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Systematic Review of Nursing Simulation Literature for Use of Learning Theory

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Abstract

The purpose of this systematic analysis of nursing simulation literature between 2000 –2007 was to determine how learning theory was used to design and assess learning that occurs in simulations. Out of the 120 articles in which designing nursing simulations was reported, 16 referenced learning or developmental theory as the basis of how and why they set up the simulation. Of the 16 articles that used a learning type of foundation, only two considered learning as a cognitive task. More research is needed that investigates the efficacy of simulation for improving student learning. The study concludes that most nursing faculty approach simulation from a teaching paradigm rather than a learning paradigm. For simulation to foster student learning there must be a fundamental shift from a teaching paradigm to a learning paradigm and a foundational learning theory to design and evaluate simulation should be used. Examples of how to match simulation with learning theory are included.

KEYWORDS: nursing simulation, learning theory

Nurse educators are familiar with students who perform well in the clinical setting but who have difficulty passing the didactic portion of the class. Even more frustrating are the students who perform well in class but have serious difficulty applying their learning in the clinical setting. These situations raise a critical question about the relationship between clinical teaching and student learning. Why are bright capable students struggling to apply classroom learning to the clinical setting?

Simulation is purported as *the* vehicle for translating classroom knowledge into a safe learning environment (Leigh, 2008). The nurse educator literature supports the use of simulation for helping students feel more confident in performing clinical work (Leigh). However, self-confidence and self-efficacy are only part of the learning picture. Other aspects of learning include conceptual knowledge and skill development. Simulation is a "teaching strategy" that is used to facilitate making "connections between and among concepts and [that] engage(s) students in the learning process" (Jeffries, 2005, p. 99). Thus, it appears simulation is used for either teaching or learning.

A systematic review of nursing simulation literature was completed to achieve two purposes, the first of which was to determine if nurse educators view simulation as a teaching modality or as a way to design learning opportunities for nursing students. The second was to determine how learning was used to design simulation. The operational definitions used in this paper were as follows:

- *Teaching* is what the educator provides the student in terms of goals, methods, objectives, and outcomes.
- *Learning* refers to the processes by which the student changes skills, knowledge, and dispositions through a planned experience.

The review dates for this systematic analysis of nursing simulation literature were 2000-2007. The search strategy covered four literature databases: Medline, CINHAL, Pre-CINHAL, and Healthsource, using the following search words: *nursing* + *simulation*, *nursing* + *learning theory* + *simulation*, *nursing* + *teaching* + *simulation*. Hand-searching, Internet searches, and attention to 'gray literature' were also used. In the initial search, 650 articles were identified.

These 650 articles were further screened using the following two criteria: (1) nursing simulations only and (2) English language. These criteria reduced the initial pool of 650 articles to 120 articles.

A third set of criteria were used to review these 120 nursing simulation articles as follow:

1. The article described a simulation. Since "simulation" teaching and learning was the focus, the authors expected each article to report something about conducting and designing a nursing simulation.
2. The article described either a teaching or learning purpose in the development or analysis of the simulation and satisfied the following assumptions.
   - If *learning* was critical to the purpose of creating the simulation, then a learning theory would be used as a foundational element in the design of the simulation.
   - If *teaching* was the purpose of the simulation, then teaching was the focus for the goals, objectives, and outcomes.

Of the 120 nursing simulation articles, 104 articles did not reference or mention a learning theory in the simulation design or assessment of student learning, while 94 discussed using simulation as a teaching method or strategy. Therefore, according to this systematic review of the nursing literature, simulation is primarily being used as a teaching modality.

The 16 remaining articles were further analyzed to determine how learning was used to design simulation. An evidence table that depicts the 16 articles according to authors and publication date, purpose of simulation, evaluation methods, learning theory, findings, and how learning theory supported simulation design follows.

