



Teaching interprofessional competencies using virtual simulation: A descriptive exploratory research study

Dawna Williams*, Lee-Anne Stephen, Pamela Causton

45190 Caen Avenue, Chilliwack, BC V2R 0N3, Canada



ARTICLE INFO

Keywords:

Interprofessional competencies
Virtual simulation
Pre-licensure
Nursing students
Multidisciplinary

ABSTRACT

Background: Interprofessional education provides a venue for the acquisition of interprofessional competencies. Virtual reality experiences may allow students from different health professions the opportunity to work together to develop these competencies for safe patient outcomes.

Objective: The purpose of this study was to determine if virtual reality supports the development of interprofessional competency knowledge for Bachelor of Science in Nursing, Practical Nursing and Health Care Assistant students.

Design: A descriptive qualitative study using semi structured pre and post questionnaires were administered to students in their senior semesters of their respective program.

Setting: Mid-sized western Canadian University.

Participants: Twenty-seven Bachelor of Science in Nursing students, twelve Practical Nursing students and seven Health Care Assistant students.

Results: Three themes emerged from the analysis: Intentional Collaboration, Role Awareness, and Positions of Power.

Conclusions: Virtual reality provides students with the opportunity to collaborate for safe patient care. Students were able to strengthen their knowledge of interprofessional competencies. Further work is needed to determine if these experiences carry through post-graduation and impact work relationships.

1. Introduction

Interprofessional education (IPE) is an essential aspect of Canadian health care curricula (Canadian Interprofessional Health Collaborative [CIHC], 2007). IPE experiences provide the opportunity for health care professionals (HCP) to learn collaboratively within and across disciplines to gain the knowledge, skills, and values required to work with other members of the health care team (CIHC, 2007). According to the World Health Organization (WHO, 2010), IPE needs to include interaction between different HCP students where students “learn about, from and with each other to enable effective collaboration and improve health outcomes” (p. 10). In spite of the importance of this type of educational experience, it is often challenging to provide students with a focused IPE experience in the clinical setting. This can be even more difficult to implement in the classroom setting because of limitations imposed by content heavy health care curricula (Fowler et al., 2018; Reeves et al., 2016).

2. Background

Interprofessional simulation (IPS) experiences provide students with a safe, realistic backdrop to practice interprofessional competencies and are an important aspect of health professional education (Reising et al., 2017; WHO, 2013). IPS experiences allow participants to practice collaboration skills; assist with understanding and appreciating their own and other HCP team members roles; and improve overall communication skills (Buckley et al., 2012; Granheim et al., 2018; Labrague et al., 2018; Murphy and Nimmagadda, 2015; Reising et al., 2017). IPE activities can be labour intensive to organize and complete as students must be together at the same time, in the same place. Virtual simulation may have the potential to provide students with quality IPE experiences while overcoming the barriers of time and place constraints found with traditional IPE activities (Caylor et al., 2015; Djukic et al., 2015; King et al., 2012; Tschannen et al., 2018).

In the context of this study, virtual learning is defined as a “computer or internet-based learning environment that includes virtual worlds with the use of avatars” (Fowler et al., 2018, p. 669). Djukic

* Corresponding author.

E-mail addresses: Dawna.williams@ufv.ca (D. Williams), Lee-Anne.Stephen@ufv.ca (L.-A. Stephen), Pamela.causton@ufv.ca (P. Causton).

et al. (2015) found nursing students who participated in a virtual IPS experience had a significantly higher attainment of 'team knowledge domains' including team members' roles and responsibility, teams and teamwork, communication and conflict resolution and interprofessional care planning when compared to those who participated in face-to face and online IPE coursework. King et al. (2012) also found that the virtual experience highlighted the importance of communication between multidisciplinary team members.

2.1. Theoretical framework

The NLN/Jeffries simulation framework supports the use of an environment that is learner centered, interactive, collaborative and experiential (Jeffries, 2016). This framework was foundational in the development of the simulation experience. Pre and post questionnaires and the simulation scenario were based on the CIHC framework. This framework outlines six interprofessional competencies: interprofessional communication, patient/client/family/community-centered care, role clarification, team functioning, collaborative leadership and interprofessional conflict resolution (CIHC, 2010).

2.2. Purpose/aim

The purpose of this study was to determine if virtual reality (VR) supports the development of interprofessional competency knowledge for Bachelor of Science in Nursing (BSN), Practical Nursing (PN) and Health Care Assistant (HCA) students.

