty then changed their debriefing practices to imitate the strategies used by the researcher in the pilot study. While this change of practice had an adverse affect on the researcher's study, the entire student group involved in the study likely benefited as a result in the change of debriefing practice by the faculty. Students indicated that they preferred the change in debriefing practices as evidenced by their positive comments on the end-of-course survey. In fact, several comments indicated that the debriefing format in the study was significantly different from the format used in past courses and represented an improvement from what the students had previously experienced.

There were some unexpected positive outcomes related to implementation of the assessment-centered attribute of the HPL format. The findings from the transcription coding results labeled Peer-to-Peer Support and Peer-to-Peer Challenge indicated that students engaged in the kind of communication behaviors that are promoted in the practice environment. The researcher and co-researcher were both impressed with the process and outcome of the feedback students provided to Susan and Paul, the two students who were often the subjects the interactions labeled Peer-to-Peer Challenge. Both the transcripts and the field notes documented the positive influence these interactions seemed to have on improving the two students' practice.

Community-Centeredness

The community-centered attribute of the HPL framework was not explicitly designed into the interventions planned for the experimental group. Because of the planned differences between the pre-briefing and debriefing process of the control group and the experimental group, the researcher assumed that the experimental group's debriefing process would promote the "intellectual camaraderie and attitudes" (Bransford, Brown, & Cocking, 2000, p. 25) that characterize this attribute of the HPL framework. In addition, it was also assumed that the extra time spent in pre-simulation discussion would influence the creation of a community among the experimental group participants. At the same time, the control group essentially created their own community through the student-led pre-briefing activity. In fact, there is a possibility that the student-led learning activity was superior at creating the community-centered characteristics of this aspect of the HPL framework.

Bransford, Brown and Cocking (2000) presented two other strategies that are important when promoting the community-centered aspect of the HPL framework. Both of these strategies were evident for all students in the study, which may have created further diffusion between the two groups in regard to this attribute. This diffusion again may account for the lack of statistical differences between the control group and experimental group on the LCJR.

Bransford, Brown, & Cocking (2000) observed that promoting community-centered approaches involves establishing norms of conduct and behavior for the classroom and school. For the participants in this study, these norms were well established through expectations outlined in the college and nursing program handbooks. More importantly, the students were at the end of their program, and formal and informal behavioral norms within the peer group were well established. Additionally, the faculty and researcher had previously established and communicated behavior expectations specific to the simulation lab, which were posted and discussed before every simulation session. Thus, norms were visible and discussed for both the control and experimental group. These expectations included a philosophy that mistakes are learning opportunities, assumptions that learners are competent professionals who are motivated to engage in the best practices available, and a commitment to confidentiality known as the "Vegas Rule" in the simulation lab: what happens in simulation, stays in simulation. All students consistently demonstrated adherence to these previously established norms throughout the study.

Bransford, Brown, & Cocking (2000) also noted that creating the community-centered approach in the HPL framework involves teachers establishing a community of learning among themselves. They posited that a community among teachers promotes a sense of comfort with questioning and inquiry rather than an expectation related to knowing the answers. A learning community among teachers promotes a model of creating new ideas built on the contribution of individual members and engenders a sense of excitement for learning that is then transferred to the students' learning environment . This sense of excitement then confers a sense of ownership of the new ideas that are embraced by teachers and their students (Bransford, Brown, & Cocking, 2000).

The field notes described the establishment of a learning community that included the course faculty, the two raters who scored the rubrics, and the researcher. This community was not intentionally facilitated and developed as the study progressed. The field notes also described the scenario development sessions and dozens of impromptu conversations among these participants. These conversation incorporated reflections about the teaching and learning practices that were being discovered among the faculty through the study period. One teacher sent an email to the researcher and the other faculty describing her delight with using this technology to promote required competency for students. She claimed it was one of the most rewarding experiences of her 20-year teaching career as the learning that was occurring through simulation had assured her that students were able to demonstrate the proficiency required in today's practice environment. The email prompted an electronic discussion that continued for several days between the course faculty and the researcher. Students in both the experimental and control groups likely benefited from the community-centeredness that was established among faculty and the researcher.

Upon review and analysis of the qualitative data, reflection on how the HPL framework was intended to be applied, and consideration as to the way it was actually applied, it is clear that each of the four HPL interventions were applied to both groups of students so that the differences related to the HPL interventions between the two groups were minimal. This suggests that both groups received significant aspects of the interventions that were planned only for the experimental group.

Importantly, though, the quantitative results from this study indicate that students from both groups showed significant improvement in all 11 performance indicators as described by the pre- and post-rubric scores. There are multiple factors that may have contributed to this improvement for both groups. However, the possibility that the practices that emulated the HPL framework significantly influenced the improvement in clinical judgment for both groups of students should be considered. Further research that could be conducted to explore this possibility is presented below.

Instructional Strategies: Implications and Recommendations

No differences were found in the outcomes on the LCJR between the control and experimental groups, and evidence was compelling that the learning environments and instructional practices experienced by both groups were similar. But, both groups did show significant development in clinical judgment as measured by the LCJR. This section attempts to identify and discuss aspects of the students' experience that may account for this change.

The first purpose of this study was to identify instructional strategies that lead to effective learning when using high-fidelity simulation. This purpose was fulfilled by examining the participants' experiences and their development of clinical judgment as described by the Research-Based Model of Clinical Judgment in Nursing (Tanner 2006b). This section identifies promising recommendations for practices through a discussion that addresses this first purpose of the study.

According to Tanner (2006b), five assumptions derived from research inform the Research-based Model of Clinical Judgment in Nursing. Analysis of the data for this study indicated that each of these five assumptions was incorporated into the simulation experiences. While these assumptions did not purposefully guide selection of the simulation experiences, the researcher's analysis suggests that students in both groups were exposed to all five assumptions. This, in turn, may have contributed to the increase of clinical judgments by all students.

Assumption 1: Clinical Judgments are Influenced by What Nurses Bring to the Situation

Tanner (2006b) provided a description of the various kinds of knowledge that a nurse uses to make clinical judgments and proposed that previously learned knowledge influences clinical judgment. Each of these types of knowledge was integrated into at least one simulation scenario in this study. Exposure to the various types of knowledge as described by Tanner was both intentional and serendipitous. Given the significant increase in clinical judgment between pre- and post-test evaluation for all students, there is significant rationale to suggest that the exposure to these types of knowledge, which were embedded in the simulation activities and scenarios, may account for some of that increase.

Tanner (2006b) described one type of knowledge that nurses use in many clinical situations as "…generalizable, and applicable in many situations and… derived from science and theory" (p. 205). The design of simulation experiences throughout the study provided ample opportunity for students to use and further develop the generalizable knowledge derived from science and theory in several ways. First, students were provided with the background information for each scenario case they would encounter a week before the scheduled simulation session. That background information included a brief case history and each patient's medical diagnosis, prescribed medication and treatments, and prior health history. This provided students with ample time to research relevant science and theory that might need to be applied in the simulation. Frequently, students did not apply this knowledge during the simulation as accurately and completely as the faculty and the researcher expected. However, the debriefing transcripts often indicated that students were able to retrieve and make meaning out of this kind of knowledge during the reflective discussion. Qualitative analysis of the data indicated students consistently identified the knowledge they used or should have used when they were describing what was important to notice about a situation. Students recognized the knowledge that related to interpreting data. These insights usually occurred with a prompt or cue from the facilitator. The conversations that were coded as *reflecting* indicated that students also accurately applied theory-based, generalizable knowledge when reflecting on what actions they took or should have taken during the scenario.