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Table
Evidence Table of Articles

Authors	**Purpose of simulation**	**Evaluation Method**	**Foundational Learning Theory**	**Findings of Student Learning**	**Did Learning Theory Support Simulation Purpose?**
Aliner, G, Hunt, W., & Gordon, R. (2004)	Used an experimental design to study simulation as educational tool.	Student confidence questionnaire Identical pre- and post- OSCE used as a summative assessment and to compare the two groups on competence Subjects: 120 nursing students	Experimental situated learning (Kolb, 1993,2007) Situated learning (Lave & Wenger, 1991)	Students from the experimental group improved OSCE scores by 6.7% over the control group.	Learning theories not used in the simulation design; student outcomes were based on theoretical constructs of experiential/ situated learning.
Campbell, M., Themessl-Huber, M., Mole, L., & Scarlett, V. (2007).	Designed a 3-hour simulation session as a teaching strategy to challenge students' beliefs and values.	Gave students feedback; students completed a workbook. Measured student self-efficacy. Subjects: not reported	Adult learning theory (Knowles, 1980,1990) Change theory (Lewin, 1951,1997)	None reported.	Learners' needs not predetermined; therefore, learning theory did not lead simulation design. Students' beliefs were assessed.

Table (continued)

Authors	Purpose of simulation	Evaluation Method	Foundational Learning Theory	Findings of Student Learning	Did Learning Theory Support Simulation Purpose?
Edward, K., Hercelinskyj, J., Warelow, P., & Munro I. (2006).	Students participated in six simulations, each representing a major mental health illness, prior to being in their clinical practicum. The stated purpose was to improve skill mastery.	Faculty reports. Subjects: not reported	Confidence/self efficacy theory based on Dewey by Radwin, 1998. Experiential learning Kolb learning theory (Kolb, 1993, 2007).	None reported.	To design a simulation based on Kolb's learning theory, students' skills need to be determined prior to simulation. As there was no pretest of student's skills, Kolb was not used to design the simulation. However, students' knowledge of their experiences during the simulation, matches Radwin's self efficacy beliefs.
Effken, J. A., & Doyle, M. (2001).	Used simulation to determine how cognitive style interacts with computer interface design to affect the user's abilities to learn to use a computer simulation.	Looked at student responses Matched user preference to task. Mixed analysis of variance. Subjects: 18 nursing students.	Multiple cognitive style theorists (e.g. Pask & Scott, 1972; Biggs, 1987)	None reported.	Multiple taxonomies used to define cognitive preference. Only visualize group met the simulation design.

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Table (continued)

Authors	Purpose of simulation	Evaluation Method	Foundational Learning Theory	Findings of Student Learning	Did Learning Theory Support Simulation Purpose?
Feingold, C., Calaluce, M., & Kallen, M. A. (2004).	Investigated student and faculty perceptions of a computerized universal patient simulator.	Student perceptions. Faculty perceptions Subjects: 65 students and 3 faculty.	Adult learning theory (Knowles, 1980, 1990)	None reported.	Knowles adult learning theory guided simulation design and assessment.
Goldenberg, D., Andrusyszyn, M.A., & Iwasiw, C. (2005).	Descriptive study that investigated self- efficacy of students in performing health teaching.	Students participated in role-playing. Developed own self-efficacy measurement tool. Subjects: 66 nursing students.	Self efficacy theory (Bandura, 1995, 2006)	None reported.	Purpose of simulation was teaching. Student recall of self-efficacy and splinter skills of affective behavior were measured, thus, the purpose and measurement did not match. Bandura says if the students feel more confident, their performance will improve. Recall did not measure whether perceived confidence matched performance.

Table (continued)

Authors	Purpose of simulation	Evaluation Method	Foundational Learning Theory	Findings of Student Learning	Did Learning Theory Support Simulation Purpose?
Goolsby. M. J., (2001).	Qualitative study to look at how nurse practitioner students solve computer-assisted simulations.	Student interviews. Observation of students. Subjects: 8 FNP students.	Direct learning from the ecological psychology perspective (Barker, 1968)	None reported.	The purpose, outcomes, and evaluation methods match the ecological psychology perspective.
Lasater, K. (2007a).	Qualitative study about student reports of high-fidelity simulation use and debriefing on their learning.	Focus group with predetermined questions and prompts. Subjects: 24 nursing students.	Reflective thinking and feedback (Brookfield, 1990)	None reported.	The purpose, outcomes, and methods match.
Lasater, K. (2007b)	Used simulation to develop a clinical judgment rubric that delineates levels of student performance using Tanner's (2006) Clinical Judgment model.	Qualitative scoring based Lasater's Clinical Judgment Rubric. Qualitative scoring of experience. Quantitative scoring of performance. Subjects: 39 nursing students.	Novice to expert performance model (Benner, 1984) Reflection is the catalyst for clinical learning (Tanner, 2006; Dewey, as cited in Radwin, 1998)	None reported.	Benner's performance model was used in the design and evaluation methods. Reflection was the learning philosophy.