3. Methodology

3.1. Simulation development

A lack of collaboration in the clinical environment was a critical gap that necessitated the creation of a simulation to bring students together to learn interprofessional competencies. The resulting virtual IPS was developed to allow the three health care disciplines (BSN, PN and HCA) to have a unique role in the care of a patient experiencing elder neglect and abuse. The participant's avatars would enter the patient room at staggered points to allow each participant time with the patient individually. As the participants gathered role specific data from the patient, they would be required to collaborate with the other health care disciplines to provide safe patient care. Prior to implementation, the simulation and questionnaires were reviewed by faculty in the BSN, PN, and HCA programs to ensure accuracy of content and readability. BSN student volunteers not eligible to participate in the study piloted the scenario, completed the pre and post questionnaire, and provided feedback. The researchers discussed this feedback and adjusted the questionnaire to improve the quality of data collected.

3.2. Simulation modality

The Clinispace® VR platform was used during this learning experience. It is a screen-based simulation modality that provides a modifiable, immersive 2D virtual health care environment. Through this platform, patient assessments are simulated through drop down boxes, clinical resources such as X-rays, lab and consult reports can be accessed, and communication between avatars occurs via headsets.

3.3. Running of the simulation

A week prior to the scheduled virtual IPS, students were provided with an onsite orientation to the Clinispace® VR platform. Patient background and participant roles were provided to students, and there was opportunity to practice operating the health care provider avatars.

Participants were required to be onsite on the day of the virtual IPS to ensure equal access to computers with the appropriate technological

capacity to run the virtual platform. During the pre-brief, one of the facilitators reviewed the overall learning objectives of the virtual IPS and discussed the importance of the simulated learning environment being a safe space for learning. Each of the four virtual IPS sessions included a BSN, a PN and an HCA student working individual avatars. Avatars participated in a virtual ice breaker where they introduced themselves and explored the virtual environment. Students participating as avatars were in separate rooms with faculty members who offered technical support during the simulation. The virtual IPS was broadcast to a classroom where groups of twelve to fifteen students were observing.

Debriefing lasted between 40 min to 1 h, and was conducted by the same researcher experienced in simulation debriefing to maximize consistency. The debriefing focused on the interprofessional competencies demonstrated by the avatars during the simulation and allowed participants to connect this learning experience with previous and future clinical experiences.

3.4. Research design

This descriptive qualitative study was designed to explore the effectiveness of VR in the development of interprofessional competency knowledge.

3.5. Participants and setting

Students in their senior semesters of the BSN, PN, and HCA programs at a medium sized university in western Canada were invited to participate. The BSN program is a four-year university degree program preparing students to work in a variety of settings with varying levels of patient acuity. The practical nursing program is a two-year diploma program that prepares graduates to work with a stable client population. HCA students complete a six-month program focusing on basic care skills. Although these three programs are taught at the same campus few, if any, classes are taught together.

Information sessions were provided by a member of the research team not involved in teaching the participants. None of the participants had prior experience with VR for educational purposes. The virtual IPS was a mandatory class in the three curricula and students were aware that the decision to consent to the use of their pre and post experience data would not impact their grades for the course. Students completed consent forms attached to the questionnaires. Two of the three researchers had academic authority over the students, so only the researcher who no longer had this authority was aware of which students consented to participate in the study. All consent forms and participant identifiers were removed from the questionnaires and the questionnaires were transcribed verbatim into excel spreadsheets for analysis. Those students who did not consent still completed the questionnaires for curriculum review. Ethics was granted by the university Human Research Ethics Board.

3.6. Data collection

Data was collected via a semi structured questionnaire developed by faculty with research and simulation experience. The resulting pre and post questionnaires allowed participants to document how the virtual IPS experience impacted their knowledge of the six CIHC competencies. Immediately prior to the virtual IPS, time was given for participants to consider their current knowledge of these competencies and answer the pre-simulation questionnaire. After the debriefing, participants were encouraged to reflect on the virtual IPS and the impact this had on their knowledge of the CIHC competencies through the completion of the post questionnaire.

Table 1
Demographics of students (n = 46).

