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## **Taking the Patient to the Classroom: Applying Theoretical Frameworks to Simulation in Nursing Education**

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# Taking the Patient to the Classroom: Applying Theoretical Frameworks to Simulation in Nursing Education

Magda H. Waldner and Joanne K. Olson

## Abstract

Upon completion of their education, nursing students are expected to practice safely and competently. Societal changes and revisions to nursing education have altered the way nursing students learn to competently care for patients. Increasingly, simulation experiences are used to assist students to integrate theoretical knowledge into practice. Reasons for and the variety of simulation activities used in nursing education in light of learning theory are discussed. By combining Benner's nursing skill acquisition theory with Kolb's experiential learning theory, theoretical underpinnings for examining the use of simulations in the context of nursing education are provided.

**KEYWORDS:** simulation, skill acquisition, clinical education, Benner, Kolb, teaching methods

Because hospitals of the time were the sole providers and generally the sole controllers of nurses' training, turn-of-the-century students lived in the hospital that trained them. Graduate nurses, who were employed almost exclusively in private homes and were on duty 24 hours a day, were usually given meager accommodations in those households. (Hermann, 1999, p. 18)

Nursing education has changed significantly since the times described in the vignette. Nursing students no longer live in hospitals; nursing *training* has evolved into nursing *education*; hospitals no longer control nursing education; and some nursing students don't see the inside of a hospital until they are in their second or third year of their programs. Many positive changes have accompanied this shift away from hospitals as the centre and focus of nursing education. However, one challenge that has arisen is students' limited access to practice opportunities with patients.

Nursing practice extends well beyond hospital walls and clinical experiences involve much more than physical assessment skills and the application of those skills in patient care. The focus of this article, nonetheless, is the development of those physical assessment and intervention skills as alternative strategies to help nursing students achieve practice competencies are imperative.

The human patient simulator is a teaching strategy currently receiving much attention in nursing education. Despite its popularity, little is known about how the simulator should be used in nursing education and how it compares to other simulation activities already in use. In this paper, the authors discuss reasons for implementing simulation as a learning approach. Also discussed are simulation activities applicable to nursing education. Benner's theory of the development of nursing skills and Kolb's experiential learning theory are used as frameworks to examine the use of simulation in the context of nursing education.

### ***Clinical Placements and Alternative Experiences***

Educators are acutely aware that students don't have the access to clinical placements needed to fully develop the nursing competencies required when they join the work force (Del Bueno, 2001; Feingold, Calaluce & Kallen, 2004; Morton, 1996). The reasons for the lack of clinical placements vary. Medley and Horne (2005) point to shorter lengths of stay, greater numbers of students, higher patient acuity, and nursing staff shortages. Feingold et al., echo these concerns and consider the shift from hospital-based to university-based programs as partly

to blame; Lyons and Milton (1999) found that patients were less likely to consent to being ‘practiced’ on, due to their increased knowledge about health and health care. However, even without a lack of clinical placements, developing competencies by practicing on real life patients has become an ethical issue due to the potential threat to their safety (Rystedt & Lindstrom, 2001).

From an educational perspective, clinical placements also have some drawbacks. Student learning experiences cannot be standardized. They often have only one opportunity to practice a competency and feedback and discussion can only occur after the experience with the real patient is over, and sometimes this debriefing does not take place (Medley & Horne, 2005). Traditionally, employers provided newly hired nurses with sufficient orientation to overcome some of these challenges; However, budget restraints, nursing shortages, and the complexities of care have placed constraints on the extent of orientations offered, and nurse graduates are expected to have highly developed nursing competencies (Morton, 1997). Considering the many intricacies involved in clinical placements, it is not surprising that, over the years, nursing education programs have sought alternatives to clinical placements in addition to those limited placement experiences available to students.

The clinical placement alternatives discussed in this manuscript all have a component of simulation incorporated into them. According to Rauen (2004), simulation in nursing education is “... an event or situation made to resemble clinical practice as closely as possible” (p. 46). Educational simulation technology has become an accepted mode of instruction in a variety of professions and occupations. For example, pilots and astronauts can now train in flight simulators, nuclear power plant employees prepare for technical operations using simulated exercises, and military personnel train by playing war games (Issenberg, McGaghie, W., Hart, I., Mayer, J., Felner, J., Petrusa, et al., 1999).

