

Nurse Educator's Guide: Using

VIRTUAL REALITY

to Boost Simulation Experiences



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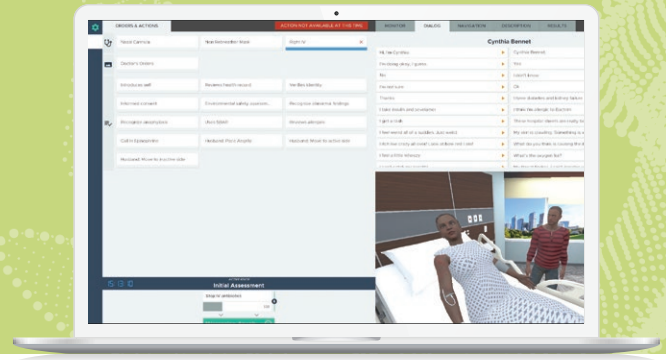
Immersive technology provides many advantages over more traditional types of simulation. The most pressing advantage in our times is the ability to host remote learning activities. Many immersive platforms allow the educator and students to be in real-life separate spaces, while still participating in the same virtual simulation. Scenarios can also broadcast in real-time to a larger student audience who can participate through observation.

Remote learning can provide the opportunity to invite expert guest educators. For instance, a nationally renowned cardiology educator could serve as a remote moderator for an Advanced Cardiovascular Life Support (ACLS) simulation. Immersive technologies also allow for more control over the development of scenarios. For example, the educator can decide the amount of visual realism needed to teach a specific topic. They can design the cases to be fully immersive or partially immersive to allow for hints or other guidance through a case. There is also the ability to program cases to run with a moderator to guide case flow or to allow the student to play through

the scenario like a video game without a moderator. This can allow for a wide range of case complexity. Educators could design either basic scenarios students complete asynchronously, or highly complex scenarios with dynamic case flow and multiple potential outcomes.

For educators contemplating implementing immersive technologies, first consider a few basic principles. Most importantly, set out clear learning objectives. Once established, determine if virtual reality is the right technology to help teach these learning objectives. The best applications of this technology leverage the unique strengths of VR, such as the ability to provide remote learning or increased visual realism. Also consider the practical application of the technology during the learning activity, such as if students will complete the scenarios individually or in groups and how to include extra students that cannot actively participate in the scenario. Careful planning that is grounded in establishing clear learning objectives before implementation will allow the technology implementation to be successful.

The Move to Virtual Reality: Linking Theory to Practice



Immersive technologies such as virtual reality (VR) and augmented reality (AR) have seen a recent explosive evolution of applications for medical education. It is now becoming practical to incorporate this technology to teach nursing, medical, and other health professions students. This continues a long tradition of experiential healthcare training. While incorporating new technology is exciting, it is important to understand the educational theory behind its implementation to create the best curriculum for students. Core educational theories that have shaped current simulation-based curriculums include behaviorism, constructivism, social-constructivism, and experiential learning (McGaghie, 2018).

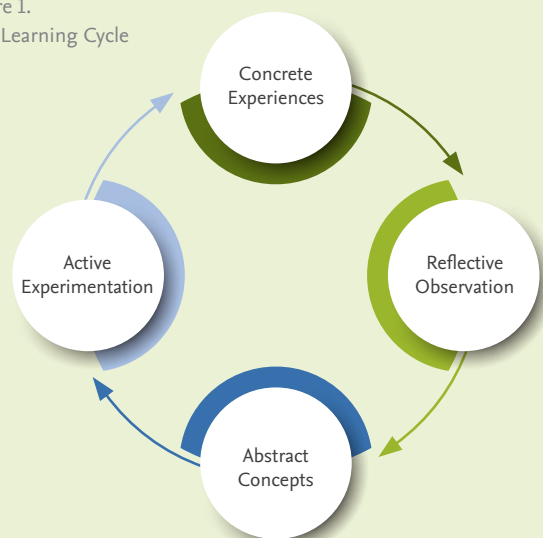
One of the earliest education theories, **behaviorism** describes how students respond and adapt to their environment. For a pure behaviorist, the focus is on what students do, not how they think or feel (Kay, 2016). This theory is teacher centered. Teachers control the environment, identifying appropriate rewards and/or punishments to reinforce desired behaviors. While modern educational theory has certainly moved beyond pure behaviorism, it has had lasting contributions on educational framework, including direct teaching, role of incentives and rewards, the importance of clarifying learning objectives, and behavior management (Kay, 2016).

