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Using Case Study to Examine Simulation in a Problem-based Course

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Cover Page Footnote

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Background

In health care professions such as nursing, students acquire knowledge and expertise to provide professional care to patients and families in a variety of health care contexts. During formal nursing education at the baccalaureate level, students integrate a theoretical foundation in nursing and health sciences with concurrent professional practice experiences in a variety of settings. The balance of both theoretical and practice components of learning varies depending on the philosophical beliefs and educational values within nursing curricula at each university (Pierazzo, 2014).

The professional practice component of baccalaureate nursing education commonly occurs outside of theoretical class time. In the last decade, the use of simulation-based technology to support professional practice and strengthen student learning has evolved, with greater attention to the educational process and the development of clinical reasoning. As a result, nursing educators are encouraged to carefully examine teaching approaches to ensure students are able to fully grasp theoretical concepts and apply them to the care of patients and families. In this study, the perceptions of baccalaureate nursing students using high-fidelity simulation (HFS) during a theoretical problem-based course were explored. The researchers were interested in understanding if the coupling of two active learning approaches would assist students in better integrating theoretical knowledge and practice.

Literature Review

Problem-based learning

Since the late 1960s, problem-based learning (PBL) has been used within health science education with a foundation at McMaster University in Ontario, Canada (Barrett, 2005; Neufeld & Barrows, 1974; Rideout, 2001; Woods, 1996). It has been described as an active teaching and learning methodology within a constructivist paradigm whereby students acquire knowledge through a discussion of real-world patient scenarios. Within this process, the teacher fosters a climate for inquiry and problem-solving. Generally, the process begins with a patient care scenario, followed by the generation of hypotheses and learning issues, the gathering of information from a variety of resources to address learning gaps, and the application and reflection of knowledge and group process (Rideout, 2001).

Currently, in the Canadian nursing program discussed here, PBL is the platform for learning in all theoretical nursing courses. Nursing students are introduced to a number of patient care scenarios across the four years of their program. Traditionally, standardized patients (individuals trained to simulate a patient scenario) have been used as learning enhancements during group discussion. In the second year of the program, students discuss care scenarios whereby patients display more acute clinical symptoms, requiring a greater understanding of care and an advanced knowledge for clinical reasoning. Unfortunately, the use of standardized patients for these acute situations has not been effective. More importantly, there is often a mismatch between the acute clinical situation and the physiological realism of the standardized patient. As a result, it was important to consider an alternative approach to the learning enhancement. In this study, a human-like manikin was introduced in a high-fidelity simulation activity as a substitute for the standardized patient.

Simulation-based learning and problem-based learning

In the literature, there is evidence supporting the use of active forms of learning in nursing education, such as simulation-based learning and PBL. Both approaches are described as being linked to principles of constructivism and collaborative learning (Roh, Kim, & Kim, 2014), although they may occur in parallel or coupled with a patient scenario. This blending of learning approaches has been variable in the evidence. Nevin, Neill, and Mulkerrins (2014) introduced acute simulation scenarios to nursing students using PBL methodology. This approach enabled students to develop critical thinking skills, integrate theory and practice, and critically reflect on performance as an individual and as a team. In a study by Walshe, O'Brien, Murphy, and Hartigan (2013), increasingly complex simulations were integrated into PBL, requiring students to build upon prior learning. In this study, students demonstrated increased competency in the domains of patient assessment, clinical decision-making, technical skills and communication. Similarly, Murphy, Hartigan, Walshe, Flynn, and O'Brien (2011) also found positive outcomes in problem-solving, critical thinking, and teamwork when both forms of learning were blended. Finally, Christiansen, Boje, and Frederiksen (2015) conducted a qualitative study with a small sample of six students. The students in this study perceived the use of simulation-based learning and PBL to be meaningful in terms of creating links between theory and practice; furthermore, the role of the facilitator and the peer team were important in enhancing student engagement in the learning experience.

Additional studies offered insight in relation to preparation for clinical practice. Roh, Kim, and Kim's (2015) study found students viewed the integration of PBL and simulation in a circolo-respiratory course to be positive, reinforcing interactive learning within a realistic clinical context. Liaw et al.'s (2009) study of the use of high-fidelity simulation in a first year theoretical PBL course found that students who engaged in both forms of active learning demonstrated better clinical performance in managing a patient with acute chest pain and respiratory distress when compared to students who only participated in a theoretical PBL course. This later study provides a comparison between groups of learners with and without simulation exposure with a focus on clinical performance. In the proposed study, students' perceptions of learning when simulation is coupled with a PBL scenario will be explored from both a clinical and theoretical perspective.

