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Designing for Success: Evaluating Immersive Virtual Reality Learning in Nursing Education From a Remote Context

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The rapid evolution of health care delivery and persistent nursing workforce shortages have placed increasing pressure on nursing education programs to graduate competent and practice-ready nurses. Simulation-based learning has long played a critical role in bridging the gap between theory and clinical practice (International Nursing Association for Clinical Simulation and Learning [INACSL] Standards Committee, 2021). More recently, immersive virtual reality (IVR) has emerged as a powerful simulation modality that allows students to engage with complex patient scenarios in a controlled and risk-free environment. IVR is particularly relevant for nursing students in rural and remote programs, where access to high-acuity clinical placements may be limited and faculty resources are often overextended.

This study explores the integration of IVR in undergraduate nursing education using the lens of situated learning theory (Lave & Wenger, 1991). This theory emphasizes that meaningful learning occurs through participation in authentic and context-rich tasks that are embedded in a social learning environment (Lave & Wenger, 1991). IVR, when designed with pedagogical intention, can re-create many of the situated conditions essential to experiential learning.

To better understand the factors that promote meaningful learning through IVR in the remote context, this study examines the experiences of students and faculty from two remote nursing programs. The aim is to identify the design elements that support learning and engagement in immersive simulations and to contribute to a growing body of scholarship on how virtual modalities can enhance nursing education in diverse and distributed contexts.

Background and Rationale

Nursing students in rural and remote programs often face structural barriers to experiential learning in high-acuity environments. Limited availability of complex or high-acuity patient care, and some academic supports are ongoing challenges that may compromise equitable educational access to some experiences (Luscombe et al., 2021; Walsh et al., 2022). The COVID-19 pandemic amplified these inequities, accelerating the adoption of virtual modalities, particularly IVR, as a means to sustain and expand clinical learning opportunities (D'Errico, 2021).

While often used interchangeably, *immersive virtual reality* and *virtual simulation* represent distinct modalities. According to the *Healthcare Simulation Dictionary* (Lioce et al., 2025), *virtual simulation* generally refers to a computer-based re-creation of reality displayed on a screen, where learners interact through standard interfaces such as a keyboard, mouse, or touch screen. In contrast, *immersive virtual reality* refers to a fully immersive, computer-generated three-dimensional environment accessed through head-mounted displays and motion sensors that track users' movements, creating a sense of spatial presence, embodiment, and agency. This distinction is important because IVR enables a heightened sense of realism and interaction compared to traditional screen-based virtual simulations.

IVR offers students the ability to immerse themselves in highly interactive and realistic clinical environments in which they can practise assessment, communication, and clinical decision-making skills. Compared to screen-based or mannequin-based simulations, IVR creates a more embodied learning experience that simulates real-time decision-making.

Situated learning theory provides a useful framework for understanding the pedagogical potential of IVR in this context. According to the theory, learning is not merely the transfer of knowledge but a social process that occurs through legitimate participation in authentic activities situated within real-world contexts (Lave & Wenger, 1991). In IVR, students can engage in simulated clinical practice that mirrors the complexity of real-world nursing, with the opportunity for guided reflection and feedback. This simulated participation in a community of practice, particularly when paired with facilitator support and structured orientation, can foster clinical judgement, confidence, and a sense of professional identity (Verkuyl et al., 2024).

Despite the alignment between IVR and situated learning principles, limited empirical evidence exists on how IVR should be designed and implemented to optimize learning, especially in distributed or resource-limited settings. Most existing literature focuses on outcomes such as satisfaction or knowledge gains (Liaw et al., 2020; Sung et al., 2024) rather than exploring the learner experience in depth. This study addresses that gap by examining how IVR is experienced by students and faculty in a remote nursing program and identifying which design features best support situated learning in these contexts.

Research Questions and Methods

This study was guided by situated learning theory (Lave & Wenger, 1991) and sought to explore how IVR can support nursing students' learning experiences in remote educational settings. The following research questions were addressed:

1. What design elements of IVR promote student learning outcomes in nursing education?
2. How do students describe their experiences with the implementation and facilitation of IVR?
3. What unique considerations emerge when IVR is used in remote nursing programs?