The study finding related to Tanner's (2006b) ideas about what influences the nurse's initial grasp of the situation speaks to the importance of using simulation before students are immersed in the practice setting. The study design did not include evaluation of whether the knowledge that students were learning in simulation transferred to the actual practice setting. However, as the study progressed, students began providing anecdotal accounts of how they were applying the knowledge that they were learning in simulation, as evidenced by the following sample email:

> Just to share an experience with you after my "Holy Cow" simulation with a post-partum bleeding episode. I am happy to report that simulation works. Today, I had an elderly female patient with C-Dif and Diarrhea. Her condition worsened today, a positive guiac stool, a second stool that was bloody, and a third stool that was 40 cc of frank blood. Rather than say "Holy Cow" I took her BP, assessed for impeding doom (i.e. pt states, "I want to commit suicide, but don't have a plan), assessed HR, felt her abd for firmness and pain. I am happy to report a favorable response from the doc who ordered additional fluids and H & H Q 8 hrs. I left the hospital knowing I did what I can to communicate the situation. I don't think I would have been as crisp or on as high alert without the simulation experience to notice a possible emerging situation.

Interestingly, this student was a 4.0 student, had a previously earned Master's degree, and an established career in computer programming. By all accounts, she was a successful student. In addition, she was successful on the test that evaluated her understanding of shock yet performed particularly poorly in the simulation she references in her email. The clinical incident she describes occurred about two weeks after the simulation featuring a patient in shock. Her narrative account indicates that the knowledge gained through the simulation experience affected her initial grasp of the situation and influenced what she noticed in an actual practice situation. She was able to accurately apply generalizable knowledge from science and theory and she attributed this successful transfer of knowledge to the opportunity to rehearse that application in simulation.

The resulting recommendation based on this finding is that effective simulation experiences should be structured so students review needed generalizable knowledge that is embedded in science and theory prior to the simulation experience. This recommendation is congruent with the knowledge-centered attribute of the HPL framework. In addition, the scenario itself must provide opportunity for students to retrieve and apply this kind of knowledge. Debriefing and other companion reflective learning activities should be structured to help students identify how effectively they have applied generalizable knowledge when making clinical judgments.

Tanner (2006b) described another kind of knowledge that affects the nurse's initial grasp of a clinical situation. This type of knowledge is "...[which is] filled out in practice, grows out in practice, is often tacit knowledge" (p. 205). Analysis of the data indicated exposure to such tacit knowledge occurred in two different ways during this study.

First, the scenarios themselves were a reflection of the faculty's tacit knowledge. Each scenario incorporated a storyline that reflected an actual practice dilemma or event that the author had experienced. The mere selection process of the story for the scenario suggests that the author's tacit knowledge is embedded in the storyline as the case unfolds during the simulation. The selection of which stories are important for students to experience is testament to the faculty members' tacit knowledge and speaks to what they thought was important for students to experience in preparation for their professional practice.

One scenario used in the study particularly exemplifies the tacit knowledge that is embedded in practice. In this scenario, students had to care for a patient who had just been admitted to the hospital. The task at hand involved preparing the patient for a procedure. The patient is awaiting a bronchoscopy to determine if she has lung cancer. The patient presents with extreme anxiety and begs for a medication that will alleviate it. There is an order for an "on-call" narcotic that is also used as an anti-anxiety medication. An "on-call" procedure means the nurse must wait for a call from the operating room before the medication can be administered. The simulated medication was available for students to administer. They must make a judgment about the proper timing for administering the medication and consider the patient's request.

In most cases, the students gave the medication without the proper notification from the operating room and before the informed consent form was signed by the patient. The patient's procedure therefore had to be postponed as the informed consent would not be legally defensible because the patient would have signed after being medicated with a narcotic. Debriefing discussion uncovered that students did not know that "on-call" meant the medication could not be given until the operating room staff called the unit and directed them to give the medication. There was also misunderstanding about the nurse's role related to obtaining the patient's signature on an informed consent form.

The students' actions were influenced by two issues. They wanted to do what would most likely provide immediate comfort for the patient and didn't know how to access other options such as calling the anesthesiologist to report the patient's extreme anxiety and requesting a medication that could be given. More importantly, the students lacked the needed knowledge that is learned through practice experience. This scenario made explicit common tacit knowledge that is embedded in practice.

The resulting recommendations related to tacit knowledge can be addressed through scenario development and debriefing. First, the storylines in some of the scenarios should be designed to uncover the tacit knowledge that is embedded in practice and not easily retrievable through texts and the literature. In this study, most scenarios included some sort of tacit knowledge. The incorporation of tacit knowledge was based on the researcher's hunches and faculty speculation about what students might not know. The incorporation of tacit knowledge should be an explicit learning outcome and informed by evidence. When students do not identify the tacit knowledge, or apply it incorrectly, faculty must correct such misunderstanding in a debriefing or other reflective learning activity. Faculty must also be mindful to assure that the tacit knowledge they present through simulation represents competent and current practice standards. Some tacit knowledge currently used in practice has been refuted through research. Therefore, tacit knowledge that is incorporated into scenarios should be selected carefully. Faculty should affirm that there is solid evidence that provides rationale for the tacit knowledge presented in simulation scenarios.

Debriefing discussion frequently exposed students to the ethical knowledge that Tanner (2006b) indicated is embedded in the professional practice. Benner and Sutphen (2006) referred to this as the development of ethical comportment. One particular simulation session elicited a particularly rich conversation wherein the debriefings for each group included faculty and students both sharing practice experiences that involved ethical conflicts. The conversation involved narrative that is rarely shared in the classroom and included ethical reasoning that is used by expert nurses (Benner & Sutphen, 2006; Benner, Tanner, & Chesla, 1996; Tanner, 2006b). Several of the students indicated that the scenario and discussion provided a perspective that helped them rehearse the inevitable end-of- life dilemmas that most nurses encounter in practice. The following excerpt from the field notes summarizes one of the debriefing discussions that illustrated how ethical knowledge became integral to the discussions between faculty and students.

> The debriefing at the end of this scenario was pretty interesting. Our conversation about the moral dilemma created by the HIPPA law progressed into students telling stories about times their own personal ethics have been compromised when functioning as nursing assistants. One student told a story about a charge nurse who told her to take vital signs every 10 minutes when a patient was in the actively dying phase. She told the group she felt this intervention compromised the patient and family's comfort. The student then went on to say she falsely recorded findings to avoid a conflict with the charge nurse in order to treat the patient humanely. She was quite emotional and indicated this action clearly created a values conflict related to doing what is good and right.
>
> We recognized that most students don't have the experiences to reason through these difficult dilemmas they will confront in complex situations. So the faculty took turns posing some questions to explore other options…like saying "No…I won't do that. If you want it done, you do it." This progressed to how to refuse an inappropriate physician order, and how to use the systems in the environment when either your ethics, the ethics of the profession, or standards of care are being compromised.

Tanner (2006b) made the case that the nurse's initial grasp of the situation is significantly influenced by the nurse's reasoning about "fundamental disposition toward what is good and right." (p. 206). She explained that some of these values are personal values and inform the ethical knowledge and philosophy central to the profession. These ethical underpinnings of the profession are often unspoken and are often not recognized, but they profoundly influence what the nurse attends to in a particular situation (Tanner, 2006b). Many of the scenarios developed and used through the study period incorporated ethical dilemmas that had to be incorporated into the clinical judgments students were required to make. Some of the debriefing conversations that were coded as *reflection* described the conversations around these issues.

Students often come to nursing with a passion to provide humanistic and ethical care (Benner, 2004). New graduates are often unprepared to manage the value conflicts that are inherent in the context of increasingly complex and regulated practice environments. Results from this study indicate that simulation provides a learning environment that facilitates the identification of these conflicts and promotes the development of a deep understanding related to the issues that create a mismatch between what actually occurs in practice and what nurses perceive as "good and right." Most importantly, simulation creates an opportunity to rehearse plausible clinical judgments involving both common and difficult ethical dilemmas within a supportive learning environment.

