White Paper

Orchestrating Virtual Reality Simulations in Undergraduate Nursing Education

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ABSTRACT: Nursing faculty complement clinical experiences with simulations to expose undergraduate students to a variety of clinical situations, facilitate theory-practice integration, and cultivate a range of competencies. The adoption of immersive virtual reality (VR) simulations in nursing programs has risen recently. However, little is known about the design of learning analytics tools in VR systems for nursing education, and how faculty utilize them to meet their clinical education goals. Thus, in this practitioner-corporate track report, the authors unpack the design and implementation of the SimX moderator tool—a multimodal interface used to select and facilitate scenarios—in Simulation Learning System with Virtual Reality (SLS with VR) using categories for technologies for classroom orchestration (Dillenbourg & Jermann, 2010). Insights from Fall 2020 and 2021 indicate that the moderator tool affords nursing faculty the agency to prioritize student learning goals, personalize instruction within a certain range, adjust their scaffolding just-in-time, and maintain the realism of clinical settings.

Keywords: virtual reality, learning analytics tool, nursing education, classroom orchestration, simulation

INTRODUCTION AND BACKGROUND

The growing number of nursing schools in the United States and increasing student enrollment has left many institutions struggling to obtain clinical partnerships. This issue is juxtaposed with a rapid shift in patient demographics and social determinants of health, digital transformation in healthcare and education, and reports indicating that new graduates are not being sufficiently prepared for participation in clinical settings (Kavanagh & Sharpnack, 2021). Over the last two decades, nursing programs have reliably used simulations to complement clinical experiences. More recently, the adoption of immersive virtual reality (VR) simulations has gained momentum. Studies are increasingly demonstrating the positive impact of this high-fidelity modality on nursing students’ cognition and psychomotor skills (Choi et al., 2022). Furthermore, reports illustrating the technological affordances of VR (e.g., immersion, cost effectiveness) have catalyzed acceptance among nursing faculty and students. However, there is a dearth of reports that unpack the design and implementation of learning analytics tools that faculty use to facilitate simulation experiences in nursing programs (Fernandez-Nieto et al., 2022). Focusing on this technological-pedagogical gap is the goal of this practitioner-corporate track paper.
In what follows, we (Wills-Savoia, practitioner author-director of clinical and simulation learning at University of St. Francis and Shah, corporate author–learning scientist at Elsevier) report findings from a descriptive case study capturing nursing faculty insights about the moderator tool (developed by SimX) in Elsevier’s Simulation Learning System with Virtual Reality (SLS with VR). We use Dillenbourg and Jermann’s (2010) design categories for technologies for classroom orchestration. As a design metaphor, orchestration provides a lens to understand the effectiveness of learning analytics tools from teachers’ perspectives. Thus, to situate the reader, first we introduce SLS with VR and the anatomy of its moderator tool. This is followed by a description of SLS with VR implementation at a private nursing college in midwestern United States. Results are organized by the nursing faculty (practitioner author and partnering faculty) insights about the moderator tool’s affordance for teacher-centrism, cross-plane integration, sequentiality, time management and physicality (Dillenbourg & Jermann, 2010). We discuss findings in the context of extant literature and conclude with implications for future inquiry.

**SLS WITH VR**

SLS with VR enables nursing schools to provide undergraduate students with immersive clinical experiences alongside traditional simulation experiences. Faculty have a choice of 100 scenarios and associated student-facing activities and faculty resources across multiple content areas in nursing. The moderator tool enables faculty to (a) select scenarios, (b) orient students to the clinical environment and possible actions in VR; (c) introduce virtual characters, situational distractions, control patient and other virtual character speech and actions, (d) monitor student participation and patient health, (e) provide just-in-time support; and (f) obtain an end-of-scenario report of interventions performed by the learners. Nursing faculty navigate and choose from the following features in the moderator tool while facilitating scenarios – 1. Orders & actions pane, 2. Dialog tab, 3. Monitor tab, 4. Required actions pane, 5. VR view pane, 6. State map tab, 7. Description tab, 8. Settings button, 9. Screen recording button. This video provides a brief demonstration of SLS with VR, including the use of the moderator tool and the instructor view it affords.

**DESCRIPTION OF IMPLEMENTATION**

Two faculty (practitioner author whose expertise is in Pediatrics, and an Obstetrics and Fundamentals expert) utilized SLS with VR with a group of 50 undergraduate pre-licensure nursing students initially during Fundamentals—their first clinical course (Fall 2020) and then in Obstetrics and Pediatrics (Fall 2021) – their third clinical course. Both implementations were 8 weeks long. Typically, in each simulation session, two students participated in the patient scenario while two others observed. At the same time, four students completed pre-simulation activities such as concept maps in the waiting room before it was their turn to role-play. The second implementation (Obstetrics and Pediatrics) included the same fifty students, plus two additional students who had no prior experience with VR. Faculty that led SLS with VR simulations with the first group also led them with the second; this aided in consistency in pre-briefing, facilitation and debriefing. During both implementations, the corporate author and her team provided onboarding and technical support, and engaged in remote observations of the SLS with VR sessions.
RESULTS