To answer these questions, we employed a qualitative interpretive descriptive approach. This methodology was selected to generate practical insights that are directly applicable to nursing education, while allowing for nuanced interpretation of participants' experiences (Thorne, 2016). Interpretive description is particularly well suited for studies aiming to inform pedagogical practice and program development in applied disciplines such as nursing.

The simulation was implemented using the virtual reality program UbiSim by Labster. The study was conducted at a 4-year baccalaureate program, with participants that were completing year 3 in medical-surgical clinical rotations and completing year 4 in labour and delivery clinical rotations. In this study, the IVR scenarios were intentionally selected to promote the development of clinical reasoning and confidence by placing students in situations that required assessment, prioritization, and decision-making. For example, the medical-surgical scenario involved caring for a deteriorating postoperative patient with escalating pain, abnormal vital signs, and early indications of sepsis, prompting students to identify subtle clinical cues, choose appropriate interventions, and communicate with the virtual interprofessional team. The labour and delivery scenario required students to assess a patient in early labour who progressed to signs of fetal distress, requiring timely interpretation of assessment findings, decision-making under pressure, and activation of appropriate responses. These scenarios reflected the types of complex, high-stakes situations that students reported rarely encountering in their remote clinical placements and, therefore, were designed to foster confidence through repeated exposure, safe error-making, and guided reflection.

Students underwent a 3-hour orientation to the virtual environment. This orientation included a separate tutorial that allowed the learner to interact with the environment so that during the live simulation, they were prepared for the virtual reality (VR) simulations, which included picking up a virtual stethoscope, applying a blood pressure cuff and taking a set of vital signs, looking for medication administration records, and talking to the patient. For the simulation content, students were given their regular preparation guides, which typically include the scenario objectives along with reflective questions and videos/readings as they pertain to the scenario. These materials are provided to the students to complete 1 week prior to the simulation date. During the orientation, students were introduced to the two roles available in the VR simulation: the *driver* and the *active participant*. The driver is the student who is responsible for managing the simulation for their peers, which includes transitioning and prompting during the active simulation. In the UbiSim program, the driver also has a predetermined checklist to keep the active participant on track. The active participant wears the VR headset and directly interacts with the virtual environment and patient. Students typically switch roles for each new simulation to allow each to participate in and experience both roles.

Each faculty facilitator was also orientated to the virtual environment. Each facilitator completed the UbiSim tutorial after participating in a general orientation to simulation hosted by the university. After completing the orientation, facilitators completed their assigned scenario independently a minimum of three times before the live simulation with students. Facilitators also received a facilitator guide, which included key transition points and a step-by-step breakdown of the simulation. This facilitator guide also contained a detailed structured prebrief and a step-by-step debrief outline using the PEARLS debriefing framework (Eppich & Cheng, 2015) that is used by our institution. The role of the facilitator in VR included helping both active participants and drivers to explore the scenario and assisting students in connecting actions to appropriate outcomes and learning goals.

Data were collected from undergraduate nursing students across two remote nursing programs over a 3-week period. Participants were recruited using purposive sampling to capture a range of perspectives related to IVR implementation. Students in the third or fourth year of their program who had participated in IVR simulations were invited to participate in focus groups. Faculty members who had been involved in the design, facilitation, or integration of IVR were invited to participate in individual semi-structured interviews.

Focus groups and interviews explored participants' experiences with IVR, including their perceptions of orientation, facilitation, realism, technical challenges, and overall impact on learning. To support methodological transparency, examples of the semi-structured focus group questions are provided here. Students were asked to describe their initial perceptions of engaging in virtual reality (e.g., "What did you think when you first heard you would be participating in a virtual reality simulation?"), their experiences during orientation (e.g., "Were the orientation videos and equipment preparation helpful?"), and their reactions to participating in the active simulation (e.g., "How did you feel during the virtual reality scenario?"). Additional questions explored the driver role, debriefing, and perceived impact on clinical reasoning and confidence.