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Table (continued)

Authors	Purpose of simulation	Evaluation Method	Foundational Learning Theory	Findings of Student Learning	Did Learning Theory Support Simulation Purpose?
Larew, C., Lessans, S., Spunt D., Foster, D., & Covington, B. (2006).	Developed a non-graded simulation to enhance students' learning of management and collaboration skills with postoperative patient problems.	Analysis of video tapes. Subjects: 190 nursing students.	Novice to expert performance development (Benner, 1984)	None reported.	Used introspection of expert nurse to determine patient prompts from vague to specific. Benner's philosophy was used to design simulation prompts but not used to evaluate student learning.
Lathrop, A, Winningham, B & VandeVusse, L. (2007).	Designed a simulation to provide nurse midwives the opportunity to experience clinical practice in emergency situations.	Pre- and post-tests of students' beliefs. Open-ended student feedback. Subjects: 4 nursing students.	Constructivist learning approach (Fosnot, 2005; Driscoll, 2005)	None reported.	Constructivism used to design the simulation. However, it was not used in the assessment of student learning because students were not measured on whether the simulation changed their cognitive levels of understanding.

Table (continued)

Authors	Purpose of simulation	Evaluation Method	Foundational Learning Theory	Findings of Student Learning	Did Learning Theory Support Simulation Purpose?
Reilly, A., & Spratt, C. (2007).	Designed a high-fidelity simulation to assess students' perceptions of simulation as a teaching and learning strategy.	Focus group interviews with students and faculty to measure beliefs. Subjects: 20 nursing students.	Constructivist learning theory. Learning through reflection (Oliffe, 2002)	None reported.	Constructivist philosophy used for designing the simulation but not the evaluation of student learning.
Rhodes, M L., & Curran, C. (2005).	Designed a simulation with the goal of improving students' critical thinking and clinical judgment skills.	A 13-item survey developed by the nursing faculty given post-simulation to measure student satisfaction. Subjects: 21 nursing students and 2 nursing faculty.	Novice to expert performance based philosophy (Benner, 1984) Self-efficacy (Bandura, 1995,2006)	None reported.	Did not use Benner for evaluation. Bandura used as basis for measuring whether students liked the simulation process. They did not evaluate their purpose, which was to improve students' critical thinking and clinical judgment skills.

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Table (continued)

Authors	Purpose of simulation	Evaluation Method	Foundational Learning Theory	Findings of Student Learning	Did Learning Theory Support Simulation Purpose?
Schoening, A., Sittner, B, & Todd, M., (2006).	Non-experimental pilot evaluation study to identify and refine simulation learning activities, learning objectives, and student perceptions of the experience.	Developed own evaluation tool. Scored self-efficacy. Reflections journals. Subjects: 60 nursing students.	Self -efficacy models (Madorin & Iwasiw, 1999)	None reported.	Self-efficacy models were used to design and evaluate simulation. Data were collected on student perceptions of their ability to meet simulation objectives.
Wayman, K., Yeager, K., Sharek, P J., Trotter, S., Wise, L., Flora, JA., Halamek, LP. (2007).	Created a simulation to teach students how to communicate information about adverse events to family members. The situation developed addressed disclosure of medication errors.	Pre and post intervention Quasi-experimental design. Subjects opinion of authenticity of study to evoke "true verbal and non verbal skills" Subjects: 16 pediatric oncology nurses	Self efficacy – Bandura (1995, 2006).	None reported.	Pre and post test design was used that matches Bandura self-efficacy.

Table (continued)

Authors	Purpose of simulation	Evaluation Method	Foundational Learning Theory	Findings of Student Learning	Did Learning Theory Support Simulation Purpose?
Wong, T. & Chung, J. (2002)	Explored diagnostic reasoning process among nursing students with different learning environments.	Case study. Biggs study process questionnaire. Pattern of study approaches. Subjects: 20 nursing students	Information processing (Biggs,1987) Limited rationality Decision-making	Examined cognitive learning that occurs in a simulation.	Information processing, limited rationality, and decision-making used in simulation design and assessment strategies to evaluate thinking and not just skill development.

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DISCUSSION

The first purpose of conducting a systematic review of the nurse simulation literature was to determine if nurse educators were viewing simulation as a teaching modality or as a way to design learning opportunities for nursing students. Out of the 120 nursing simulation articles found, the use of simulation as a teaching method or strategy was discussed in 94 articles. Simulation is thus a widespread method of teaching.