Constructivist learning theory sees knowledge as subjective and actively constructed as learners engage with, and make meaning of, their lived experience (Kay, 2016). Instead of knowledge being an objective fact that the teacher holds and shares with the learner, constructivists believe knowledge is subjective. The learner builds their knowledge through subjective experiences and in the context of previous life experiences.

This paradigm shift to constructivist learning theory was in large part due to Jean Piaget's research on the cognitive development of children. Teaching strategies include more student-centered instruction designed to engage students in constructing their own personal knowledge. Lessons are designed to take place in real-world situations where students are presented with complex problems. Social constructivism takes this idea further to say that students live in a social context that guides their perspective, learning in the context of their lived experiences in society.

Another learning theory put forth by Kolb and Fry is the **experiential learning cycle**. Building on previous theories, they explained that learning happens in a continuous loop from concrete experiences, to reflective observation of experiences, to formation of abstract concepts, to testing new concepts, which make more concrete experiences. Students can enter the cycle at any point, and this process can happen quickly or over time (Kolb, 1984).

Figure 1.
Kolb Learning Cycle



Scenarios can also broadcast in real-time to a larger student audience who can participate through observation.



These foundational learning theories have influenced modern healthcare education. Most programs have moved to providing students with early clinical exposure, with the intent that this real-life experience will provide a student-centered, rich learning environment. However, putting learners in a real clinical environment can lead to errors affecting patient care. These less controlled environments may also leave opportunity for inappropriate student stress and trauma that could have negative learning consequences.

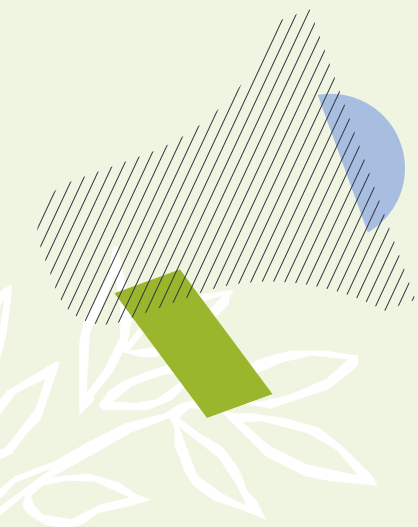
To balance these challenges of experiential learning in a clinical setting, simulation-based learning gives students exposure to real-life experiences without the risks of patient harm. Simulation learning has been shown to enhance transfer of learning, specifically allowing students to take on the roles of what will be expected of them in practice (Miles, 2018). Until recently, manikin-based simulation was the most common available option for high fidelity, realistic simulation. But with the technological advances in VR and AR, immersive technologies can augment or replace manikin-based simulation to provide an engaging and interactive real-life experience (Izard, 2018; Kyaw, 2019; Ellington, 2019; Sapkaroski, 2019).

Immersive technology provides many advantages over more traditional types of simulation. The most pressing advantage in our times is the ability to host remote learning activities. Many immersive platforms allow the educator and students to be in real-life separate spaces, while still participating in the same virtual simulation. Scenarios can also broadcast in real-time to a larger student audience who can participate through observation. Immersive technologies also allow for more control over the development of scenarios. Educators could design either basic scenarios that students complete asynchronously, or highly complex scenarios with dynamic case flow and multiple potential outcomes. Careful planning that is grounded in establishing clear learning objectives before implementation will allow the technology implementation to be successful.

Debunking Myths about Virtual Reality

Virtual reality in nursing education provides students with a new, immersive way to gain clinical experience in a safe environment. As more information comes out on virtual reality in simulation, so do misconceptions about the technology, its practicality, and importance in nursing programs.

Here are the top four myths on virtual reality debunked.



1 MYTH: Virtual reality is too new of a technology and untested.

Contrary to popular belief, virtual reality technology has been around [since the 1960s](#)¹. Over the last sixty years, VR has continuously evolved and improved. When it comes to using VR in healthcare settings, there have been [a number of different applications](#)² in patient care and training future healthcare providers. Bringing virtual reality to nursing education extends the already existing reach of VR technology.

When it comes to the Simulation Learning System (SLS) with VR, developed in collaboration with partner [SimX](#)³, trusted content from SLS was used to create 100 immersive virtual reality scenarios. The team at SimX, comprised of physicians from Stanford, UCLA, and UCSF, brings VR training to over 150 different institutions around the world, including governments, hospitals, universities, and military.