All sessions were audio-recorded and transcribed verbatim. Data were analyzed using Braun and Clarke's (2014) six-step process for thematic analysis, which involved familiarization, coding, theme generation, and iterative refinement. Three researchers independently coded the transcripts and met regularly to compare findings and resolve discrepancies through discussion and consensus. Themes were then clearly defined, named, and supported with representative participant quotations to ensure coherence and credibility in the final report.

To ensure the trustworthiness of the analysis, we applied several strategies to enhance credibility, dependability, confirmability, and transferability (Lincoln & Guba, 1985). Credibility was supported through investigator triangulation: Three researchers independently coded the data and met regularly to compare and refine interpretations. Dependability and confirmability were strengthened by maintaining an audit trail of coding decisions and analytic memos throughout the process. Transferability was supported by providing rich descriptions of the study context, participants, and IVR implementation to allow readers to determine relevance to their own settings.

Ethics

Ethics approval was obtained from the university's health research ethics board. All participants provided informed consent and were assured of confidentiality and the voluntary nature of their involvement. Participation in the IVR sessions and subsequent focus groups or interviews was not graded and had no impact on students' course evaluation or academic standing. To promote psychological safety, focus groups were conducted by a research assistant who was not involved in students' instruction or evaluation, and participants were reminded that they could decline to answer any question or withdraw at any time without consequence.

Findings

The findings from this study revealed four themes that align with the research questions and provide insight into the design and implementation of IVR in undergraduate nursing education in a remote setting. These themes reflect participant perspectives on orientation and preparation, physical and spatial design, facilitation and support, and the immersive qualities of simulation. Collectively, these findings illustrate how IVR can support situated and authentic learning experiences in remote contexts.

The study included 12 participants from remote programs, comprising 11 females and one male, with the majority aged between 21 and 25 years. Most participants were in the third year (second semester) of their nursing program, with a smaller number in the fourth year. Previous VR experience varied, with most students reporting none, while a few had used VR through video games or experienced virtual reality outside of the home (see Table 1).

Table 1

*Participant Demographics (*n *= 12)*

Characteristic	***n***
Age	
< 20	0
21–25	8
26–30	1
31–35	1
36+	2
Gender	
Female	11
Male	1
Non-binary	0
Prefer not to respond	0
Previous VR experience	
None	7

Consul video games	3
VR at home	0
VR outside of the home	2
Year in program	
Third year, second semester	9
Fourth year, second semester	3

Note. VR = virtual reality.

Theme 1: Orientation and Preparation for IVR

Participants generally felt that orientation played a crucial role in successfully engaging with IVR for clinical simulations. While some found the provided orientation materials, such as videos, helpful in setting expectations and reducing initial anxiety, others felt unprepared, particularly those without prior VR experience. Participants expressed a strong desire for more hands-on practice before the simulations, as limited time with the IVR equipment created additional stress and affected learning outcomes.

Participant 4 appreciated the orientation materials, stating, “The orientation materials were very helpful.... They give you a clear idea of what to expect.” However, Participant 12 noted that while the videos were useful, “it’s different from watching at home versus being in the scenario.... Hands-on practice would have made it more beneficial.” Similarly, Participant 10 wished for more time to familiarize themselves with the equipment, explaining, “I wish there was more time to practise with the equipment.... Entering the VR space felt rushed.” Participant 11 echoed this sentiment, suggesting, “A test run would be helpful so you don’t feel like you’re being thrown into it.”

These findings support the notion that prebriefing and orientation are critical components of situated learning, preparing students to participate authentically in immersive and unfamiliar environments.

Theme 2: Impact of Physical and Spatial Design on IVR Experience

The physical set-up and spatial design of the IVR environment significantly influenced participants’ comfort, immersion, and ability to engage effectively in the simulation. Limited space, overcrowding, and equipment set-up challenges often led to discomfort, distraction, and difficulty navigating the VR environment. Many participants noted that small rooms with multiple set-ups restricted movement, affecting their ability to perform tasks effectively.

Participant 5 described, “There’s not enough space in the room. You end up bumping into things.... Two set-ups in a small room made it too cramped.” Similarly, Participant 10 stated, “It was hard to move around.... Having more room to spread out would reduce stress.” Navigation and handling of VR equipment were also hindered by the physical space and lack of practice, affecting participants’ ability to fully engage with the scenarios. Participant 3 noted, “The VR controls were confusing at first, especially if you wear glasses. It took time to adjust.” Participant 11 echoed concerns about the rushed set-up and expressed the need for “more guidance on how to interact with VR equipment effectively.”