The second purpose of the systematic review of the nursing simulation literature was to determine how learning theory was used to design simulations. Of the 16 articles that used learning as a purpose for designing simulation, only Lasater (2007b) and Wong and Chung (2002) considered learning as a cognitive task.

Lasater (2007a) suggested that the affective domain of learning is central in the debriefing process of simulation. She acknowledged that learning that occurs during an experience is highly subjective. She noted that the creation of an assessment rubric, allows for a connection between student and teacher that measures both difficult and complex tasks (2007b). Lasater's Clinical Assessment Rubric is based on an *Understanding by Design* (Wiggins & McTighe, 2005) approach that describes conceptual levels of what the students in simulation need to know rather than just looking at psychomotor performance and inferring understanding from watching the students' actions. In this way, Lasater uses a model of critical thinking as an attempt to capture the cognitive basis for what the student performs. Her rubric measures the same objectives across four dimensions of understanding; therefore, she is able to identify different levels of student performance. These different levels are tied to measurements of clinical judgment, not levels of cognitive learning. By creating a rubric, Lasater took the process of learning and turned it into a developmental hierarchy of performance, which supports using simulation as an evaluation tool. Lasater advocated that simulation be seen not just as a teaching method but as an evaluation of what the student does in a situation, at different levels of performance. She suggested that if this type of tool is usable, then it may also be used in the clinical setting, thereby bridging the evaluation of the student's performance in simulation with the student's performance in the actual setting.

Wong and Chung (2002) explored the reasoning process (cognitive learning) of nursing students in different learning environments (social development). They examined whether differences in social environments would affect the students' cognitive reasoning. This type of relationship between social

and cognitive development parallels modern social constructivist theories (Jeffries, 2008). Like Lasater, Wong and Chung are using simulation for more than perception, beliefs, and measurement of skills; they are examining the cognitive learning that occurs while participating in a simulation.

One of the major assumptions of this systematic review of the nursing simulation literature was that simulations would focus on learning, whether that is learning that occurs while participating in a simulation or as a result of using simulation as an evaluation. However, the majority of the simulation studies in this review did not consider student learning as cognitive and social processes that occur through a planned experience. Instead, suggested by this literature is that nursing faculty execute simulation from a teaching paradigm rather than a learning paradigm. The two exceptions, as noted above, were Lasater (2007b) and Wong and Chung (2002), who explored student cognitive changes as a result of participating in the simulation.

IMPLICATIONS FOR NURSING EDUCATION

Through this systematic review of the nursing simulation literature, it is suggested that simulation is most commonly used as a teaching modality. Therefore, simulation is a planned experience that provides specific goals, methods, and objectives for teaching outcomes. The application of learning theory to guide the design of nursing simulations may increase learning-centered opportunities for students to gain skills, knowledge, and disposition. If learning is the goal of simulation, then the learning processes need to be made explicit to guide parallel simulation activities. A discussion follows to demonstrate how definitions of learning may affect simulation design.

Social Learning Theory

The learning theorist most often referenced in this literature review was Bandura (1965; 1995), a social change theorist, who posited that self-efficacy or social change occurs through modeling and reinforcement learning (Bandura, 2006). Using this type of learning theory, the educator designs a simulation to teach a skill, pattern, or role play, and then designs additional simulations where the target behavior is reinforced. Using Bandura as a foundational theorist for planning and designing simulation focuses the effort on tenets of behaviorism and operant conditioning. The simulation would provide planned stimuli organized in a way so as to give the participant the opportunity to respond. Cognitive problem-solving separate from the operants (reinforcers, rewards, implicit or explicit punishers) of a modeling situation are not part of this theory.

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Critiquing students' responses would focus on reinforcing teaching of skills, not learning of concepts. If a nurse educator wants students to change in terms of their knowledge, values, attitudes, or beliefs, then the basis for simulations should be on the learners' changes in conceptualization of knowledge, values, attitudes, and beliefs, not on behaviors related to reinforcement of *skills*. From a design perspective, lessons based on Bandura (2006) and other experiential model learning theorists consider how to design a simulation as a good teaching strategy, not on student learning. The underlying assumption is that teaching and learning are reciprocal. However, nurse education falls short when we equate teaching with learning.

Nurse educators who use Bandura (2006) as a basis for planning and designing their simulation would need to clinically program the transfer and generalization of all taught behaviors across multiple settings, if they wanted their outcomes regarding skills to cover a broad spectrum of authentic clinical possibilities. The cost of this type of simulation model would be very expensive and is perhaps not feasible.