Seropian, Brown, Gavilanes and Driggers (2004) make a helpful distinction between three categories of simulation in nursing education. Computer-based simulation involves “... the use of software developed to simulate a subject or situation” (p. 166). Task and skill trainers are models of varying completeness and realism such as an IV arm or a computer driven human patient simulator used to practice skills. Full-scale simulations aim to “... recreate all of the elements of a situation that are perceptible to students” (p. 168). The latter may involve elements of the first two categories, as well as real people acting as patients, coworkers or visitors, all set within a *recreated* clinical environment.

Task and skill trainers come in a variety of complexities, sophistication, and realism, also referred to as ‘fidelity’ (Yaeger, et al., 2004; Wilson, Shepherd, Kelly & Pitzner, 2005). Low-fidelity task and skill trainers allow students to focus on a defined skill area, such as an arm for development of injection techniques, or head-and-chest models for cardio-pulmonary resuscitation (CPR) training. Medium- or moderate-fidelity models provide somewhat more realism (breath or heart sounds with no chest movement or palpable pulse). Medium-fidelity models are not programmed to respond to interventions to the extent of high-fidelity models. High-fidelity models have more integrated signs and symptoms and are more comprehensively programmed. Medications can be scanned into the computer and physical reactions to the medications can be exhibited by these models (Seropian et al., 2004, Yaeger et al., 2004). Fidelity will no doubt increase as companies develop more sophisticated models.

### ***Evidence of Effectiveness of Simulation Education***

Although all three categories of simulation mentioned by Seropian, et al., (2004) are used in nursing education, little evidence exists that these simulations produce the same or better outcomes than either traditional lecture-based or clinical-based learning. The first category, computer-based simulations, may lack the degree of interaction required to facilitate higher level learning (Sims, 1997). For example, Madorin and Iwasiw (1999) found that although students who participated in a computer-assisted surgical patient simulation had higher self-efficacy scores immediately after participating in the simulation, scores did not differ from the control group once both groups had completed their clinical practicum experience. In Bauer and Huynh’s (2001) study, students who only completed a CD-Rom education session on blood pressure measurement were less proficient than students who learned about it using the lecture method. Students who experienced both the CD-Rom session and the lecture session outperformed students who learned by either method alone. Garrett and Callear (2001) describe how innovative computer strategies may improve computer-based instruction by increasing the interactivity between student and computer. They maintain that computer programs have not yet reached an artificial intelligence level comparable to that of a real-life tutor needed for optimal learning to take place.

Research into the effectiveness of the second category of simulation, skill and task trainers, shows mixed results as to how effective they are in comparison to traditional classroom teaching methods and/or clinical experiences. Alinier, Hunt and Gordon (2004), report on an ongoing study examining the effect of adding a human patient simulator session to traditional teaching methods on clinical performance. Initial results show that students who participate in the

human patient simulator session perform better on the Objective Structured Clinical Examination (OSCE) than students who did not attend. Similarly, Yoo and Yoo (2003) found that students who participated in a simulation session with standardized patients scored higher on written and performance tests than students who didn't participate. Griggs (2002), on the other hand, noted that students who participated in a human patient simulator session scored no better on a knowledge test, and, in some cases, worse than the students who did not participate in the session. Likewise, Ravert (2004) observed similar scores on written tests for critical thinking, performance, and self-efficacy by students who participated in a discussion about a case scenario and those who participated in simulation sessions. These research studies also direct our attention to an inherent problem in testing the effectiveness of simulation experiences. Although one expects knowledge, critical thinking, and/or self-efficacy to increase with experience, the purpose of simulation education is really to improve performance or clinical competency. Performance or clinical competency is more difficult to measure than knowledge, critical thinking, or self-efficacy. In fact, simulations themselves are frequently used to test clinical competency (Johanson & Wertenberger, 1996; Nehring & Lashley, 2004).

Full-scale simulation in nursing education is the most time-consuming and labor-intensive to create. No objective studies involving nursing students were found. In all three categories of simulation there is considerable evidence that students and faculty perceive simulation experiences to be generally well liked (Kenny, 2002; Ross and Tuovinen, 2001) and valued (Bearnson & Wiker, 2005; Cioffi, 2001; Feingold et al., 2004). Several studies into perceptions of full-scale simulations report that students and faculty generally responded favorably to full-scale simulated sessions (Decker, Galvan, & Sridaromont, 2005; Mole & McLafferty, 2004; Yaeger et al., 2004).

Computer-based simulation differs from task and skill simulation and full-scale simulation in that there is still a fair amount of work to do around the interactivity of the programs. As research on interactive computer-based simulation is limited, this category of simulation education in nursing will not be addressed here. Instead the discussion will focus on a combination of task-and-skills-trainers and full-scale simulations.