	BSN	HCA	PN	n (%) Total
Number of participants	27 (59)	7 (15)	12 (26)	
Age				
19–20		4 (57)		4 (9)
21–24	16 (59)		6 (50)	22 (48)
25–29	4 (15)		2 (17)	6 (13)
30–34	4 (15)		1 (8)	5 (11)
35–39	2 (7)	1 (14)	2 (17)	5 (11)
40–44	1 (4)		1 (8)	2 (4)
45 or older		2 (29)		2 (4)
Past health care experience				
Care aide	5 (19)		6 (23)	11 (24)
Licensed practical nurse				
Employed student nurse	19 (70)		1 (8)	20 (43)
Gender				
Male	1 (4)			1 (2)
Female	26 (96)	7 (100)	12 (100)	45 (98)

3.7. Data analysis

Qualitative data were analyzed via directed content analysis (Hsieh and Shannon, 2005) with broad predetermined codes developed from the interprofessional competencies. Data that did not fit within these predetermined codes were categorized separately. Each researcher individually reviewed the transcripts and provided an initial coding for each data set. The researchers then discussed the codes and developed categories. With each subsequent review of the codes and emerging categories, categories were collapsed together or broadened as necessary creating themes. Researchers engaged in bracketing throughout the process to prevent preconceived biases regarding curricula content from impacting the development of codes and themes. Although data was collected at one point in time, thematic saturation occurred.

4. Results

Fifty-seven students participated in the simulation experience and of those, forty-six students consented to their data being used in this study (see Table 1 for demographic information). Overarching themes identified were intentional collaboration, role awareness, and positions of power.

4.1. Intentional collaboration

Intentional collaboration was defined as teamwork based upon effective communication and respectful recognition of individual strengths with the common goal of achieving positive patient outcomes. Prior to the simulation, all groups of participants identified that communication skills and the ability to collaborate were very important qualities of team members. Respect and open-mindedness were also thought to be essential aspects of team work. Participants were concerned that their ability to work together would be affected by a lack of communication among team members or being disrespected by other participants during the experience. A BSN participant stated that being “mistreated or talked down to” would impact the collaboration of the team. Another worried that “miscommunication would lead to safety risks and conflict”. An HCA participant was worried that there would be “a lack of communication which could affect the client's health and well-being”.

After the simulation, participants felt the qualities important to teamwork identified prior to the simulation had not changed post simulation, but were instead accentuated. Participants emphasized the importance of collaboration and appreciated the importance of functioning as a team. A BSN participant reflected that “communication between all health care professionals is important to establish efficient

and adequate patient care”. The IPS “showed the importance of working together, and proper communication between professions to give holistic care” (PN participant). Another BSN participant stated that “without teamwork, safety issues could arise”. “Working together, you can gather little pieces and put them together and collaborate. Things are less likely to be missed” (PN participant). Respect was prominent in the discussion of teamwork and collaboration. “I feel we are always working on teamwork and this just proved how communication and respect is so important” (PN participant). One participant stated that “collaboration is important to gain understanding of any situation. You are never alone” (PN student). “I thought most of the nurses worked mostly individually unless they needed help, however this team was collaborating and planning from the beginning of the shift” (BSN participant). Participants also recognized when opportunities to collaborate had been missed. A PN participant realized that she didn't address the HCA who had been talking with the patient. “I was worried that the HCA may have felt overlooked when I went into the patient's room. I don't feel that I addressed her effectively. I failed to ask her how the patient was doing.”

4.2. Role awareness

Role awareness is defined as being cognizant of all scopes of practice, recognizing the overlapping roles and the differing perspectives within the nursing team. Participants were asked to identify the similarities and differences between their roles prior to engaging in the simulation. All three groups recognized the overlap of roles such as the provision of patient centered care, the need for collaboration, and the psychomotor/therapeutic skill set shared as well as scope specific skills not shared. Overall, participants were aware of how different educational preparation resulted in different levels of responsibility and psychomotor skills between the various roles. When discussing similarities and differences between roles, PN participants focused more on psychomotor skills than the knowledge and critical thinking that separated the PN and BSN roles. “Skills are similar” (PN participant). “The RN can do certain skills that the entry to practice nurse is prohibited from doing” (PN participant).

In spite of being exposed to curricula that describes the scope of all team members, participants still expressed concern that they didn't fully understand the scope of their interprofessional team members. “Poorly defined roles and responsibilities...can lead to confusion and conflict. This complication can make working with others a daunting prospect” (BSN participant). “[This simulation] made me realize how unsure I am of other disciplines, responsibilities and scope” (BSN participant). A common comment from the PN participants was that HCPs either overestimate or underestimate their role, “are [HCPs] aware of what our scope of practice includes and [there is the] possibility of being asked to work/perform tasks outside of it” (PN participant). An HCA participant stated that she was concerned about “not being taken seriously” because of the HCA role in the health care team.