2 MYTH: Virtual reality is too expensive in general.

The VR headsets on which SLS with VR operates range in cost, starting at around \$350 per device (e.g., Oculus Quest 2). [According to an INACSL study](#)⁴, even the most basic simulation labs costs start at over \$100,000, and more advanced labs can cost millions. This price alone does not account for all of the equipment costs, manpower costs to operate, actor and volunteer costs, and other expenses to maintain a simulation lab.

Additionally, sim manikins can average \$27,000 and can easily cost upwards of \$60,000 per manikin. Most sim labs require multiple manikins including medical-surgical, obstetrics, pediatrics, and more. To provide unique manikins for each of these disciplines means the cost for most sim labs can quickly surpass \$100,000. Virtual reality can bring this price down significantly, with [SimX](#)⁵ estimating that VR is about one-tenth the price of a standard simulation manikin.

3 MYTH: Virtual reality is unsafe.

While some users can experience headaches and dizziness from prolonged use, virtual reality is safe when used responsibly. Overall, the more students use VR, the easier it is to adapt to it. However, students should take frequent breaks when using the headsets. For users with preexisting medical conditions like vertigo and epilepsy, it is recommended to consult with a doctor before use.

Latency, or the amount of time it takes for the movements of your head to be replicated in the virtual environment, is also an important consideration for safe VR use. With higher latency times, VR perception and physical experiences aren't aligned.

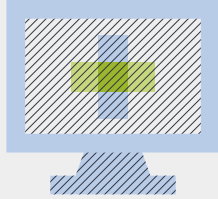
When it comes to safety in the classroom, it's important to keep in mind the space required for safe VR use. With the Oculus Quest 2's Guardian feature, users do not have to worry about any unseen dangers in the VR headset. As long as the required physical space is clear of obstacles, users are safe within the VR environment.

4 MYTH: VR is not a good educational tool.

Effective patient care is essential for students to become great nurses. Not only can VR be a great educational tool to teach hands-on skills through immersive, realistic experiences, but it can also help students learn soft skills, such as how to communicate to patients with empathy. VR allows students to learn the right things to say to the patient by practicing in scenarios that have interactive communication.

VR also presents simulation experiences in a safe environment controlled by facilitators who can guide student learning. Educators can put in keywords that the student must mention or implement further scenarios to improve their skills. Presenting students with these skills in a virtual experience makes the scenarios more real, helping students develop skills they can apply in the clinical setting.

Meeting the **Clinical** Requirements



NCSBN Expert Panel Checklists

The National Council of State Boards of Nursing (NCSBN) has provided an additional tool to help nursing programs offer student-centric simulation experiences and to help state boards of nursing provide effective oversight. In 2016, an expert panel was convened to develop national guidelines that integrate evidence regarding simulation. The expert panel included representatives from the International Nursing Association for Clinical Simulation and Learning (INACSL), the American Association for Colleges of Nursing (AACN), the National League for Nursing (NLN), the Society for Simulation in Healthcare (SSIH), state boards of nursing, and the NCSBN. After a review of the literature, the expert committee developed two checklists to be used to ensure evidenced-based simulation — one for the program and one for the faculty. Below is a synopsis of each checklist.

Program Checklist

- Adequate fiscal, human, and material resources
- Policies and procedures to ensure quality-consistent simulation experiences
- Adequate number of dedicated, trained simulation faculty members
- Job descriptions for simulation faculty/facilitators
- Plan for orienting simulation faculty/facilitators to their roles
- Use of a needs assessment to determine which scenarios should be used
- Subject matter expertise for each scenario debriefing
- Incorporation of INACSL Standards of Best Practice: Simulation
- Appropriate physical space for education, storage, and debriefing
- Use of evaluative feedback for quality improvement of the simulation program
- Long-range plan for the simulation program



Visit <https://ncsbn.org/9535.htm> for more information about the guidelines established by the NCSBN expert panel.

Faculty Checklist

- Based on educational theories associated with simulation, such as experiential learning theory
- Preparation of faculty using the INACSL Standards of Best Practice: Simulation
- Evaluation plan reflecting INACSL Standards of Best Practice: Simulation Evaluation Methods
- Based upon clear objectives and expected outcomes communicated to students prior to each simulation activity
- A learning environment that encourages active learning, repetitive practice, and reflection; faculty provide appropriate support throughout each activity
- Preparation of faculty for use of facilitation methods congruent with simulation objectives/expected outcomes
- Use of a standardized method of debriefing using a Socratic methodology
- Development of a rubric to evaluate student acquisition of KSAs throughout the program
- Development of a method to share student performance with clinical faculty
- Collection and retention of evaluation data regarding the effectiveness of the facilitator
- Provides professional development (webinars, conferences, journal clubs, readings, and certifications, such as certified health care simulation education) and participation in NLN Sim Leaders/Sigma Theta Tau International Nurse Faculty Leadership Academy (with a focus on simulation)

Making Your Lab Virtual



SLS with Virtual Reality creates an immersive clinical experience meant to be used alongside current practices in your simulation lab. Virtual reality technology provides students with a safe, ultra-realistic virtual environment to gain valuable hands-on patient care experience.