Assumption 2: Sound Clinical Judgment Is Influenced by Knowing the Patient

Tanner's (2006b) model of clinical judgment includes the importance of what is described in multiple studies as "knowing the patient" (p. 206). This study identified a means to facilitate the knowledge related to that knowing. This occurred through the second simulation session, which involved an unfolding case featuring the same patient for all three of the scenarios that were presented. The scenarios were designed to help students attain understanding of the trajectory of illness for a patient with a cancer diagnosis. In the first scenario, the patient was diagnosed with cancer. In the second scenario, the patient experienced an untoward response to chemotherapy that the students had to manage. In addition, the patient began to question the utility of treatment and asked the nurse to help tell her family she wanted to abandon curative treatment and begin hospice. In the final scenario, students provided end-of-life care and were confronted with the moral dilemmas regarding pain management with a narcotic that would likely hasten the patient's death. In addition, students were asked to respond to a request for information from a family member.

By the third scenario, students had formed a relationship with the patient. The analysis of the debriefing transcripts and field notes indicated that students' clinical judgments were influenced by the relationship they had established in the first two scenarios. An excerpt from the field notes described this finding:

> There was some emotion during the last scenario evidenced by tearful behavior. I am surprised that the students get pretty attached to the patient as played by SimMan™ by the third scenario. Most everyone was tearful, including the faculty; our control room tech wept and most of the students watching the scenario in the debriefing room were also teary-eyed.
>
> This debriefing focused on pain and symptom control and the ethical dilemma regarding HIPPA. We also talked a lot about giving that last dose of morphine and the possibility that it's the last dose of morphine given by the nurse that causes the physiological death. None of the students found this notion disturbing and all verbalized a moral obligation to address the patient's clear evidence of suffering. The students verbalized that they were sure this was the right thing to do since the patient was terminal and both the patient and family indicated they were ready for death. The rationale for the judgment they made

indicated students applied what they learned about the patient as an individual in the first two scenarios to their decisions and actions in the third scenario.

Qualitative analysis results from this study suggest that the use of unfolding cases in simulation can provide practice with clinical judgments that are influenced by "knowing the patient." There are limitations to full exposure to this kind of knowing when using a plastic mannequin as a practice patient. There are no subtle changes in skin color, movement, and facial expression that nurses rely on as indicators of a change in a patient's situation. However, the debriefing transcripts revealed that students' clinical judgments related to medicating this patient were significantly influenced by the relationship they had established with the patient and family in the previous scenarios. The students in both the control and experimental groups were adamant that medicating the patient was appropriate. They had reached conclusions about the patient's preference for comfort through conversations in the previous scenario in which the patient indicated she was ready to die. Unfolding cases in simulation may be a powerful strategy that can be further developed to promote clinical judgments that must incorporate individualized care and that are derived from relationship-centered care.

Assumption 3: Clinical Judgments Are Affected by the Context in Which the Situation Occurs

Social group norms, habits, and culture influence which situations require nursing judgment (Benner, Tanner & Chesla, 1996; Tanner 2006b). As noted above in the discussion describing strategies to promote the community-centered aspect of the HPL, the faculty intentionally created a culture that assumed that all learners were capable and motivated to do their best. In addition, a culture where mistakes were viewed as puzzles to be reasoned out was visible through ground rules and actual posters displayed in the debriefing room.

Study results indicated that contextual issues related to workflow systems influenced the students' responses and clinical judgments. The end-of-course surveys clearly identified problems with systems in the simulation lab that created distractions for students during the scenarios. There were occasional references in the debriefing transcriptions that identified these kinds of systems problems. Student comments suggested that they may have been distracted from the salient data they should have been noticing because they were focused on a distraction related to a workflow malfunction. These distractions may have compromised the reasoning required to make some of the judgments that were presented in the scenario. Ebright et al. (2003) reported that alterations in workflow in the hospital also have an adverse effect on nurses' clinical judgments. Work spaces are being redesigned because research found that interruptions and distractions lead to medication errors and adversely affect the nurses' ability to focus on the patients' problems (Ebright et al.).

Common systems-related problems in the study included lack of easy access to needed supplies and equipment that was unfamiliar to students. For example, during one scenario, the proper dose of medication was not available. Students then assumed they were supposed to engage in a dosage calculation and became focused on this task, ignoring the patient's deteriorating condition.

In the beginning of the study, the students sometimes wondered if these systems problems were purposeful in an attempt to make sure they knew how to identify systems-related problems. Additionally, early in the study students sometime "stumbled" because they were not familiar with the mannequin. Because the pulses and heart and lung sounds are slightly different from those of a human being, students seemed to have difficulty accurately assessing the related signs (e.g., wheezy lung sounds) and verbalized that they were reluctant to interpret the signs and symptoms that were presented. This improved as the study progressed and students became more familiar with the mannequin.

Students were very reliant on a full set of medical records for determining the salient issues related to the patients. In the early sessions, faculty provided what they perceived as the essential records, but students complained that they needed full access to all the records available to them in the hospital. This stated need may have occurred because students were unfamiliar with the normal trajectory of the illnesses that were presented and relied on medical records to fill in the pieces. Experienced nurses fill in these pieces through tacit knowledge. Faculty responded by carefully attending to providing the equipment and medical records that students might need. The complaints about the interference that these issues caused with learning subsided.

These findings should be considered when determining future educational practices in simulation. In summary, creating familiarity with the simulation environment is an important activity to incorporate in an orientation to the simulation lab. Presenting systems that emulate the authentic hospital workflow creates context that students need to fully engage in simulation. Attending to these details creates a context in the simulation laboratory that assures that students can succeed. A success-oriented culture should be promoted in simulated learning environments.

The qualitative analysis identified an important finding that addresses the importance of culture in nursing and other health care professions practice. That finding was identified through the narratives that were coded as Peer-to-Peer Challenge. Many of these conversations were slightly uncomfortable for the participants but may be an indicator that students were engaging in a behavior that exemplifies attempts in the health care system to address a culture that historically ignores and even covers up mistakes. The report titled *To Err is Human* published by the Institute of Medicine (Kohn, Corrigan, & Donaldson, 2000) pointed out that each year hundreds of thousands of patients are harmed because of avoidable mistakes. A subsequent study titled *Silence Kills* (Maxfield, Greeny, McMillan, Patterson, & Switzler, 2005) suggested there are seven "crucial conversations" that workers in health care frequently fail to hold: broken rules, mistakes, lack of support from co-workers, incompetence, poor teamwork, disrespect, and micromanagement. Failure to engage in these crucial conversations contributes significantly to the unacceptable error rates, and the *Silence Kills* study purported that health care workers need to confront co-workers when there are problems related to these crucial concerns.

Analysis of the debriefing transcriptions indicated that students in the experimental group frequently confronted each other with observed concerns that played out in the simulation. In one scenario, the nurse yelled out "Holy cow" when she discovered the patient was hemorrhaging. A fellow student confronted her on that response during the debriefing. This confrontation led to an in-depth conversation on how to be honest with patients when they are experiencing a life-threatening situation while at the same time assuming a stance that communicates confidence and reassurance. Through the course of this conversation, the students affirmed that shouting out Holy Cow in the situation was an inappropriate response. Eventually, the conversation created an opening for students to discuss alternative responses. The culture of confronting mistakes outright may have emerged because of the community-centered aspects of the HPL framework and may indicate that simulation may create a culture where *crucial conversations* are expected.

Assumption 4: Nurses Use a Variety of Reasoning Patterns When Making Clinical Judgments

Tanner's model of clinical judgment describes three interrelated patterns of reasoning used by experienced nurses in their clinical reasoning. Review of the qualitative data and study design show that the scenarios incorporated clinical problems and storylines that facilitated narrative reasoning. The second simulation session, which involved the unfolding case, provided opportunity for students to engage in narrative reasoning as the storyline unfolded. The debriefings associated with the last scenario in this unfolding case consistently resulted in students and faculty telling stories related to other end-of-life experiences. This kind of dialogue may result in narrative reasoning that is relevant to the students' future clinical judgments. Again, it would be interesting to know how what is learned in simulation is transferred into practice. The following excerpt from the field notes illustrates how the impact of one student's story led to new understandings for all students involved as the dialogue described how nurses cope with end-of-life issues in practice.