Additionally, the presence of other students in the same room sometimes provided unintended learning benefits, as noted by Participant 2: “If two students are in the same room … you hear from the other student speaking about the same sort of things, so you kind of get an idea of what to do next.” While space constraints created challenges, some participants found value in overhearing peers, which indirectly guided their own actions.

Physical space therefore influenced not only the fidelity of the virtual experience but also the opportunities for social engagement. Even when learners were not actively collaborating, sharing the same physical environment allowed them to observe, listen, and compare approaches—forms of peripheral participation that reflect the social dimension of situated learning. These findings suggest that the design of the physical environment must support both the embodied and social dimensions of learning by allowing learners to move comfortably, observe others, and engage in shared reflection during or after simulation.

Theme 3: Support and Guidance in IVR Simulations

Facilitator support played a crucial role in participants' experiences with IVR simulations, affecting their confidence, comfort, and ability to engage effectively. Many participants highlighted the importance of having a facilitator available to reduce anxiety, provide guidance, and create a psychologically safe learning environment. Participant 7 noted, "The facilitators were always helpful, which made me feel safe to ask questions without judgement." Participant 11 added, "The facilitator was patient…. She made the environment a safe place for learning."

However, participants had differing preferences for the level of facilitator involvement. Some appreciated a balanced approach, where facilitators were available but not overly directive. Participant 1 explained, "The support was enough for me…. Having the instructor there if needed but not overbearing helped me focus." Others felt that additional structure or checklists would have been useful, particularly for the role of the driver, who was responsible for controlling the simulation while another student engaged in the scenario. Several participants expressed confusion about their responsibilities as the driver, with Participant 10 stating, "I didn't know what to do…. I was supposed to be responding to questions, but I didn't have a clue as to what was going on in the beginning." Participant 4 suggested, "Maybe there should be more, a list of what to say in the system"—indicating that clearer guidance could improve the experience for those managing the IVR interface.

Additionally, some participants felt that a structured test run or additional coaching (e.g., prompting students to navigate the learning environment and responses from the avatars) before entering the simulation would have been beneficial. Participant 11 emphasized, "There could have been a little bit more coaching prior to actually entering the scenario … especially for people who had never used VR before." Similarly, Participant 12 noted, "A test run would have made it more beneficial."

These insights reinforce that facilitation in IVR must extend beyond content delivery to include emotional and cognitive support, fostering psychological safety and role clarity as foundational elements of situated learning.

Theme 4: Realism and Immersion in IVR

A key aspect of the IVR experience is its ability to create a sense of realism and immersion, which can enhance learning by providing a safe environment for skill development. Many participants appreciated the opportunity to practise complex skills without the risk of harm to real patients, which helped build their critical thinking and decision-making abilities. As Participant 9 noted, "It felt like I was dealing with real patients, which helped me think critically about my actions." Similarly, Participant 4 stated, "It's helpful to make mistakes in VR without risking real lives…. It prepares us for real-life scenarios." These experiences emphasize the transferability of learning to clinical practice. Several participants (4, 5, 7, 10, 13) also described feeling more comfortable and confident after repeated exposure to IVR, noting that the ability to make and correct mistakes in a realistic, low-stakes environment reduced anxiety and enhanced preparedness for real-world clinical encounters.

However, the limitations of the VR interface sometimes disrupted realism and caused frustration, particularly when simulation capabilities did not align with real-life protocols. Some participants found that the constraints of VR restricted their ability to apply best practices, leading to inconsistencies in learning. Participant 5 expressed, “We learn best practices in the skills lab, but in VR, some things feel too artificial or don’t match real-life procedures, like blood transfusion checks.” Similarly, Participant 13 noted, “I wished some tasks, like measurements, felt more realistic…. It would improve the learning experience.”