As an immersive clinical experience, VR can be used alongside traditional simulation practices to help combat some challenges to clinical that students and faculty may be facing:



Moderator Capacity

Only one moderator (or facilitator) is required, and they will have a full view of what students are experiencing in the VR space. Moderators also have access to orders and actions that help better facilitate the scenario.



Clinical Judgment

Students are required to make decisions in real time that have direct patient implications in realistic clinical scenarios.



Soft Skills

Direct patient interactions and responses, as well as communication with family members, makes developing communication skills easier for students.

Virtual reality in nursing education can vary and look different, depending on your needs and provider. Elsevier's SLS with VR is conducted with Oculus Quest headset equipment and hand controllers.*

Classroom Requirements and Recommendations



In order to use SLS with VR, here are a few requirements and recommendations:

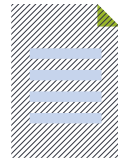
- 1 10' x 10' space is required, with up to 25' by 25' maximum space with Oculus Quest
- 2 Two VR headsets per 50 students is recommended for your simulation center
- 3 Laptop computer with Windows operating system
- 4 **Optional:** A second laptop and monitor are recommended for student observation that allows for student interaction

When facilitating VR simulations, we recommend including the following roles for a successful simulation experience:

- 1 Two student nurses that can interact together in the scenario
- 2 A facilitator who can moderate the scenario, typically an instructor or lab coordinator
- 3 Student observers who can learn from the scenario run by the students

Specific implementation and detailed operating requirements can be discussed with your account team upon adoption.

**Elsevier will support additional hardware that is supported by SimX, as it becomes available.*



Writing and Reaching Out

When writing grants for funding in nursing education, applicants should be clear and concise while communicating the details of how the grant will be executed. Although there are online registration steps for these funding projects with requirements of what's included, it's also important to keep your intention and audience in mind. Think about your program needs relevant to simulation and determine what will be most beneficial to achieve your goals.

Explore available resources for nurse education programs at <https://evolve.elsevier.com/education/expertise/simulation-success/funding-simulation-technology-in-your-nursing-education-program/>



Local Outreach for Funding

After exploring resources offered by outside organizations, faculty still have some options when it comes to funding simulations in their courses and should pursue multiple avenues to extend the reach of their ask. Are there other schools nearby that you may be able to partner with to share equipment and resources? Look for partners in your community who can help! You can also reach out to clinical agencies, medical centers, etc. that you work with closely who might be interested in helping or working with you in a funding capacity. Many agencies might be interested in joining your efforts with the potential for publication and attention drawn to your program.

As we continue to teach in classrooms that are shifting and adapting to all of the changes that have come our way, innovative simulation programs can be the answer to ensuring students have strong patient experiences with opportunities to develop their clinical judgment. Buffering challenges that programs may face when it comes to sourcing funding for tools in simulation should be explored from numerous avenues.

Grant Writing to Receive Funding for Your Program

Using simulation in nursing education provides students with an opportunity to build their clinical judgment and reasoning skills in a safe environment. Whether you're using a solution like the Simulation Learning System (SLS) in the simulation lab or virtually, giving students opportunities to practice patient care builds their clinical competency and overall practice readiness. Nursing education simulation has also recently expanded to include virtual reality (VR) — an immersive, realistic virtual environment where students can gain valuable nursing experiences. Although simulation and VR are great learning tools, the associated cost for equipment can be expensive for nursing programs.

As the need for creative solutions for clinical judgment development in the nursing classroom becomes more pressing, exploring different options to source funding for these solutions is important. Luckily, there are a number of resources available to nursing programs to find funding for simulation and tips on how to successfully make these requests.

Learning Strategies Associated with Virtual Reality



One of the primary strengths of the SLS with VR solution is the ability to truly “train how you fight,” as the military saying goes. Achieving a high degree of psychosocial immersion is key to encouraging learners to make decisions around patient care, helping to cement both the memory of the experience and the lessons learned. However, inadequate preparation can leave learners unmoved by even the most sympathetic of simulated patients. Similarly, a lack of deliberate and effective performance review, or debrief, can leave learners unable to process the experience and integrate feedback into future patient care experiences. VR simulation brings unique challenges and advantages to the paradigm of experiential learning, and properly understanding these unique aspects of VR simulation can allow instructors to fully realize the learning potential in any given learning scenario. Below are recommended strategies for preparing, using, and debriefing from a VR simulation.