> The most intense time came in the debriefing. We had a student play Alyce's (the patient) daughter at the bedside. We asked for volunteers and Annie (not her real name) immediately volunteered. She was teary at the bedside, responded as we might expect as a daughter watching her mother die. We assumed the student had suspended disbelief and was simply doing a great job with the role – a similar reaction someone might have watching a sad movie. When she got into the debriefing room after the scenario, Annie began sobbing soon into the debriefing. I turned off the recorder. It turned out Annie had lost her own mother [when Annie was] age 14 to a brain tumor. The students used caring communication with their peer. They let her cry and listened as she told her story. I was impressed with the group's maturity and caring behaviors towards their peer. Chrissy was facilitating the debriefing but all three of us participated (Chrissy, Melody, and me) as the situation at hand prompted responses from all of us. Annie regained her composure and indicated she was ready to discuss the scenario, but that transitional moment was awkward and the silence was uncomfortable. It was difficult to address what happened and move forward with discussion aimed at meeting the objectives. I stepped in and focused the conversation on loss. I posed a few questions to help students acknowledge that as people, nurses experience loss just like the rest of the world and sometimes our patient's losses trigger the emotions associated with our own personal losses. We had a rich conversation about identifying feelings, developing coping strategies, supporting co-workers, the end-of-life rituals nurses engage in [in] a variety of settings (critical care, hospice), and other mechanisms nurses use to cope with death. We talked about how our own personal experiences can affect the judgments we make about our patients The discussion concluded with a deep conversation on how to maintain [a] hopeful perspective when we are witnessing and immersed in the human suffering associated with nursing practice.

This unfolding case provided opportunity for students to engage in narrative reasoning as they engaged in story telling about experiences with past patients and also linked personal stories with coping strategies they will need in future practice. In addition, students engaged in caring behaviors toward each other, which strengthened the community-centered aspect of the HPL framework. Bransford, Brown and

Cocking (2000) posited that creating community-centered learning environments involves developing "...ways to link classroom learning to other aspects of students' lives." (p. 26). The conversation that unfolded in this debriefing linked end-of-life experiences in practice with students' personal end-of-life stories. As a result, students considered how to support each other and work together when the burdens of caring for patients are especially difficult.

In summary, this study demonstrated that scenarios can be designed to facilitate narrative reasoning as described in Tanner's model of clinical judgment. Description of narrative reasoning was easily elicited during debriefing. Unfolding scenarios, which feature a storyline that unfolds over time like a chapter in a book, may provide opportunity for students to understand a patient's experience with illness. This creates a deep understanding of the patient as an individual person and sets up the situation required for narrative reasoning. Development of narrative reasoning may be enhanced when the community-centered aspect of the HPL framework is facilitated as learners share their stories to turn individual experience into shared deep understanding. Debriefing can be structured to encourage participants to tell their stories, which transforms shared experiences into knowledge and understanding that affect clinical judgments.

Assumption 5: Reflection on Practice Is Often Triggered by Breakdown in Clinical Judgment

Tanner purported that often a trigger event that results in breakdown or perceived breakdown in clinical judgment stimulates reflective thought. The email from a student presented earlier in this chapter provides an example of this phenomenon. The student had failed to make an appropriate clinical judgment, which she attributed to not noticing an emergent situation. The correspondence indicates that she engaged in reflection-on-action as a result of this breakdown.

The scenario that created this breakdown in practice was of concern to the researcher and the faculty. The scenario was designed to apply knowledge from a unit that had been recently taught in their theory class. The scenario was presented so students would have an opportunity to manage shock related to blood loss in a post-partum patient. Hypovolemic shock secondary to a post-partum bleed is a fairly common occurrence and is resolved easily when the early signs and symptoms are recognized in a timely manner and treatment is initiated. Proper recognition and treatment of shock is a subject that is frequently presented on the nurse licensing exam. Shock is also a situation that most nurses encounter in their practice. Students were told that the simulation session would be based on caring for a patient in shock. They were provided with the patient's background information a week before the simulation session so they knew that the likely cause of shock would be related to a post-partum hemorrhage. The necessity to understand and be able to respond to this problem was made explicit. Even so, the students did not perform as expected in the scenario, and all of the students in both groups failed to recognize the early signs of shock presented by the mannequin. Consequently, the patient's condition deteriorated from early shock to a more serious condition. Twice, the faculty member had to assume the role of a nurse supervisor and intervene in the scenario because the students failed to initiate appropriate treatment. The faculty member rescued the students from their failure to notice because of the prior agreement that we would not let the mannequin die due to student action or inaction.

This scenario was probably what Bransford, Brown and Cocking (2000) would call a "just manageable difficulty" (p. 24). Such an activity means that the experience is challenging enough to move the learner to a higher level of competence but not so difficult that the learner becomes discouraged and overly frustrated. When presenting difficult problems for students to address, Bransford, Brown and Cocking (2000) recommended that *scaffolds* be available to assist students if the situation at hand becomes too difficult to manage. Scaffolds are a feature of cognitive apprenticeships (Bransford, Brown, & Cocking; Cope, Cuthbertson, & Stoddart, 2000, Lave & Wagner, 1990; Taylor & Care, 1999; Wolley & Jarvis, 2007) and are described as "sufficient support to allow student to achieve more than they would be able to without help" (Cope, Cuthbertson, & Stoddart, p. 851). In the shock scenario, multiple scaffolds were used to assist the students. When they failed to notice the early signs of shock, the mannequin's voice provided more verbal cues that embodied the evolving physical symptoms associated with shock. The mannequin voice eventually prompted the students by complaining that she felt something wet under her buttocks. Students finally lifted the bedcovers to discover the mannequin was lying in a significant pool of blood. At this point, the students did understand that the patient was in shock due to blood loss; however, they did not implement the appropriate treatment. The faculty member provided another scaffold by assuming the role of an actor in the scenario and redirecting the students to the appropriate life-saving actions.

Some simulated learning experiences should include “just manageable” scenarios. Not every scenario should push the students to the point where they are unable to manage independently, but the occasional use of a very difficult scenario may prompt the perceived breakdown in clinical judgment that leads to reflective practice. The important lesson learned from this scenario is that faculty must also engage in habits of reflection-in-action as the scenario unfolds and be prepared to provide necessary scaffolds.

The HPL framework comes into play when considering the use of scaffolds to facilitate the learning that influence sound clinical judgment. The debriefing transcripts showed significant discussion occurred when faculty shared their practice expertise and knowledge. However, this practice expertise was rarely demonstrated in an actual simulation. The simulated learning environment has the potential to provide students with visible and explicit exposure to what expert nursing practice looks like. This became apparent to the researcher during a workshop she conducted for practicing nurses that included the same scenarios used in this study.

The scenario featured the patient who experienced hypovolemic shock as described above. The scenario incorporated complex physiology and required rapid processing of information to make an accurate clinical judgment about the situation at hand. When this scenario was used with practicing nurses, the nurses who were unfamiliar with the kind of patient featured in the scenario made the same mistakes in clinical judgments as the novice nursing students. Interestingly, there was an experienced labor and delivery nurse attending one of the workshops. In her practice, she had managed dozens of patients who had experienced heavy bleeding after a normal delivery. Her judgments and responses to the problems presented in the simulation were masterful and seamless. She immediately noticed the cardinal signs of early shock, interpreted the data, and quickly began multiple appropriate treatments simultaneously and instantly (e.g., baby to breast to stimulate uterine contractions that will stop the bleeding, placing the patient's head down, her feet up, administration of fluids and medications, and a call for help). The debriefing with the practicing nurses focused on the expertise they all witnessed. The participants described the exquisite practice they had witnessed and identified the characteristics of expert practice.