In summary, although the three categories of simulations in nursing education are generally well liked by faculty and students, the evidence of their effectiveness compared to traditional, lecture-based methods and clinical experiences is somewhat inconclusive. Despite this lack of evidence, nursing educators continue to view simulation education as the only available alternative

to clinical experience. These authors contend that it is unlikely that nursing students will ever be able to practice all their skills on real patients again. As well, many educators intuitively believe that hands-on experiences, in particular with skill and talk trainers, improve learning outcomes (Seropian, et al., 2004). Adult, constructivist, and experiential learning theories support this intuition. If simulation in education curricula is here to stay, how can educators ensure they are using the simulation experiences in the best possible way? Benner's (1984) model of skill acquisition and Kolb's (1984) experiential learning theory provide frameworks that can be used to help nurse educators guide their decisions about simulation experiences for nursing students.

## **THEORETICAL FRAMEWORKS FOR SIMULATION EDUCATION**

### ***Benner's Model of Novice to Expert***

When Benner (1984) published her book, *From Novice to Expert*, she envisioned that her research and the ensuing model of development of expertise in nursing practice might lead to more autonomy for practicing nurses, staff development programs, stable staffing, and clinical specialization in nursing education. Her model was met with acceptance (Noyes, 1995) and rejection (Cash, 1995) in its application to the development of nursing knowledge through practice experience. However, on the more basic level of skill acquisition, the model provides a context for skill development in nurses and nursing students. Benner (1984) bases her model on the idea that, first and foremost, theoretical knowledge informs practice: "Providing nursing care involves risks for both nurse and patient, and skilled nursing requires well-planned educational programs. Experience-based skill acquisition is safer and quicker when it rests upon a sound educational base" (p. xix). However, experience then provides the context for theoretical knowledge. Through practice experiences, nursing students apply, adapt, and intertwine theoretical knowledge with practical knowledge to "... create a process of skill acquisition and development" (Dillon, 2002, p. 49).

Benner (1984) distinguishes among five levels of competency. Differentiation among the levels is determined by the nurses' focus of attention, involvement in the situation, and perception of responsibility or accountability (Benner, 1984; Benner, Tanner & Chesla, 1992; Dillon, 2002). At the first level, the novice nurse focuses attention on objective, measurable attributes, such as weight or vital signs. Involvement or actions are determined by 'context-free' rules regarding these objective measurements, rules that are governed by principles and theories gleaned from classroom education (Dillon, 2002). The

sense of responsibility and involvement is limited by the focus on individual signs or symptoms.

At the second level, the advanced beginner has had enough practice experiences to recognize the clinical signs vital signs measure to be manifestations of a disease profile. Action is determined by the guidelines and protocols associated with the disease, and the nurse focuses on organization and prioritization of tasks that will maintain the patient's status quo. Accountability is gauged by the ability to complete the tasks the advanced beginner sets for him/herself (Benner, et al., 1992).

The competent level of nursing practice is characterized by a focus on patient care issues deemed important for long term goals and plans. The competent nurse starts to see the impact nursing actions in relation to a more comprehensive patient picture. Because nurses at this level begin to see the inadequacy of both "... formal, scientific knowledge..." and the "... analytical approach to clinical situations" (Benner, et al., 1992, p 22), they feel a profound sense of responsibility.

When nurses perform at the fourth level of skill acquisition, proficiency, they are able to see the changing relevance of clinical signs. Actions are based on fine distinctions in patient circumstances. Instead of using clinical guidelines and protocols for assessment and in determining a course of action, proficient nurses *read* a situation and decide on their actions.

Finally, the expert in Benner's (1984) model, who has achieved the fifth level of skill acquisition, relies on his or her "... intuitive grasp of each situation and zeroes in on the accurate region of the problem without wasteful considerations of a large range of unfruitful, alternative diagnoses and solutions" (p. 32). Experts have a deep understanding of the situation, based on vast experience, and then act accordingly. An expert nurse's sense of responsibility is more realistic and takes into account the context of the care environment, including decisions of other health care professionals and imbalances of power in the decision making processes.

It is important to keep in mind that Benner (1984) applies the word 'experience' only to those situations in which the person "... actively refines preconceived notions and expectations ... Experience is gained when theoretical knowledge is refined, challenged, or disconfirmed by actual clinical evidence that enhances or runs counter to the theoretical understanding" (p. 294). Kolb's (1984)

theory of experiential learning can explain why Benner sees the need to define experience in the context of theoretical knowledge.