Coupling Learning Strategies

In this qualitative study, a team of nursing educators with expertise in PBL and simulation explored students' perceptions of learning when two active learning approaches were coupled in a theoretical nursing course. This coupling occurred within a second-year PBL course during group discussions of two acute care scenarios. The first scenario was a patient with chronic obstructive pulmonary disease (COPD) who experienced an exacerbation of respiratory symptoms. The second scenario was a patient who presented with delirium, secondary to a urinary tract infection.

In class, students began the PBL process with an initial discussion of the care scenario in a small group. In this discussion, learners reviewed prior learning and identified relevant hypotheses and learning gaps to guide their independent and interdependent research. Once the students discussed the research, the patient in the care scenario was introduced in a HFS activity. The students were able to interact with the patient and practice components of what had been discussed in class, including health assessment and symptom management. Each simulation

activity was videotaped and lasted 20 minutes followed by a debriefing session that linked learning back to the PBL discussion in class. It was hypothesized that the HFS activity would provide a better context for applying theoretical knowledge to practice.

Method

A qualitative instrumental case study design was used in this study (Stake, 2005). In this approach, the goal was to understand the student learning experience in a PBL course when an HFS activity was introduced. As Stake describes, a researcher may learn from a particular case that is well defined and homogeneous. In this study, the instrumental case was defined as second-year baccalaureate nursing students who participated in an HFS activity as part of their PBL discussion in a theoretical nursing course. Approval was granted by the university research ethics board and the undergraduate nursing education committee.

Sample

A convenience, purposeful sampling method was used to recruit baccalaureate nursing students during the academic year. Students were invited through electronic and verbal communication to participate in one of three focus groups. Inclusion criteria for participation included all baccalaureate nursing students in year two of a three-site collaborative program who were enrolled in a theoretical PBL nursing course and who had participated in an HFS activity during discussion of one or both of the acute care scenarios described earlier. Nineteen students participated in one of three focus group interviews. All participants were from the two collaborative college sites.

Data Collection and Analysis

The members of the research team conducted all interviews, either as a facilitator or a field observer. The enactment of both roles was clearly reviewed in the team to ensure greater consistency in the three focus groups. The interviews ranged from 45 to 60 minutes, using a semi-structured interview approach with probes to enhance the participants' reflective comments. Consent was attained, and students had the opportunity to ask questions and clarify any concerns. The prepared interview guide was pilot tested with a student group to clarify content and understanding of questions. The questions were open ended and focused on exploring the student learning experience in class and in the simulation lab. At the end of each interview, the data was verbally summarized to provide an opportunity for students to validate ideas. Following this, the focus group audiotapes were transcribed verbatim.

The process for data analysis included the following steps:

1. each member of the team individually read the three transcripts and field notes;
2. a thematic analysis was conducted using categorical aggregation to label a collection of "instances" from the data (Stake, 2005);
3. the frequency of the instances was tabulated to support identification of prevalent themes;
4. the team discussed the identified themes and merged similar interpretations; and
5. themes were renamed as needed and further synthesized.

Five major themes with rich instances emerged from the data analysis.

Evolving Themes and Considerations

In this study, the student voice expressed a positive experience in coupling HFS in a PBL nursing course. The students overwhelmingly articulated a growth in knowledge and understanding as they had the opportunity to immediately apply content from their PBL discussion and care for the patient in the HFS activity. There were five major themes emerging from the students' perspectives:

- bridging theory and practice;
- integrating knowledge from other courses;
- enhancing confidence for practice;
- learning together; and
- learning in a safe environment.

Each theme, including participant statements, will be discussed in the following sections.

Bridging Theory and Practice

In the qualitative analysis of the transcripts, the predominant theme was bridging theory and practice. The use of HFS within a theoretical PBL nursing course provided a context for students to make connections between the theoretical group discussion and the nursing activities they performed in professional practice. Students described understanding the relevance and value of the theoretical concepts within the context of nursing practice. Furthermore, they genuinely embraced the opportunity to immediately apply what had been discussed in PBL and to practice nursing skills that were important for patient care. The following student comments highlight this theme:

“PBL is like your research and then clinical is like your practice... this helped to bridge the gap between the two and helped to make connections between the research and clinical in like a safe setting with your peers.”

“Simulation was an opportunity for us to connect how we can actually use PBL to benefit our clinical practice and really connected the two classes together.”

“Out of all the scenarios, the ones with simulation are the ones I remember best... I remembered the information because it was presented in different ways.”