Students rarely have exposure to what expert practice looks like, nor do they have the opportunity to dissect the reasoning patterns that expert nurses use to make sound clinical judgments. Bransford, Brown and Cocking (2000) advocated for community-centered environments that include experts as mentors and teachers. Simulation and debriefing could be used to provide students with exposure to the actions, reasoning, and judgments that define expertise.

Several recent articles in the nursing education literature have identified the notion of integrating the characteristics of "situated learning" into clinical education (Cope, Cuthbertson, & Stoddart, 2000; Taylor & Care, 1999; Wooley & Jarvis, 2007). Cope and associates (2000) posited that experts do not operate by following rules that are derived from knowledge and higher order cognitive process but rather use

"...complex situation understanding a mature and practiced dexterity that comes from their breadth and depth of experience" (p. 855). In situated learning, experts focus the learner's attention towards the salient features of the situation in question. One of the defining characteristics of cognitive apprenticeship is that experts make their situational or tacit knowledge explicit as they coach the learner. Coaching incorporates modeling expert performance and includes providing feedback on the learner's performance. The notions of *scaffolding* and *fading* are essential components to cognitive apprenticeships. In scaffolding, the mentor offers support to the learner and as the learner gains competence and confidence, the expert withdraws (fades) the support (scaffolds). Cognitive apprenticeships also include strategies such as articulation, reflection, and exploration (Cope, Cuthbertson, & Stoddart, 2000). As the learner gains confidence and competence, he or she is encouraged to articulate his or her understanding and reflect on his or her acquisition of expertise. Additionally, as the learner progresses and begins to demonstrate recognizable competence, he or she is encouraged by the mentor to explore multiple approaches to addressing problems in practice. Much of this process involves the opportunity to learn from established members of the professional community (Cope, Cuthbertson, & Stoddart).

Simulation learning environments provide an ideal setting to implement the characteristics of cognitive apprenticeship and situated learning. The attributes of the HPL framework would come into play with this implementation. For example, the development of the community-centered aspect of the HPL framework needs to be developed. Practicing expert nurses could be included in the simulation activity and could be assigned to model expert nursing practice in simulations. The students could also work alongside the experts, and the students could be coached in real time as the problems unfolded in the simulation. This kind of learning activity is often not desirable with real patients as they need to be assured that the nurse involved in care is experienced and competent to manage the problems that present themselves. Consequently, nurses often take over for the student when training involves real patients, and they avoid cueing and prompting the students in the patient's presence. Coaching occurs out of the patient's earshot and often is delayed to accommodate workflow on the unit.

Debriefing immediately after the scenario provides for appropriate timing for coaching activity. Coaching can be enhanced because scenarios are recorded and the recording can be replayed. Students and expert mentors can together describe and reflect upon the thinking behind their clinical judgments, and they can actively engage together in reflection-on-action. The kinds of knowledge and reasoning that experts use to make clinical judgments can be uncovered. Descriptions of how the experience is transferred to practice can be made explicit. Staff nurse time is often very limited and the opportunity for them to participate in simulation with students may be limited. Faculty often assume the role of expert nurses in the simulation learning environment and can further offer their expertise by deliberate implementation of the components of cognitive apprenticeship.

Faculty Preparation

Using high-fidelity simulation as an instructional strategy requires the faculty to develop new skill sets. Simulation is essentially instruction that involves a case-based approach. Faculty must learn to create a plausible storyline for each scenario and develop the capacity to predict likely student responses to the case as the story unfolds. The bigger challenge involves the ability to respond to student actions that were not considered during the scenario planning process. This flexibility requires faculty to have an in-depth knowledge of the patient problems that are embedded in each scenario which includes understanding pathophisiology, medications, and implications of diagnostic tests. In summary, teaching in a simulation environment requires faculty who have developed expertise in both nursing practice and in education. Understanding how students' learn to think like a nurse is paramount to using simulation as a means to teach clinical judgment.

Teaching in simulated environment involves developing proficiency in using the requisite technology. The educator must learn to manipulate the computer settings that control the mannequin quickly in response to students' actions. Managing the digital recording features and trouble shooting equipment failures must also be addressed. This study was very dependent on the simulation technician to address the ongoing technology issues that consistently occurred. Maintaining fidelity during the scenario is dependent on proficient execution of the technology involved learning new skills and creating a team that worked together to implement each scenario.

Multiple authorities (Hertel & Millis; 2002; Jeffries, 2007; Lederman, 1984, 1992; Medley & Horne, 2005; Rudolph, Simon, Dufresne, & Raemer, 2006) indicate debriefing is the most important component of the simulation learning experience. Facilitating debriefing requires an in-depth understanding of group process and how students learn in groups. The nurse educator must have well developed communication techniques that are used to facilitate inclusive discussion that leads to uncovering the student's thinking and development of new knowledge that can be transferred to the practice setting.

Summary of Recommendations for Educational Practices

In summary, the following recommendations for educational practices to use in simulation environment have emerged through the analysis of the study results.

Knowledge-Centered Environment

- Scenarios should be designed to embody the various types of knowledge (e.g., generalizable knowledge derived from science and theory, tacit knowledge, knowing what is good and right).
- Reasoning patterns (e.g., analytical, intuitive, and narrative) that nurses use when making sound clinical judgment should be incorporated into scenario storylines. Debriefing should make the application of various types of knowledge and reasoning visible to the students.
- Unfolding scenarios provide opportunity for students to engage in a relationship-centered stance that results in clinical judgments that incorporate knowledge derived from knowing the patient.

- Students need opportunity to know and understand what expert clinical judgments look like.
- Simulated learning activities should be framed by learning outcomes and be flexible enough to respond to unpredictable circumstances and context.

Assessment-Centered Environment

- Simulation activity should include formative assessment linked to every scenario.
- Journaling assignments should link learning in simulation to actual clinical experiences, and the process should provide a mechanism for feedback from faculty.

Learner-Centered Environment

- Scenarios should incorporate the knowledge, skills, and attitudes that learners bring to the environment.
- Students should have opportunity to retrieve prior knowledge that will be applied in the simulation scenario.
- The complexity of scenarios should be difficult enough to challenge students to attain higher attainment of competency but not so complex that students become frustrated and overwhelmed.

Community-Centered Environment

- Educators should cultivate a culture where crucial conversations are expected and embraced.

- Simulation provides opportunity to incorporate characteristics of cognitive apprenticeship and should include modeling and coaching by expert nurses.
- In an effort to establish the deep and varied knowledge required for sound clinical judgments, scenario debriefing should be linked to narratives that include both stories from student's and expert's practice experience.

Further Development of the Lasater Instrument: Recommendations

The second purpose of this study was to contribute to the further development of an instrument designed to measure the Research-Based Model of Clinical Judgment in Nursing (Lasater, 2005; Tanner 1998, 2006b). Further development of the rubric was done by establishing inter-rater reliability and internal consistency of the instrument.

Descriptions of the quantitative data related to this purpose are presented in Chapter 4. As previously discussed, inter-rater reliability was established through rater training and was maintained throughout the study. Study results also indicated that there is internal consistency of the instrument. This demonstrates that Lasater's rubric served as a reliable instrument for this study and shows promise as a measurement tool for future studies.

Repeat studies should be conducted to duplicate the inter-rater reliability that was established in this study. Sideras (2007) did not sustain inter-rater reliability throughout the course of her study; however, there were differences between the process used in this study and the study conducted by Sideras. Raters from the Sideras study watched digital recordings of students in simulation when using the LCJR to evaluate clinical judgment. Recordings of participants included junior and senior students and the raters did not know the students. The raters were not told whether the students were junior or senior students. In other words, the raters were considered blind raters.

The two raters who evaluated students in this study viewed the simulations live and reviewed digital recordings immediately after the simulation session ended. The digital recordings were to clarify the ratings that the raters had assigned during the live simulation sessions. More importantly, both raters were well acquainted with the students as they were faculty at the college where the study was conducted. Because of the varying inter-rater reliability, further research is needed to establish inter-rater reliability of the instrument using a consistent and rigorous rating process.