Furthermore, using the simulation experience or situation as a model stimulus for learning follows the tenets of behaviorism (e.g., Bandura, 1965; Bijou, Etzel, LeBlanc, & Baer, 1977; Skinner, 1978). In other words, using the simulation as a model for measuring clinical skills and a students' confidence in the situation actually measures whether the teacher provided students with what the programmer expected. This type of simulation is dependent on whether students can positively respond to the stimuli and therefore receive positive feedback. If students are able to positively respond to stimuli, then they should show an increase in self-efficacy. Basically, it is through simulation that tasks are taught. The risk might be that the teaching is focused on a lower level of cognitive process and not students' ability to critically think.

In addition, cognitive understanding of the programmed simulation task is not measured, but performance of the task is measured. For example, the student raises the head of the bed at the right time as a response to specific stimuli. The student receives a positive check and possible positive feedback for being correct; however, this type of simulation set-up and response or assessment does not determine if the student knows *why* he or she raised the head of the bed. In fact, it is possible that the student raised the head of the bed for the wrong reasons.

Experiential Learning Theory

Slightly removed from the behaviorist approach of modeling skills discussed above is Kolb's experiential learning paradigm (Kolb & Fry, 1975). Kolb has produced a plethora of adult learning tools such as the Kolb Learning Style Inventory (1993) and the Kolb Adaptive Style Inventory (2007). Kolb's works support the purpose of designing simulation to match a student's needs and preferences for learning. Learning style categories were developed based strictly on observations of what people were doing while learning was assumed to be taking place. For example, some people move around all the time or fidget while paying attention (assumed learning taking place); therefore, they were assigned to the kinesthetic learner style.

For a simulation to be based on student learning styles from Kolb's learning paradigm, there would need to be a pretest to determine what students know about their learning preferences. A simulation designed using Kolb's experiential learning theory would assess students' styles and preferences first. Then students would be assigned to participate in a simulation activity that matches their learning style. The effectiveness of the simulation would be determined by how well the students felt the simulation matched their learning style.

Teaching to what the student prefers provides for a positive social learning environment and a positive student experience, but it does not necessarily challenge the student's thinking. For example, students may be reporting nothing more than that they really like participating in the simulation.

Lave and Wenger (1991) expanded the experiential learning approaches by looking at the social/situational orientation to learning; however, their method is similar in tenets to the behaviorist approach to learning. Lave and Wenger suggested that participation in social structures provides a learner with acquisition of social knowledge. A simulation based on social modeling would expect the outcomes to consider whether the student learned from the model. The whole simulation would be designed to parallel a community of learners. Again, a community of learning would look at social outcomes and affective development, but not at the cognitive change of knowledge or conceptualization. Granted, positive affective learning situations provide students with more positive and sometimes greater learning of skills. However, emphasis is on social outcomes and not cognition.

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Adult Learning Theory

Knowles (1980, 1990) built on the behaviorists' principles of reinforcement, generalization, and transference based on the assessment of what adults believe that they are like or need for learning to occur. From research with adult learners, for example, two identifiable characteristics of adult learners are self-direction and motivation. A simulation designed using Knowles Adult Learning Theory would expect students to set self-directed learning goals. The outcomes are pre-determined by the students' said goals. In this way, the adult students are motivated to succeed. Examining how adults expect their learning to occur fits nicely with Lewin's Change Theory (1997). As a foundation for simulation, students' motivations, thinking preferences or styles, and approaches would first be measured and then matched to the simulation design. The goal would be to create a simulation that could provide information to the change agent (student) from where the student begins. The assumption is that if students are engaged in a learning activity that matches their styles as adult learners as well as their goals and desires, then they will perform better. Therefore, nurse educators who use Knowles and Lewin as the basis for their simulation development and assessment need to use a learner pre-assessment .

Social Construct Theory, also Known as Constructivism

Some of the simulation studies considered the component of "doing as learning." Radwin (1998) used the philosophy of John Dewey suggesting that genuine knowledge is the off-spring of doing (not thinking). Radwin (1998) reported that the efficacy of the simulation task depends on whether the students believed that the task helped them to learn. The assumption is that the students know what they need to learn as well as what they already know or don't know. Therefore, the philosophy of constructivism (Fosnot, 2005) is highly pertinent to the feedback role that the nurse educator might use in a simulation model. Student learners construct their meaning as well as receive feedback on how they are performing in the simulation. For example, students participate in a simulation and receive immediate feedback which the students are expected to use to construct new learning for participating in additional simulations. Of the articles reviewed, Lasater (2007b), Reilly and Spratt (2007), and Lathrop et al. (2007) used a constructivist approach in the simulation design.