In Fall 2020, faculty used one scenario featuring a patient with diabetes and a cellulitis wound. Students had to assess the wound, engage in empathetic communication and provide education to the patient and their family, report to the provider, and administer medications. However, at that time, many of the students had not yet gained practical experience in the clinical setting. This inexperience was reflected in students’ struggle with performing most tasks in the simulation and completing interventions. Instead, the participants focused on communicating with the patient and family. In Fall 2021, this same group used two scenarios. The first was a patient with preeclampsia and the second was a pediatric patient with sickle cell disease. At this time, the students had spent approximately 150 hours in the clinical setting. Their growing competence was reflected in their ability to complete their assessments, determine necessary interventions, implement those interventions and reevaluate their care, while they communicated with the patient and family. The implementation of SLS with VR in the two clinical courses helped the nursing faculty complement students’ clinical experiences. The moderator tool provided them the means to orchestrate scenarios for nurturing students’ practice readiness and observing clinical judgment improvements during the simulation sessions.

Dillenbourg and Jermann’s (2010) first design category states that technologies designed for classroom orchestration should be teacher centric. They should grant teachers leadership, flexibility and control in order to meet their instructional goals. Overall, the moderator tool allowed the nursing faculty to “drive the bus” and choose specific milestones. Although multiple tabs and panes were available to provide a real-time view of how a scenario was unfolding, the faculty could decide what they wanted to prioritize for their students for each simulation session and scenario. The practitioner author and her colleague noted using the dialog tab frequently to prompt and respond to students through different characters in the scenario, steer their attention towards specific aspects, and encourage critical thinking about patient-centered communication, teamwork and collaboration. Using the moderator tool, faculty maintained a certain level of control; however, as in the real-world, patient outcomes in the virtual world depended on student interventions.

The second category is cross-plane integration; Dillenbourg and Jermann (2010) suggest that tools should facilitate students’ engagement in the curricula at multiple levels. The moderator tool provided an array of functions and multi-modal feedback mechanisms to deepen (individual and dyad) students’ participation in a scenario. For instance, as students progressed in their program, nursing faculty prioritized multiple learning goals including peer collaboration, assessing patient condition, performing interventions, demonstrating cultural sensitivity and adopting safety measures. Sequentiality, the third design category, is characterized by the extent to which a tool allows teachers to expect a degree of linearity and continuity, and introduce drama in a learning situation when needed. Across scenarios and semesters, the moderator tool allowed nursing faculty to guide student participation through experiences of patient assessment, intervention, and communication. This consistency allowed them to observe students’ growing competency and knowledge gaps. Introducing characters (e.g. a call from a provider seeking an assessment report) and situations (e.g., making the virtual parent walk up to the student role playing nurse and ask them why the child is hurting) provided a way to make a scenario mimic the characteristics of a dynamic clinical setting.

Time management and physicality are the final design categories; they are self-explanatory. Nursing faculty believed the moderator tool was most useful in these categories. Simulation sessions were preceded by lengthy and large group lectures on specific content. SLS with VR scenarios also complemented the lectures allowing students to apply
theoretical knowledge in short durations and smaller groups, and allowing faculty to facilitate reflection in and on action during the preparation/prebriefing, scenario and debriefing phases. The moderator tool enabled the faculty to maintain a participant observer-like presence during the simulation; they were able to watch and scaffold their students’ communications and actions in simulated clinical settings and most importantly get a first person view of what the students were seeing too. Nursing faculty rarely get this perspective in clinical settings.

DISCUSSION AND IMPLICATIONS

“Orchestration tools are based on the idea of capturing, analyzing, and visualizing student activities during class time and feeding them back to teachers to facilitate real time monitoring and support of students” (van Leeuwen et al., 2018, p. 1227). The moderator tool in Simulation Learning System with Virtual Reality (SLS with VR) affords these technological and pedagogical functions for nursing educators interested in using VR simulations to facilitate clinical readiness (Kavanagh & Sharpnack, 2021). According to Dillenbourg and Jermann (2010), teachers translate the design of orchestration technologies in the context of their practice (Dillenbourg & Jermann, 2010). In this study, nursing faculty reported using functions of the moderator tool to prioritize specific clinical competencies and personalize instruction based on students’ clinical experiences over two semesters (Fall 2020 and Fall 2021).

Future work should continue examining how nursing faculty orchestrate simulation experiences using learning analytics tools in VR systems in a variety of programs and disciplines. Pursuing this direction should include identifying best practices and challenges, generating opportunities for design enhancements, and assessing impact on students’ preparedness for clinical practice. An endeavor of this nature would be of mutual benefit to practitioners, researchers, and industry.

REFERENCES