Research should be conducted to re-establish content validity with attention to the Interpreting and Responding dimensions of the rubric. Tanner's clinical judgment model emphasizes the notion that the relationship with the patient significantly influences the nurse's initial grasp of a situation. Narrative reasoning that involves understanding the patient's responses and preferences for treatment also affect the nurse's interpretation of data. Analysis of the qualitative data from this study suggested that "knowing the patient" affected the students' clinical judgment. Findings from the second simulation session found that students' clinical judgments were influenced primarily by the patient's expressed desires. The rubric does not explicitly address this kind of narrative reasoning as described in Tanner's clinical judgment model.

In addition, Tanner (2006b) held that the nurse's clinical judgment is profoundly affected by what is "good and right." Qualitative analysis from this study indicated that students' clinical judgments were influenced by perceptions about what was the right thing to do. The ethical component that Tanner states is an important piece involved in clinical judgments is not evident in the rubric (Christine A.Tanner personal communication, June 4, 2008).

Sideras's recent study (2007) addressed construct validity of the rubric. She noted concerns with two performance indicators that emerged from Lasater's (2005) observations during the development phase of the rubric. The performance indicators labeled *calm, confident manner* and *being skillful* are not linked with Tanner's clinical judgment model (Sideras, 2007; Christine A. Tanner, personal communication, June, 4, 2008). The remaining two performance indicators related to the Responding aspect of the rubric, *clear communication* and *well-planned intervention/flexibility* reflect Tanner's clinical judgment model (Sideras, 2007).

Further research related to the LCJR should be pursued. The rubric is being used extensively in Oregon and is beginning to be used throughout the United States. This and other studies (Lasater, 2004; Sideras; 2007) suggest that the Lasater Clinical Judgment Rubric may provide the means to measure clinical judgment in simulation and possibly other clinical education environments. Since Lasater first developed the rubric, Tanner has refined her explication of her clinical judgment model (Christine A. Tanner, personal communication, June 4, 2008). Additionally, multiple educators have used the model to teach clinical judgment. Consequently, there may be changes possible in how the model is understood and is applied in education. A recent conversation with Tanner (Christine A. Tanner, personal communication, June 4, 2008) affirmed that the rubric needs to be re-examined in terms of content validity. Further study is necessary to appraise and possibly revise the performance indicators in the rubric to more accurately reflect the current understanding of each aspect of Tanner's clinical judgment model. Changes in the rubric's performance indicators will require further research to address both content and construct validity. Inter-rater reliability will need to be re-established and internal consistency will also need to be studied.

Future Research

This research has resulted in a description of some promising educational practices that can be used to promote the development of clinical judgment when using simulation. Many questions remain unanswered, however, and warrant further research:

- Does the LCJR predict clinical judgment performance in practice?
- Under what circumstances does knowledge developed through simulation transfer to sound clinical judgment in practice?
- What are the best practices related to designing the entire simulation experience such as orienting students to the simulation environment, preparing students for scenarios, and using reflective journals?

- What are effective practices in debriefing and other reflective learning activities that should be linked to learning in simulation environments?
- What are the guiding principles that should be used to define "just manageable difficulties" when designing simulation scenarios?
- What role does motivation and self-directed behavior play in the development of clinical judgment in high-fidelity simulation environments?

While this exploratory study has suggested that simulation is sensitive to students' progress in the development of clinical judgment, it is not conclusive. A repeat study incorporating the HPL design should be designed that uses a two-group approach. Based on study findings, the following recommendations are offered for advancing the use of the HPL as a framework for designing learning activities in simulation.

The knowledge-centered aspect of the HPL format may be the variable that needs to be constant in an experimental two-group study design. Further studies should incorporate the various kinds of knowledge described as influencing clinical judgments (Tanner, 2006b). The remaining three attributes of the HPL framework should be strengthened in future studies to provide more distinction between the control and experimental groups.

The learner-centered aspect could be strengthened through activities that more completely assess the knowledge, skills, and attitudes that students bring to the education setting. By assessing students' prior understandings and experiences, the foundation from which to build appropriate scenario and reflective learning activity could be established. In addition to knowledge assessment, preferred learning style and characteristics inherent in effective self-directed learning and metacognitive skills could be assessed. More explicit activities could be incorporated to assist students in the development of these skills.

The assessment attribute of the HPL format could be strengthened by offering a greater variety of formative assessments. In this study, a set of reflective journal questions was used as the only means to provide formative assessment. Angelo and Cross (1993) offered a variety of formative assessments designed for use in the classroom that could be adapted for use in the simulation learning environment. The assessment-centered activity should include individual feedback by faculty and provide opportunity for students to engage in self- and peer-to-peer assessment. This study did not ask students' to examine their own clinical judgments. Future studies should include the opportunity for students to score the rubric on themselves and for each other. Neilson, Stragnell, and Jester (2007) have designed a promising reflective guide using Tanner's clinical judgment model. This guide was designed to be used for student self-assessment and for faculty assessment of students' reflective thinking about their development of clinical judgment. The guide could be considered as a possible peer assessment tool as well. This guide could be included in future studies as a means to enhance the knowledge, learner, and assessment attributes of the HPL framework.

This study included several aspects of the community-centered attribute of the HPL framework for both the control and experimental groups. The community-centered attribute of the HPL format could be strengthened in a future two-group study design by incorporating exercises that facilitate habits of positive team learning for the experimental group. The community-centered aspect of the HPL framework could also be strengthened by including faculty and/or expert nurses as actors in some scenarios. The expert nurses could be instructed to model clinical judgment as members of the community of practice. In addition, the previous discussion that involved the teachers and students sharing stories in practice described how the community-centered aspect of the HPL framework could become a more intentional strategy in debriefing discussions.

Another recommendation related to studying the effects of the HPL framework on the development of clinical judgment involves revising the settings where the study takes place. To avoid the diffusion of treatment that occurred in this study, subsequent research should be carried out at two sites. A study that involves the control group at one site and the experimental group at a different simulation lab would assure that differences between experiences for the control group and experimental group are distinct. This study design would involve more faculties and equipment resources that are involved with using high-fidelity simulation. The number of faculty participants needed would double.

The final recommendation involves the role of the researcher. As described in Chapter 3, the researcher was an active participant and was directly involved in all aspects of the simulation experience for both cohorts. Further research may be strengthened with the researcher functioning in a more objective observational role.

Conclusion

The health care environment for which nurse educators are preparing students is becoming increasingly complex. Regulatory agencies and employers call for nursing education to prepare graduates who demonstrate expert clinical judgments in complex environments. Traditional approaches to clinical education are no longer sufficient to achieve this end. Given these increased demands for new graduates, clinical education must be designed to help students develop clinical judgment beginning with early learning experiences.

High-fidelity simulation is one strategy that holds promise for preparing learners for the complexities inherent in today's practice environment. Well-designed simulation experiences provide learning situations that allow students to work in a near-authentic work environment that addresses real problems that arise in practice. Students can synthesize multiple sources of data, make clinical judgments, initiate actual responses, and reflect on their practice. Because simulations take place in the safety of the simulation theater, risk to patients is eliminated and learning becomes the focus of the educational experience.

Results from this study suggest that the use of the How People Learn (HPL) framework, which is a research-based theory rooted in the cognitive sciences, provides structure for developing learning activities that support the development of clinical judgment in a simulation learning environment. The learner-centered and assessment-centered attributes of the HPL framework can be used to design pre-simulation learning activities. The knowledge-centered attribute of the HPL framework provides guidance for determining the content and kinds of knowledge that should be included in scenarios. Simulation provides a safe environment to apply various sources of reasoning (e.g., analytic, intuitive, and narrative) and allows students to learn from mistakes. The pre- and post-scenario discussions promote the development of reflective thinking habits that lead to the clinical judgments needed by expert nurses.