Additionally, participants in the driver role found that the lack of clear options and guidance made their experience more difficult and frustrating. As Participant 5 pointed out, “We learn in skills lab how to do things a certain way…. Then we go into the VR world and we’re limited to what the VR world entails.” This disconnect between the structured nature of real-world procedures and the constraints of VR technology was a recurring challenge that affected engagement.

Despite these limitations, students recognized IVR as a safe and effective learning environment that allowed them to practise in context. Several participants (4, 5, 10, 13) commented that this practice enhanced their confidence for future clinical placements and contributed to a stronger sense of preparedness to assume professional responsibilities. The immersive nature of IVR aligns well with situated learning theory, supporting deep engagement in clinically relevant tasks.

Discussion

This study provides insight into how IVR can enhance experiential learning for nursing students, particularly in rural and remote programs. Participants described IVR as an engaging and realistic learning environment that supported the development of clinical reasoning and confidence. Several students noted that repeated exposure to IVR scenarios reduced anxiety, improved decision-making, and fostered a sense of preparedness for future clinical practice. The findings reflect the perspectives of students only, as faculty data were not analyzed due to limited participation. Nevertheless, the insights contribute to understanding how learners experience IVR and its pedagogical potential in undergraduate nursing education. Future research should explore faculty perspectives to better understand implementation processes and instructional design considerations. These findings reflect the principles of situated learning theory, which conceptualizes learning as a social process embedded within authentic activities and relationships (Lave & Wenger, 1991).

Participants noted that IVR enabled them to practise communication, decision-making, and prioritization in realistic scenarios. These actions allowed students to actively construct knowledge through participation in simulated clinical tasks, consistent with the idea that learning occurs through engagement in practice-based settings. Kim et al. (2021) similarly found that situated simulation experiences fostered the internalization of professional roles and responsibilities.

Students emphasized the importance of structured orientation. Those who received adequate preparation felt better equipped to engage, while others described feeling disoriented. This echoes findings in simulation literature about the role of prebriefing in learner success (INACSL Standards Committee, 2021; Verkuyl et al., 2024; Walsh et al., 2022). In situated learning, preparation supports learners’ transition from peripheral to central participation by helping them understand the expectations and context of the task (Lave & Wenger, 1991).

The physical design of the IVR space shaped how learners engaged with the simulation. Participants described distractions from other users, physical discomfort from the equipment, and limited space to move. These findings highlight how the material environment shapes learner immersion and participation. When the physical and virtual contexts do not align, the coherence of the experience is diminished, interrupting the construction of meaning (Lave & Wenger, 1991).

Facilitator presence was identified as essential for creating psychological safety and helping students reflect on their performance. Students valued instructors who guided, encouraged, and debriefed them. These findings align with D'Errico (2021), who emphasized the importance of active facilitation in remote simulation environments. Within a community of practice, facilitators model expert behaviour, scaffold learning, and support students as they navigate uncertainty, all of which are central to situated learning.

Confusion regarding learner roles, particularly for those assigned as the driver, disrupted engagement. Without clear role expectations, students struggled to understand how to participate, which limited their ability to internalize professional behaviours. Role clarity is critical for identity formation and social learning, as learners must understand their position within the community to make sense of their actions (Lave & Wenger, 1991).

Despite these challenges, students viewed IVR as a valuable tool to develop clinical judgement and confidence. Theys appreciated the opportunity to repeat scenarios, make mistakes safely, and practise in high-stakes situations that were unlikely to occur in their local placements. These findings support prior studies demonstrating that simulation improves critical thinking and knowledge integration (Cant & Cooper, 2017; Hanshaw & Dickerson, 2020; Lee et al., 2020). Lemée et al. (2024) similarly found that realistic simulations exposed rural learners to uncommon clinical scenarios, enhancing readiness for practice.

In addition to individual benefits, IVR supported collaboration between remote campuses. Students and faculty from different locations could engage in the same standardized scenarios, promoting pedagogical consistency and shared learning goals. This reflects findings from Roberts and Mazurak (2022) and Liaw et al. (2020), who noted that remote access to simulation supports intercampus equity and team cohesion. From a situated learning lens, these shared experiences enable the formation of a broader community of practice, regardless of geographic distance.