The students discussed understanding the importance of theoretical knowledge and how this was related to their practice. They perceived the HFS activity enhanced their learning in PBL and assisted them in immediately applying new knowledge. Nevin et al. (2014) found that the use of PBL methodology and simulation also enabled students to integrate theory and practice and further develop critical thinking skills. Liaw et al. (2009) reinforce that simulation provides students with opportunities to review and practice their clinical skills. By integrating these two active learning strategies, students are offered greater opportunity to apply theoretical learning and make clinical connections while providing patient care. This combination enhances relationships between theoretical and practical knowledge (Christiansen, Boje, & Frederiksen, 2015; Murphy et al., 2011), and it engages learners in the learning experience. In this study, students embraced this relationship and seemed to prefer this approach to PBL discussions.

Integrating Knowledge from Other Courses

This theme describes how students were better able to integrate their learning from other courses. In order to participate in the PBL discussion and the HFS activity, students had to review key concepts from pharmacology, pathophysiology, and nursing. Specifically, students perceived that pathophysiological concepts discussed in PBL were better understood after participating in an HFS. Pharmacology and nursing treatments were also identified as concepts that were solidified. Students expressed the following perceptions:

“I learn better when information is repeated so pulling from pathophysiology, having experience in clinical, and being able to use it in PBL really enforces the learning...”

“It was helpful in incorporating the pathophysiology of COPD as well as pharmacology because we actually got to use the treatments that we had wanted to implement in our case scenario.”

By integrating an HFS activity with PBL discussion, the nursing students were also able to reinforce the knowledge and skills they had learned in other courses. During the PBL process, drawing on prior learning and concepts discussed concurrently in other courses was helpful in enriching the depth of learning. By using a second active form of learning, students were able to further these connections and apply learning in the care of the patient. Liaw et al. (2009) similarly found that nursing students who used HFS with PBL had superior clinical performance in managing a patient with chest pain and respiratory distress than students who only participated in PBL discussion. In other studies, students who integrated prior learning in simulation activities demonstrated improved psychomotor skills, enhanced confidence with physical tasks, bridging of theory and practice, and enhanced skills to care for patients in similar situations (Wotton, Davis, Button, & Kelton, 2010, Ogilvie, Cragg, & Foulds, 2011, Lasater, 2007).

Enhancing Confidence for Practice

The third theme reinforced the importance of strengthening students' confidence for professional practice. Students felt that by utilizing HFS during PBL, they were able to enhance their sense of comfort in providing patient care. It allowed them to practice and rehearse the skills and knowledge they had discussed as a group. In addition, students shared comments about the importance of noticing patient cues and responding to patient care, which contributed to making sense of the patient scenario.

“Typically, if I was in the clinical setting, I would just call my nurse and that was it... now I know that I could raise the patient's bed, put oxygen on, tripod position, deep breathing... gives you that extra confidence.”

“[I am] more comfortable in the real-life clinical setting... we can take back what we did whereas in the clinical setting we can't do that.”

“I feel a lot more confidence than I would have just going into practice... I have an idea of what to expect, what to assess for, and what to look for in patients. It's a big confidence thing for me.”

Studies have demonstrated that using HFS enhances students' affective engagement in the clinical area. Specifically, simulation has been linked to increased student satisfaction and self-confidence in learning (Kardong-Edgren, Starkweather, & Ward, 2008), as well as reducing

anxiety when students go to the clinical area (Partin, Payne, & Slemmons, 2011). In this study, HFS coupled with PBL contributed to students' perceptions of increased confidence in practice and overall readiness for learning. Students described greater comfort noticing and responding to similar elements of patient care in acute care. They also expressed less nervousness about going to practice since they had experienced some practical nursing actions while understanding the care that was discussed in small groups. Pierazzo (2014) found students perceived greater self-efficacy and less anxiety in practice if they had sufficient knowledge and preparation to participate in either real or simulated clinical environments.

Learning Together

Using HFS in a PBL class required the students to collaborate as a team to provide care to a patient. The students reported that participating in the simulation encouraged them to help each other with the new learning. The students were also able to use leadership skills such as facilitation and delegation. In addition, the feedback they received from their peers after the simulation was valuable as it provided an opportunity for them to reflect and discuss the nursing actions they did well and those they needed to work on. Students shared the following:

“In clinical, you don't really get a lot of opportunity to realize where you need to focus more... in this activity, we had peer feedback on our performance.”

“Good experience of working collaboratively with others and learning how to facilitate and delegate our individual skills.”