### ***Kolb's Theory of Experiential Learning***

Kolb (1984) describes a process of learning through experience that begins with the learner having an experience. The learner makes that experience meaningful by reflecting on it. The meaning the learner gleans from the experience through reflection is then conceptualized and incorporated into existing cognitive frameworks. This expanded knowledge (cognitive framework) is then applied to a new situation where experience again is gained, reflected upon, conceptualized and incorporated into the knowledge base. In this sense, "The learner learns both through and from the experience: through the experience by doing and from the experience by reflection" (Dillon, 2002, p 28). It becomes apparent then, that the transformation from novice to expert nurse occurs when experience is incorporated into existing knowledge patterns through a process of active reflection and conceptualization of experience.

Sewchuck (2005) explains how experiential learning theory also takes into account four different learning styles. *Accommodating* learners learn from experience and internalize learning through active experimentation. *Diverging* learners also learn best from experience, but they internalize the knowledge by reflecting on the experience. *Converging* learners learn from abstract ideas and internalize the abstract ideas by experimentation. *Assimilating* learners learn from abstract ideas and internalize those ideas through reflection. Kolb (1984) categorized nursing as a profession that attracts diverging learners.

In examining simulation in nursing education, one could use Benner's (1984) model to determine what is, should, or could be taught using a particular simulation. Kolb's (1984) theory of experiential learning could help determine how simulation can accomplish learning goals.

### ***Application of Benner's and Kolb's Models to Simulation Education in Nursing***

There is some agreement that upon entry into the nursing profession, nurses should be educationally prepared to work at least at the advanced beginner, or second level, and possibly at the competent, or third, level (Griggs, 2002; Rhodes & Curran, 2005). The progression of simulation experiences in nursing education, therefore, could be guided by the first three levels of Benner's (1984) model. Although referred to as a model of skill acquisition, the model appears to be focused particularly on assessment skills. When moving from novice to expert,

the learner shifts from assessing individual pieces of a situation to expertly assessing the situation as a whole and making decisions based on that assessment. Benner's work is less clear on how expert assessment is converted into expert decisions. Simulations allow students to improve assessment skills and see the consequences of decisions.

Applying Benner's (1984) model to simulation experiences may also seem counter-intuitive to one of Benner's main contentions, namely, that it is only through real experience that nurses can develop expertise. Certainly, existing simulators are not sophisticated enough to exhibit the seemingly insignificant changes expert nurses perceive and incorporate into their decisions. Also, full scale simulations will likely not reach the level of complexity that expert nurses are able to take in and act on. Even if students were exposed to unlimited time with simulators, limitations in portraying subtle reality will not provide the 'real' experience.

However, at the novice and advanced beginner levels, simulators can play an important role in skill acquisition, both in decreasing anxiety and in increasing exposure to 'abnormal' or 'unusual' experiences that nursing students may otherwise not be exposed to. These experiences can be used to 'refine' knowledge, as described by Benner (1984).

In the movement from the advanced beginner to the competent level, Benner, et al., (1992) note that this change is often preceded by a challenge to the advanced beginner's confidence due to clinical situations that did not turn out as planned. Simulations can provide excellent experiences, both planned and spontaneous, for advanced beginners to be immersed in the consequences of flawed decisions, without causing patient harm. These simulated experiences may, therefore, be helpful for advanced beginners to start making the transition to the competent level.

**Simulation at the novice level.** If the use of task and skill trainers is planned according to Benner's (1984) model, novices, operating at the first level of skill acquisition, would benefit most if these trainers were used in combination with practice on fellow students. Learning situations for novice learners should be simple and straightforward so that attention can be given to details of the situation. When developing basic assessment skills such as measuring vital signs or assessing chest and bowel sounds, assessment could start with fellow students. 'Practicing' on fellow students learners also overcome some of the anxiety students experience when communicating with real patients (Goldenberg, Andrusyszyn & Iwasiw, 2005).

Introduction of medium-fidelity human patient simulators could be used to expose students to abnormal findings, such as abnormal chest or bowel sounds, or uneven/weak/thready pulses. Experiential learning theory would suggest that exposure to the abnormal findings is most helpful for student learning if it occurred within context (i.e., if the simulated patient had a specific diagnosis or health history).