Furthermore, IVR facilitated a stronger sense of connectivity between classroom learning and future clinical practice. Anselmann (2023) found that educational strategies grounded in authentic tasks enhance learners' perceived preparedness for the workplace. IVR's realism, when well implemented, allows students to engage in professional roles and develop a sense of clinical agency.

Overall, these findings suggest that IVR, when thoughtfully designed and supported, can promote situated learning in undergraduate nursing education. Key elements such as structured orientation, facilitator presence, authentic scenarios, and clear social roles shape the depth and quality of participation. Because the findings represent student perspectives only, this study offers insight into how learners experience IVR rather than how educators design or facilitate it. Future research should examine faculty perspectives to deepen understanding of the pedagogical and operational factors that influence IVR implementation. By aligning simulation activities with situated learning principles, educators can create transformative learning experiences that not only build skills but foster professional identity and readiness for practice.

Transferability and Broader Implications

The findings from this study have implications for nursing programs seeking to address clinical placement inequities and support consistent learning outcomes across geographically distributed sites. While this work was situated in a remote nursing education context, the pedagogical principles underlying IVR—authenticity, active participation, and identity development—are broadly applicable. Other programs with limited access to complex or high-acuity clinical environments may similarly benefit from the integration of IVR to support clinical reasoning and professional socialization.

As Lave and Wenger (1991) describe, situated learning occurs through participation in meaningful practice within authentic social contexts. In this study, the value of IVR lies not in the novelty of the technology but in its ability to re-create the social and contextual conditions of professional nursing practice. This makes IVR particularly valuable in programs in which such conditions are otherwise difficult to access. When implemented with intentional instructional design and facilitation, IVR can extend the reach of faculty expertise, promote cohesion across campuses, and create shared opportunities for learners who may otherwise have disparate experiences.

The ability to connect remote learners and educators in real time also supports more inclusive and collaborative models of education. As Liaw et al. (2020) and Roberts and Mazurak (2022) suggest, simulation technologies that allow for synchronous participation across locations foster team-based learning and pedagogical alignment. These benefits are not limited to nursing and may be relevant for interprofessional education or health programs operating in distributed regions.

The transferability of IVR-based learning also extends to contexts beyond undergraduate nursing. As simulation expands into continuing education, licensure preparation, and competency-based assessment, IVR may offer flexible and scalable options for practice and evaluation. However, its success will depend on maintaining the relational and contextual features that support situated learning, including facilitator presence, role clarity, and alignment between virtual tasks and real-world professional expectations.

Finally, the study's findings reinforce the importance of investing in simulation environments that are not only technologically advanced but also pedagogically sound. As programs consider IVR adoption, attention must be paid to the full learning ecosystem, including physical space, faculty development, learner support, and curricular integration. When these elements are in place, IVR can support equitable, high-quality clinical education and foster the development of competent, confident graduates prepared to enter complex health systems.

Limitations

While this study offers important insights into the use of IVR in remote nursing education, several limitations must be acknowledged. The sample was limited to a single institution and remote program stream, which may affect the generalizability of the findings to urban settings. The study relied on self-reported data from focus groups and interviews, which may be influenced by recall or social desirability bias, particularly given participants' familiarity with faculty. Although faculty were invited to participate in interviews, their data were not analyzed due to limited participation. As such, the findings reflect the perspectives of students only. Additionally, IVR was explored within a single technological platform and curricular context. Variations in equipment, facilitator approach, or implementation models may yield different outcomes. The study also did not include direct observation or assessment of learner performance, limiting conclusions about the impact on clinical competence. Future research should explore longitudinal use, include diverse educational settings, and examine observable learning outcomes to strengthen the evidence base.

Conclusion

This study explored nursing students' experiences with IVR in a remote undergraduate program through the lens of situated learning theory. The findings demonstrate that IVR can promote meaningful engagement, confidence, and professional identity development when supported by structured orientation, effective facilitation, and thoughtful physical design. By highlighting how learners interact with IVR in authentic practice contexts, this study contributes to the growing evidence for IVR in nursing education. Future research should expand to include faculty perspectives and multi-site evaluations to better understand implementation processes and optimize IVR integration across diverse educational settings.

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