The simulation provided participants with an opportunity to discuss role challenges with their teammates. “I was concerned and apprehensive about working alongside nurses as I have had experiences with nurses that were not so welcoming; however now I feel great because these students are learning more about the HCA roles” (HCA participant). A BSN participant felt that she had “learned a lot about how HCAs feel”. “Hearing and talking about roles and how each other feels was extremely valuable” (PN participant). “I really enjoyed being part of the nurses' space and hearing what they had to say” (HCA participant).

Those who felt the virtual IPS had changed their perceptions of the roles of their team members stated they had a greater appreciation of the demands placed on different team members. There was a recognition of the increased time that the HCA student may have with the patient which wasn't possible for the PN and BSN student. An HCA participant recognized the importance of her role “nurses have a lot of

work to do and appreciate an observant HCA". Participants also identified a larger role overlap than they thought prior to participating in the simulation. "There are a lot more similarities than I thought" (HCA participant). There was also surprise among the BSN and PN team members about the role of the HCA. "I was unaware that HCAs get trained to have such great observational skills" (BSN participant). A BSN participant stated that "I will definitely be encouraging the HCAs to share their observations with me and will be asking them what they have assessed."

Understanding each other's roles was seen as important to prevent conflict within the team. "The students [participating in the simulation] knew their scope of practice which didn't create conflict" (BSN participant). "All three disciplines (BSN, PN, HCA) served different purposes/roles that support each other, but making sure the right person gets the right info helps avoid overlapping of duties" (PN participant). The participants also recognized the downfall of not appreciating one's own or another team member's role. "If [the HCA] was understanding of her value to the team, she may have reported [her concerns] sooner" (BSN participant). This was echoed by an HCA student who realized that "what we have to say is valuable and our role is important". Participants reflected that "every position is important" (HCA participant).

4.3. Positions of power

Positions of power is defined as the formal hierarchy that stems from education, knowledge and workplace culture. All three groups of participants were concerned about perceptions of positions of power. One BSN participant was concerned about being placed in a position of authority because she was a student like the others. "Other health care professions might assume I know all the answers just because I'm an RN [student] despite having very little experience." Another was worried about how she would be perceived if she took a position of power within the student health care team. "I hope that I don't come across as ordering people around [as] some health care practitioners act superior to other health care practitioners which makes it difficult to communicate between different disciplines" (BSN participant). A PN participant described her concerns going into the simulation as "feeling like RNs don't respect or appreciate what licensed practical nurses can do". The HCA students saw themselves as the lowest point on the health care hierarchy. One HCA describes this as "being treated unfairly because [they] are lower in the system". A PN student was concerned that the participants with more education would "devalue the amount of education" [PN students] have.

The virtual IPS highlighted that although there are natural positions of power within the health care team, all members of the team are equally important. A BSN participant stated that "the RN is in a position of higher power, although it is important to value each member of the team". "Everyone had their own role" (PN participant). "The BSN students had the ...scope to do more than the LPNs or the HCAs [could], which was expected" (HCA participant). Participants felt the term hierarchy had a negative connotation and a PN participant referred to this as "hierarchical disrespect". When team members collaborated, there was no hierarchy noted. "All [team] members were respectful of one another [so no hierarchy was present]" (PN participant). "Each individual was respectful and valued each person's input" (BSN participant). "Everyone collaborated well, didn't feel like a hierarchical aspect was seen" (PN participant).

5. Discussion

The purpose of this study was to determine if a virtual IPS would assist students in developing interprofessional competency knowledge. The CIHC IPE competencies are important individual concepts that are tightly intertwined, and the acquisition of these competencies do not occur in isolation of each other. The foundation of collaboration and

safe patient care requires role clarification and communication between all levels of nurses (Limoges and Jagos, 2016). Participants in this study came to a greater understanding of their team members' roles and the importance of effective communication to support collaboration. There was the realization that intentional collaboration improves patient outcomes. These findings have been echoed in other studies where multidisciplinary students working together in virtual worlds, providing patient care recognized the importance of collaboration, and role clarification of team members (Davis et al., 2016; Fowler et al., 2018; Shoemaker et al., 2014).

This scenario was developed so students could move freely in their roles, overlapping if necessary. When discussing differences and similarities of roles, it was found that the PN participants focused more on shared and scope specific tasks with little discussion of the underlying educational differences that impact scope and responsibility. The PN role seemed to be caught between that of the BSN and the HCA as they have no unique skill set, therapeutic or psychomotor, that is their own. This shared space creates a lack of role clarity and a blurring of boundaries in the workplace, which is further complicated by an evolving PN role in the Canadian health care climate (Limoges and Jagos, 2016). It is essential that students engage in IPE experiences with an awareness of their own role and a willingness to understand and appreciate the roles of others (Limoges and Jagos, 2016). IPE focused on roles and scopes will allow students a broader awareness of these blurred boundaries and how to collaborate for safe patient care.