For simulation to be a positive learning experience, novices need the opportunity to discuss their findings, and anchor their experiences to the cognitive frameworks they already possess. For example, in assessing fellow students, novices develop an understanding of the variation of normal vital signs. In tying the abnormal signs to the presented health history, they adapt and change their cognitive framework related to the diagnosis or health history provided in the simulation. As Medley and Horne (2005) point out "...the debriefing seminar is essential and must not be omitted because most of the learning occurs at this time" (p. 32). While debriefing, knowledge of Benner's (1984) model may remind nurse educators that novices may appear detached from learning situations. This detachment is likely part of being a novice and should not be interpreted as apathy or negligence (Downey, 1993).

**Simulation at the advanced beginner level.** At the advanced beginner or second level of skill acquisition, Benner (1984) noticed that learners start applying protocols to guide their actions. Simulations at this stage can include the high-fidelity human patient simulators that have the ability to show the consequences of actions. Simulations could be set up where students assess pain and decide on the amount, type, and route of pain medication; blood products can be administered; situations can be set up where the patient's status changes and action is required. Advanced beginners can use algorithms and protocols to guide their actions and simulators can show the consequences of those actions.

Since advanced beginners are focused on the present patient situation, simulations can either be interrupted to discuss assessments and decisions on the spot, or this debriefing can occur afterwards. Videotaping sessions helps ensure the scenario is remembered accurately and guides the discussion for post-simulation debriefing. Group debriefing allows students to review and discuss their own and their peer's performance. A positive atmosphere facilitates student learning (Johnson, Zerwic & Theis, 1999).

Some students may want to repeat a particular scenario several times. The divergent learner may be able to transform experience into knowledge by reflecting on and discussing the simulation experience, but accommodating

learners may prefer to experiment with the simulated scenarios. At the advanced beginner level, simulators provide opportunities for accommodating (Kolb, 1984) learners that real life patients should not be expected to provide.

**Simulation at the competent level.** Benner (1984) describes the competent or third level as a level where the nurse starts to see the limits of protocols and algorithms in terms of individual case details. It is difficult to exemplify those individual details with a generic patient simulator, no matter how sophisticated. However, nurses performing at the level of competency "... have a feeling of mastery and the ability to cope with and manage the many contingencies of clinical nursing" (p. 27). These 'contingencies of clinical nursing' can be simulated by using a human patient simulator, in combination with a variety of actor patients, family members, co-workers, physicians, and other aspects that make a simulation experience complex. Complex full-scale simulations require time and effort, but they are worth the effort to make simulations realistic and add value as learning opportunities (Mole & McLafferty, 2004; Rauen, 2004). Complex simulations may be most helpful for divergent (Kolb, 1984) learners, as the time and effort in creating them may be a limiting factor in repeating them for the accommodating learner.

In complex full-scale simulations, interruptions to discuss decisions and situations are likely to interrupt the scenario. Videotaping these sessions would be preferred for debriefing purposes. The debriefing process is particularly important when the simulation is complex and students may experience the situation as "... one blooming, buzzing confusion" (Thiagarajan, 1998, p. 40). For learning to take place, students need to be able to go through the process of reflection and conceptualization to adapt and reconstruct their cognitive frameworks. Thiagarajan suggests creating a structured debriefing process that touches on certain steps. For example, allowing students to vent their emotions will promote more objective reflection; sharing insights will provide generalizations for discussion; hypothesis generation can create principles for further exploration; 'what-if' questions facilitate expansion of principles. All of these steps in the structured debriefing process aid in creating meaning for students and making the simulation a learning experience. To enhance learning further, Carlson, Crawford & Contrades (2005) encouraged students to describe their practical learning experiences and use Benner's (1984) model to assess their level of proficiency. Self-assessments help clarify to students where they are in the development of nursing skills. With the help of an experienced nurse, the debriefing session can be used to discuss the self-assessments in the context of expert nursing practice, and help students' understandings of what they are striving for.

## CONCLUSION

Nursing students are expected to be able to engage in competent and safe practice when they graduate and join the work force. In order to provide that quality of care, they need to be able to apply the knowledge they gained in their programs. Nursing educators agree that simulations can expose students to a variety of practical learning situations that can foster the development of knowledge and skills. So far, however, the approach to using simulations does not consistently fit within a specific framework, nursing or otherwise. Benner's (1984) model of skill acquisition and Kolb's experiential learning model could provide theoretical scaffolds for building the progression of simulation experiences most helpful in the development of students' nursing knowledge. Using such models is important for ensuring that students' experiences reflect the appropriate sequence of developing nursing knowledge. At the very least using Benner's and Kolb's models, as described in this paper, could be seen as the start of an attempt to theoretically ground the development and use of simulations in nursing education.

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