The assessment-centered attribute of the HPL framework suggests that multiple sources of data be used for students to assess their own learning. Simulation environments that incorporate reflective learning activities create opportunity for students to monitor and regulate their own learning and performance. Feedback from peers and faculty also contribute to the assessment-centered environment of the HPL framework. The results from this research indicated that all of this appeared to have contributed to a significant increase in clinical judgment by all learners involved in this study.

One of the most positive attributes of the HPL model involves the characteristics of the community-centeredness environment. This study found that promoting a community-centered environment can facilitate habits involved in communicating issues related to practice problems that are known to cause harm to patients. The seven crucial conversations between health care professionals are valued and promoted in the workplace. The analysis of study results also suggests that the facilitation of the community-centered aspect of the HPL framework may promote learning when novices and experts are situated in simulation environments together. Simulation provides a venue for experienced nurses to model expert practice where the thinking and reasoning is uncovered and can be described because it becomes visible.

Use of simulation in nursing education comes at an opportune time as nurse educators are redesigning clinical nursing education practices. Simulation clearly holds promise as a means to prepare the learner for the complexity of today's clinical practice. Identifying and integrating best practices of teaching and learning into simulation learning environments provides the tools required to prepare nursing students for the rigorous demands of clinical practice in a variety of settings. Most importantly, simulation provides a community-centered learning environment where the humanistic values and ethical concerns that define the profession can be uncovered, upheld, and promulgated. This will assure that future nurses are well equipped to facilitate health and healing for patients who are dependent on their clinical judgments.

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APPENDIX A

Patient Preparation Information Sheet

STUDENT PREP for SIMULATION Scenario Date: Week of April 17, 2006

Scenario Title Grant Taylor
Post-op complications

Learning Activities Prior To Simulation:

Review post-op assessment
Review signs and symptoms of post-op complications
Review post-op pain management
Review Discharge Teaching for post-surgical patient

Patient Case History:

- Diagnosis –
  1. 45 year old male -4 day post spleenectomy 2[nd] to MVA. Multiple abrasions. History of borderline hypertension. Poor adherence to HTN med regime.
- Psych/Soc/Spiritual/Cultural – Past HX depression, long haul truck driver, divorced, lives alone

- Chief complaint: Pain
- Meds and Allergies-
  - NKA
  - Percocet 1-2 tablets every 4 hours prn post-op pain
  - Morphine Sulfate 1-5 mg IV push every 1-2 prn severe post-op pain
  - Cefoxitin 1 Gram IV every 8 hours
  - Reglan 30 mg IV every 4 hours
  - Phenergan 25 mg IV every 4-6 hours prn nausea
- Tubes/Drains/Dressing – Abd Dressing
- Diet-Surgical progressive-Full Liquid
- Activity-Up with assist
- Fluid Balance

Previous Shift		24 Hour	
I	O	I	O
1600	820	3700	1920

- Labs Hgb 12.8 Hct 36 post 2 units Packed Cells

Physician Orders:

- Today's Physician Orders
    - Monitor I & 0
    - Plan Discharge 1-2 days

APPENDIX B
Pre-Simulation Journal

Student Name_______________
Study ID#_____

Preparatory Journal Assignment
To be completed as prior to simulation

Using the data provided in the attached scenario, please respond to the following questions. We will discuss your responses during the pre-conference.

After reviewing the case, which health concerns seem most important?

What are the key concepts or knowledge you need to understand this clinical situation?

Have you encountered a clinical situation like this before?

- If yes what did you learn from that encounter?

- How will you apply that learning to this case?

- If not what are your thoughts at this point?

What possible nursing assessments and interventions (including psychomotor skills) will you likely use to address the health concerns of this patient?

Additional Comments/Thoughts

APPENDIX C
Debriefing Guide – Grant Taylor

Date **Debriefing Guide**

Scenario – Grant Taylor

Student name /role ____________________ **Student name /role** ____________________

Student name /role ____________________ **Student name /role** ____________________

Scenario Objectives

1. Accurately assess, identify predisposing factors, and verbalize clinical presentation evident in a patient with pulmonary embolism
2. Provide supportive nursing interventions in response to patient's clinical presentation.
3. Provide clear, comprehensive and concise report on patient's condition to physician and other members of the health care team
4. Implement physician orders accurately and in a timely manner

Critical Action Checklist

1. Manage ABC's-position, O2 administration, Airway management
2. Call for help
3. Comprehensive assessment-notes response to interventions
4. Assure IV Access
5. Report to Doc
6. Implement TX per standards and physician orders

Teaching Points	**Debriefing Questions/Prompts**
	Reactions - ***Clear the air and set the stage for discussion*** • Feelings • Facts **Understanding** 1. What were the priority health concerns in this case? • Were the priority health concerns what you anticipated? Describe the data that validated what you anticipated as the primary concern.

Teaching Points	If the concerns were different, how were they different? Describe any clinical judgments you made? (May replay the recording if students are not clear about their judgments or need to review the scenario for clarity of what actually happened). **Understanding** 2. Discuss your thinking that led to the judgment(s). • What evidence and/or knowledge did you use to make the clinical judgments? • Describe the important or significant data that led you to pursue your clinical judgment and subsequent course of action. 3. Describe anything you failed to notice or anticipate. *Evaluating/Summarize* Review what was learned and ensure the scenario is put into a larger context. Make a commitment to improvement. What were the key concepts you used to care for this patient during the scenario? Discuss any key concepts that you would use if you were going to run through this scenario again or if you confronted a similar situation in the hospital?

Thoughts/Recommendations

APPENDIX D

Post-Simulation Journal Questions

Student Name_______________

Post-Simulation Journal

(Student Version)

Please answer the following questions.

Describe the logic you used to organize and implement your actions during simulation.

Discuss anything you would do different when confronted with a similar situation.

Discuss your performance of the required psychomotor skills. Describe anything you will do differently to perform more efficiently and accurately next time?

What do you need to learn more about to effectively care for patients with similar problems in the future?

How will you prepare for simulation next time?

Additional Comments/Thoughts

APPENDIX E

OCNE SIMULATION TEMPLATE

Adapted from OHSU Simulation Scenario template , rev October 2005

<table>
<tr><td>Scenario Title</td><td></td></tr>
<tr><td>Patient Name</td><td></td></tr>
<tr><td>Medical Record #</td><td></td></tr>
<tr><td>Patient Type
and Acuity</td><td></td></tr>
<tr><td>Level (SN yr) 1-2-3</td><td></td></tr>
<tr><td>Author , w/email</td><td></td></tr>
<tr><td>Reviewers / date:</td><td></td></tr>
<tr><td>Date approved:</td><td></td></tr>
<tr><td>Learning Objectives:</td><td></td></tr>
<tr><td>Keyword - systems</td><td></td></tr>
<tr><td>Keyword - skills</td><td></td></tr>
<tr><td colspan="2">OCNE Competencies 1. Ethical 2. Reflection, Self-care 3. Self-directed learning
4. Leadership 5. Collaborative health team 6. Utilizes health care systems
7. Relationship centered care 8. Communicates effectively
9. Sound clinical judgment 10 Evidence-based practice 11. Therapeutic interventions and procedures</td></tr>
<tr><td>Particpant Assignment</td><td></td></tr>
<tr><td>Nurse 1:</td><td>VS, Assessment, and Symptom Analysis</td></tr>
<tr><td>Nurse 2:</td><td>Team Leader</td></tr>
<tr><td>Nurse 3:</td><td>Skills</td></tr>
<tr><td>Actor (s):</td><td></td></tr>
<tr><td colspan="2">Pt Case History

Allergies</td></tr>
<tr><td>Medications</td><td>Diagnostic Tests</td></tr>
<tr><td colspan="2">Physician Orders
1.</td></tr>
</table>