Cognitive Styles

Pask and Scott (1972) studied how different learning approaches, or what they called *cognitive styles*, influence information processing. A simulation model

based on cognitive styles, such as those suggested by Pask and Scott, would be designed to match students' individual cognitive styles. A simulation designed from a holistic point of view would use a serialist approach or sequence of small pieces. Students would participate in multiple simulations, each of which would provide a piece of the overall learning, such as teaching students to perform an integrated or head-to-toe assessment. The assumption would be that the simulation is designed to match the cognitive way the student learns concepts. Cognitive styles are taxonomies that may or may not be exact because the categories are determined by students' self-reports of their cognitive learning style. Beliefs are judgments, evaluations, and interpretations of what students like, feel, believe, or think about something; however, beliefs do not measure what students *know* conceptually.

Reflective Practice

Schon (1983) looked at reflective practicing as a thoughtful self-regulated process. To use Schon in the design of the simulation, the reflective practice must increase in cognitive complexity parallel to the increase in simulation complexity in order to measure the increases in student conceptual learning. For example, students are required to video-tape themselves while performing a skill or assessment. Then they are to review the tape to determine if they included all the steps of the task. The students redo the task until they complete it correctly. The students turn in the video tape, which is reviewed with the teacher for a grade.

Performance-based Models

Benner (1984) captured a philosophy of learning that uses the tenets of information processing for explaining different levels of a nurse's actions. The assumption is that the majority of students' actions will match the expected performance level, as described by Benner. These levels of performance (novice, advanced beginner, competent, proficient, and expert) are based on an introspection methodology. Introspection methodology, as used by Benner, asks expert nurses to do a task analysis or explain everything they remember they did and why they did that action through reflective practicing. A simulation designed on a problem-based model uses a graded hierarchy of performance activities, such as the assessment rubric by Lasater (2007b). This investigative method results in a graded hierarchy of performance actions; however, it is crucial to note that these levels do not reflect cognitive developmental progression.

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CONCLUSION

This systematic review of the nursing simulation literature, between 2000 and 2007, shows that simulation is considered more often as a teaching model rather than a learning model. Most of these studies approached the complexity of practice as the acquisition of skills taught through "doing." Two of the studies considered learning from a social/affective and cognitive perspective. However, none of the studies used research about how the brain acquires or learns concepts. Even when student thinking was considered, students' preferences, beliefs, or perceptions of beliefs, which are all components of self-efficacy, not conceptual learning, were measured

Faculty who are involved in the development of simulations may benefit by initially reflecting on the purpose of the simulation. Is the focus of the simulation on teaching or learning? If the focus is on teaching, simulations which evaluate mastery or performance of modeled or taught skills through performance criteria are suitable as the foundational element of design. However, especially for novice students, the evaluation of performance in a cross-section of problem-solving experiences from a longitudinal set of skill-based experiences may not be the most ideal approach for learning. Simulations focused on student-centered learning may benefit from social construct theories (constructivism) or neurobiological language learning theories (Arwood, 1991) to guide the design.

Learning-based simulations provide opportunity to enhance higher-order thinking and critical problem-solving while supporting the assessment of conceptual learning. Conceptual learning provides the nurse educator with the opportunity to recognize and evaluate what knowledge level a student possesses. For example, during a simulation that assesses the nursing care of a patient experiencing hypovolemic shock, a student may lower the head of the bed, put the patient on oxygen, and retake vital signs which are all appropriate nursing actions. The student could have taken these actions based on understanding the rules or because the student knows the underlying concepts of the physiological processes. However, assessing why the student took these actions necessitates a learning approach to concept development. In this way, simulation can be used for conceptual learning as well as the teaching of psychomotor tasks or the evaluation of self efficacy.

More research is needed that investigates the efficacy of simulation for improving conceptual student learning. One conclusion of this study is that most nursing faculty approach simulation from a teaching paradigm that includes goals, objectives, methods, and student outcomes. For simulation to foster learning as a

set of social and cognitive processes, there needs to be research on how to shift simulation design from a teaching to a learning paradigm.

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