Developing effective communication skills is a core element of nursing curricula and is important to sustaining a healthy work environment. Using an HFS activity within a PBL nursing course also provided an opportunity for students to practice working with their peers and understand the power of learning as a team in a health setting versus a group in the classroom. For example, when the students noticed physiological changes in the simulator, they were able to discuss the symptoms with their peers and respond to the situation. In this way, learning mimicked what naturally happens in an acute setting where communication with other members of the team is essential. Often, novice learners do not consistently have the opportunity to engage in these changing health situations. According to Wotton, Davis, Button, and Kelton (2010), students recognize the value of working together as a team when a problem arises in a simulation. In addition, Nevin et al. (2014) found that using simulation with PBL methodology enabled students to critically reflect on individual and team performance.

Learning in a Safe Environment

The final theme which emerged was learning in a safe environment. Students shared feeling comfortable in the simulated environment, particularly in knowing if they made a mistake, they would not harm the patient. The students also reflected on their actions and were able to identify what they would do differently in the future. They felt HFS helped them to connect what they had discussed in PBL and practice this in a safe simulated environment with their peers.

“I love having a safe environment and feeling like if I do make a mistake it's not the end of the world.”

“Helped more to bridge the gap between the PBL and clinical... this helped me to make the connections between research and clinical in a safe setting with your peers.”

“Gives you an ease and you know if you make a mistake you’re going to remember that mistake and you’re not going to make it again and you’re not going to harm anyone in the process of learning what you’re doing.”

Providing safe care is an important goal of student learning. It can be difficult to take what is discussed in the PBL context and directly apply it to the clinical setting. Integrating an HFS activity assists students to practice their learning in a safe context where potential error cannot impact the simulated patient. The students expressed feeling more engaged in their learning with decreased anxiety about the consequences of an error. Murphy et al. (2011) and Walshe et al. (2013) reinforce the value of learning in a safe environment and also recognize that patient safety is a benefit when using HFS as a teaching and learning strategy. Furthermore, Partin, Payne, and Slemmons (2011) found that simulation events in a non-threatening learning environment reduced learner anxiety and helped to manage external influences that distracted learning.

Implications for Education

For years, nursing education has integrated both theoretical and practice components of learning within formal baccalaureate programs. Often teaching approaches within these two domains have evolved separately with less attention to the purposeful integration of content across courses. According to Brandon and All (2010), it has become imperative to evaluate the use of traditional approaches in nursing education and welcome a shift to a constructivist approach to teaching and learning. Approaching learning in this way provides an opportunity for students to synthesize information, link concepts, and think critically. Today, with greater variety in simulation-based technology available to us, nursing educators have the flexibility to be innovative and utilize integrated learning in both theoretical and practice contexts.

This study has provided an opportunity to reflect on the context of PBL in a theoretical nursing course and evaluate the outcomes of integrating an HFS activity in the learning process. The qualitative themes describe students’ perceptions and the value of coupling two active forms of teaching and learning. When students had the opportunity to participate in an HFS while discussing a patient scenario in PBL, they were able to immediately utilize prior knowledge and demonstrate care for the patient. Because of this approach to scaffolding, they expressed feeling more confident and prepared to attend clinical practice.

Limitations

The findings in this qualitative study provide a student perspective of the value of coupling two active forms of learning. These perceptions were expressed as self-reports in the focus groups and, as such, there may be concerns regarding validity. In addition, although the student voice was heard in this study, the teacher perspective is unknown. As alluded to earlier, it requires a level of expertise for the teacher to successfully use PBL methodology and then assist students in understanding this theoretical learning with a simulation activity. Transition in the learning contexts is important in order for students to understand relevance and to make appropriate connections in learning. As a further limitation of this study, it is possible that the convenience sample of students who participated in the focus groups may have had expert facilitators who were comfortable in both learning approaches. In this way, these students experienced an ideal coupling of learning, and so it is not really clear if there were particular patterns of challenge or disadvantage to this approach.

In addition to the challenges with self-report and convenience sampling, the participants in this study were recruited from the two college sites in a collaborative three-site nursing program. There were no participants from the university site. Although curriculum content is equivalent at all sites, there are differences in the operations of the simulation centre at each site. In this way, the scheduling and timing of the HFS activity could not be exactly the same, although the philosophical approach to coupling the HFS activity in the PBL discussion was maintained.

In conclusion, this qualitative research study highlights for nursing educators the potential value of integrating an HFS activity within a theoretical nursing course that utilizes a PBL methodology. Collectively, the five themes described in this study reported a positive experience for the nursing students while learning about a patient care scenario. By providing the students an opportunity to engage in both PBL discussion and a simulated practice experience about the same patient, students were able to take advantage of learning from both methodologies. Recommendations for future research include exploring faculty perceptions of coupling HFS and PBL in a nursing curriculum and quantitatively examining the impact of learning on perceived outcomes such as self-confidence for professional practice.

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