<table>
<tr><td colspan="5">Initial Computer Set up</td></tr>
<tr><td>HR</td><td>RR</td><td>BP</td><td>Temp</td><td>Pulse Ox</td></tr>
<tr><td>Lung Sounds</td><td>Heart Sounds</td><td>Bowel Tones</td><td>ECG</td><td></td></tr>
<tr><td colspan="5">General Description of Patient – Skin, wounds, affect</td></tr>
<tr><td colspan="5">Report to start scenario</td></tr>
<tr><td colspan="3">Scenario Flow</td><td>Expected Stuent Repsonses</td><td>Sim-Man Responses</td></tr>
<tr><td colspan="5">Debreifing Priorities</td></tr>
</table>

APPENDIX F

LASATER CLINICAL JUDGMENT RUBRIC
Effective Noticing

Effective NOTICING involves:	Exemplary	Accomplished	Developing	Beginning
Focused Observation	Focuses observation appropriately; regularly observes and monitors a wide variety of objective and subjective data to uncover any useful information	Regularly observes/monitors a variety of data, including both subjective and objective; most useful information is noticed, may miss the most subtle signs	Attempts to monitor a variety of subjective and objective data, but is overwhelmed by the array of data; focuses on the most obvious data, missing some important information	Confused by the clinical situation and the amount/type of data; observation is not organized and important data is missed, and/or assessment errors are made
Recognizing Deviations from Expected Patterns	Recognizes subtle patterns and deviations from expected patterns in data and uses these to guide the assessment	Recognizes most obvious patterns and deviations in data and uses these to continually assess	Identifies obvious patterns and deviations, missing some important information; unsure how to continue the assessment	Focuses on one thing at a time and misses most patterns/deviations from expectations; misses opportunities to refine the assessment
Information Seeking	Assertively seeks information to plan intervention: carefully collects useful subjective data from observing the client and from interacting with the client and family	Actively seeks subjective information about the client's situation from the client and family to support planning interventions; occasionally does not pursue important leads	Makes limited efforts to seek additional information from the client/family; often seems not to know what information to seek and/or pursues unrelated information	Is ineffective in seeking information; relies mostly on objective data; has difficulty interacting with the client and family and fails to collect important subjective data

LASATER CLINICAL JUDGMENT RUBRIC
Effective Interpreting

Effective INTERPRETING involves:	Exemplary	Accomplished	Developing	Beginning
Prioritizing Data	Focuses on the most relevant and important data useful for explaining the client's condition	Generally focuses on the most important data and seeks further relevant information, but also may try to attend to less pertinent data	Makes an effort to prioritize data and focus on the most important, but also attends to less relevant/useful data	Has difficulty focusing and appears not to know which data are most important to the diagnosis; attempts to attend to all available data
Making Sense of Data	Even when facing complex, conflicting or confusing data, is able to (1) note and make sense of patterns in the client's data, (2) compare these with known patterns (from the nursing knowledge base, research, personal experience, and intuition), and (3) develop plans for interventions that can be justified in terms of their likelihood of success	In most situations, interprets the client's data patterns and compares with known patterns to develop an intervention plan and accompanying rationale; the exceptions are rare or complicated cases where it is appropriate to seek the guidance of a specialist or more experienced nurse	In simple or common/familiar situations, is able to compare the client's data patterns with those known and to develop/explain intervention plans; has difficulty, however, with even moderately difficult data/situations that are within the expectations for students, inappropriately requires advice or assistance	Even in simple of familiar/common situations has difficulty interpreting or making sense of data; has trouble distinguishing among competing explanations and appropriate interventions, requiring assistance both in diagnosing the problem and in developing an intervention

LASATER CLINICAL JUDGMENT RUBRIC
Effective Responding

Effective RESPONDING involves:	**Exemplary**	**Accomplished**	**Developing**	**Beginning**
Calm, Confident Manner	Assumes responsibility: delegates team assignments, assess the client and reassures them and their families	Generally displays leadership and confidence, and is able to control/calm most situations; may show stress in particularly difficult or complex situations	Is tentative in the leader's role; reassures clients/families in routine and relatively simple situations, but becomes stressed and disorganized easily	Except in simple and routine situations, is stressed and disorganized, lacks control, making clients and families anxious/less able to cooperate
Clear Communication	Communicates effectively; explains interventions; calms/reassures clients and families; directs and involves team members, explaining and giving directions; checks for understanding	Generally communicates well; explains carefully to clients, gives clear directions to team; could be more effective in establishing rapport	Shows some communication ability (e.g., giving directions); communication with clients/families/team members is only partly successful; displays caring but not competence	Has difficulty communicating; explanations are confusing, directions are unclear or contradictory, and clients/families are made confused/anxious, not reassured
Well-Planned Intervention/Flexibility	Interventions are tailored for the individual client; monitors client progress closely and is able to adjust treatment as indicated by the client response	Develops interactions based on relevant patient data; monitors progress regularly but does not expect to have to change treatments	Develops interventions based on the most obvious data; monitors progress, but is unable to make adjustments based on the patient response	Focuses on developing a single intervention addressing a likely solution, but it may be vague, confusing, and/or incomplete; some monitoring may occur
Being Skillful	Shows mastery of necessary nursing skills	Displays proficiency in the use of most nursing skills; could improve speed or accuracy	Is hesitant or ineffective in utilizing nursing skills	Is unable to select and/or perform the nursing skills

LASATER CLINICAL JUDGMENT RUBRIC
Effective Reflecting

Effective REFLECTING involves:	Exemplary	Accomplished	Developing	Beginning
Evaluation/Self-Analysis	Independently evaluates/ analyzes personal clinical performance, noting decision points, elaborating alternatives and accurately evaluating choices against alternatives	Evaluates/analyzes personal clinical performance with minimal prompting, primarily major events/decisions; key decision points are identified and alternatives are considered	Even when prompted, briefly verbalizes the most obvious evaluations; has difficulty imagining alternative choices; is self-protective in evaluating personal choices	Even prompted evaluations are brief, cursory, and not used to improve performance; justifies personal decisions/choices without evaluating them
Commitment to Improvement	Demonstrates commitment to ongoing improvement: reflects on and critically evaluates nursing experiences; accurately identifies strengths/weaknesses and develops specific plans to eliminate weaknesses	Demonstrates a desire to improve nursing performance: reflects on and evaluates experiences; identifies strengths/weaknesses; could be more systematic in evaluating weaknesses	Demonstrates awareness of the need for ongoing improvement and makes some effort to learn from experience and improve performance but tends to state the obvious, and needs external evaluation	Appears uninterested in improving performance or unable to do so; rarely reflects; is uncritical of him/herself, or overly critical (given level of development); is unable to see flaws or need for improvement

APPENDIX G

LCJR SCORING GUIDE

Clinical Judgment in Simulation Rubric

Student Name: Observation Date/Time:
Scenario #:

Clinical Judgment Components	Observation Notes
Noticing: • Focused Observation: 4 3 2 1 • Recognizing Deviations from Expected Patterns: 4 3 2 1 • Information Seeking: 4 3 2 1	
Interpreting: • Prioritizing Data: 4 3 2 1 • Making Sense of Data: 4 3 2 1	
Responding: • Calm, Confident Manner: 4 3 2 1 • Clear Communication: 4 3 2 1 • Well-Planned Intervention/Flexibility: 4 3 2 1 • Being Skillful: 4 3 2 1	
Evaluating: • Reflection/Self-Analysis: 4 3 2 1 • Commitment to Improvement: 4 3 2 1	

Summary Comments:	

Developed by Kathie Lasater, EdD(C.) and Michael Katims, Ph.D. Based on Tanner's Model of Clinical Judgment. August 1, 2004

APPENDIX H

END OF COURSE SURVEY

Course Evaluation
Please comment on the following statements

Simulation provided opportunity to discuss ideas and concepts taught in other courses.

There are enough opportunities in the simulations to find out if I clearly understand.

I learned from the comments made by the teachers before and after the simulation.

The simulations seemed to be designed for my specific level of knowledge and skills.

Feedback provided was constructive.

Debriefing helped me to analyze my own behavior and actions.

What was most helpful about simulation?

What do the instructors need to work on improving?