Prior to the virtual IPS, students described a negative connotation to hierarchy. Some participants were worried about being seen in a position of power. Others were concerned with being looked down upon, or having their knowledge discredited because of their position in the health care team. Considering these groups of students had not worked together, their prior experiences provided a negative preconceived notion of power and hierarchy. Students controlling the avatars were respectful and worked within a formal hierarchy, which negated the negative connotation of hierarchy and power during and after the virtual IPS.

5.1. Implications for practice and education

When health care education occurs in silos, there is the potential to jeopardize collaboration and patient safety. Isolating students from one another during clinical rotations further compounds the silo effect created by nursing curricula. There may be limited opportunities for students to engage in collaboration in the clinical setting as students practice slightly outside the health care team and channels of communication heavily involve clinical faculty to ensure patient safety. This may prevent students from independently collaborating with those outside their own profession. Limoges and Jagos (2015) found that students struggled with collaboration in the practice setting when opportunities to do so as a student were not provided. Faculty must facilitate collaboration between students and other members of the health care team during pre-licensure education to provide students with the application of these skills prior to graduation. A change in thinking from educational silos to educational streams, where the streams interconnect with other health care professionals through channels of shared competencies may allow for a more natural blending of student experiences prior to graduation. If students practice IPE competencies during their educational programming it is posited that intentional collaboration in practice will occur. Further research needs to evaluate the impact of simulation events on the development and refinement of interprofessional competencies and collaboration as practitioners.

Informal socialization to health care professions may be occurring without clinical faculty awareness. Participants had not engaged in IPE prior to the virtual IPS, but all had been exposed to clinical settings and as a result had interactions with professionals in both formal and informal positions of power. This resulted in students expressing concerns about hierarchy, power and conflict prior to the virtual IPS. Hierarchy

within nursing teams can negatively impact collaboration and patient care (Limoges and Jagos, 2016). Negative hierarchy, whether formal or informal, had a strong influence over the students' perceptions of collaboration and their place within the health care team. Faculty must be prepared to address negative hierarchy and power situations in the clinical setting to ensure that the student's developing role awareness is not impacted. It is also important to debunk negative health care professional stereotypes prior to these taking root in the novice practitioner's own role identity and in their understanding of the role of other health care professionals (Reid et al., 2018). Further studies are necessary to investigate the perception hierarchy and positions of power within the health care team and how these perceptions may negatively impact the development of role awareness and collaboration.

5.2. Limitations

There were several limitations to this study. This was a small study completed at one university so wide generalization of the results will not be possible. Participants had varied work histories and those who had worked as part of health care teams may have already begun to learn interprofessional competencies as part of their socialization. At this university there is a simulation code of conduct contract that emphasizes a non-judgmental supportive culture during simulation learning. This may have resulted in a more collegial interaction between students and more positive responses on the post questionnaires. In addition, the pre-brief focused on the objectives of the simulation and may have heightened the participants' awareness of the desired outcomes for the simulation. Participant responses on the questionnaires may have been impacted by the presence of faculty from all three programs producing a reactive effect during the debriefing and post questionnaire completion. Researchers found limitations to the depth of data obtained through the open-ended written questionnaire. To overcome this limitation, further research should incorporate the use of focus groups.

6. Conclusion

As virtual platforms specific to health care continue to evolve, there will be a greater ability to replicate the real-world setting and provide quality virtual IPS experiences for students. Students from BSN, HCA, and PN programs worked together to develop and refine interprofessional competencies necessary for professional practice. Participants recognized the importance of collaboration for positive patient outcomes, and the value of each role. Further investigation into the longevity of the interprofessional competencies acquired through a single virtual IPS event is necessary.

Authorship contributions

All research work presented is work completed by research team of Dawna Williams, Lee-Anne Stephen and Pamela Causton. Dawna Williams: Conceptualization, methodology, formal analysis, writing - original draft, writing - review and editing. Lee-Anne Stephen: Conceptualization, methodology, formal analysis, writing - review and editing, supervision, funding acquisition. Pamela Causton: Conceptualization, methodology, investigation, formal analysis, writing - review and editing.

Ethical approval

Granted by the University of the Fraser Valley Human Research Ethics Board.

Acknowledgement/funding statement

Funding for this study was provided by the University of the Fraser

Valley through the Fund for Innovative Teaching.

Declaration of competing interest

None.

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