Setting Expectations for Students in the VR Simulation Space

In preparing learners to participate in VR simulation, instructors are best served by clearly communicating the overarching learning objectives of a scenario. Special emphasis on objectives related to communication and interprofessional patient care will sufficiently prepare students to eliminate any systemic barriers to learning. As with other simulation modalities, giving students a general sense of clinical context, including briefing them on the simulated environment (hospital, clinic, etc.) and their role within the scenario (nurse, EMS, etc.), is crucial to their success in navigating the VR simulation.

Once inside a scenario, students must navigate the social and medical complexities of the scenario, including getting additional background/history and responding to the social and physiological changes in the patient. Students should be encouraged to verbalize thought processes as much as possible, especially to other learners present in the VR scenario, but also to the VR patients themselves. This will allow instructors to more easily recognize whether students are achieving learning objectives centered around communication and observation.

VR TIP: Students should be reminded that they have access to the same types of healthcare staff they would in any other clinical context, specifically the attending provider and emergency response teams.

The SimX software platform has unique functionality that blends the advantages of standardized patients with manikin-based simulation, so learners should be prepared to interact with patients and other virtual characters as they would in real life. This includes speaking with virtual characters freely, using clinical tools to conduct physical exams as they would in real life, and using medical devices as they would in any other clinical setting.

Acclimating to New Technology in the Classroom

Although VR has the unique power to place learners into wholly immersive environments with a diversity of patient archetypes, it remains a relatively nascent technology. Due to this fact, the two key systemic barriers to immersion that instructors must address are the lack of familiarity with VR hardware and interactions and the novelty of VR simulation.

Learning Strategies Associated with Virtual Reality, *cont.*

As with any new simulation tool, if students are distracted by the tool itself, they will be unable to emotionally invest in the learning scenario and unable to navigate it as intended. The best way to mitigate this effect is to ensure that learners have access to training materials in advance and allow them to experience the VR environment and hardware outside of the simulation session. To this end, training literature and videos are available to introduce students to VR simulation and the hardware used, as well as how tool use and patient interaction is achieved using VR hand controllers.

VR TIP: Learners should spend at least ten minutes within the available VR tutorial scenario, if not more. This will enable them to experience immersion within VR, as well as practice navigating within, and interacting with, the SimX VR environment specifically.

With proper preparation, students should be appropriately aware of the realistic nature of content within the simulation curriculum and the treatment of VR scenarios as a practice run for a true clinical setting. Accordingly, many will not optimally navigate cases. Prior to entering the simulation, students should be reminded that mistakes in simulated care will lead to better care of actual patients, and they should be prepared to review their performance in a safe and judgment-free debriefing session following their VR experience.

Debriefing with VR

In nursing simulation, the debriefing process is where much of the learning occurs. As the simulation proceeds, the SimX Moderator interface will automatically track many actions students take, including relevant physical exam maneuvers and other direct patient care activities, such as medication administration and wound care. In addition, the moderator software allows for subjective learning goals to be manually tracked by the instructor observing the case directly.

At the conclusion of a scenario, all of these predetermined learning objectives are displayed in a simple and streamlined debriefing summary.

- Under scenario information, a breakdown of the learners' performance in each state of the scenario is shown, indicating which learning objectives, or "critical actions," were accomplished, and which were missed.
- At the bottom of the report, all of the events of the simulation session are listed in chronological order. This is especially useful when talking through a case with a learner and reconstructing the events that occurred during the simulation.

Using additional software tools, it is also possible to record the entire VR simulation on a computer running the SimX Moderator software. This can allow learners to see exactly what they were doing during the case, and when, compared to the debrief summary, and what learning objectives they achieved or missed, and when.

In giving learners sufficient preparation for VR simulation, and the SimX system more specifically, the time spent in the VR simulation lab can effectively ready students to tackle complex social and medical patient care experiences. An emphasis on investing in their virtual patients, verbalizing their thoughts and plan of care, and familiarizing themselves with VR hardware and the SimX virtual environment can yield appropriately stressful and meaningful experiences within VR clinical scenarios. Using the debrief summary to review learner performance with respect to clear learning objectives in a safe environment can help build clinical confidence and lead to significant growth in areas of deficiency.



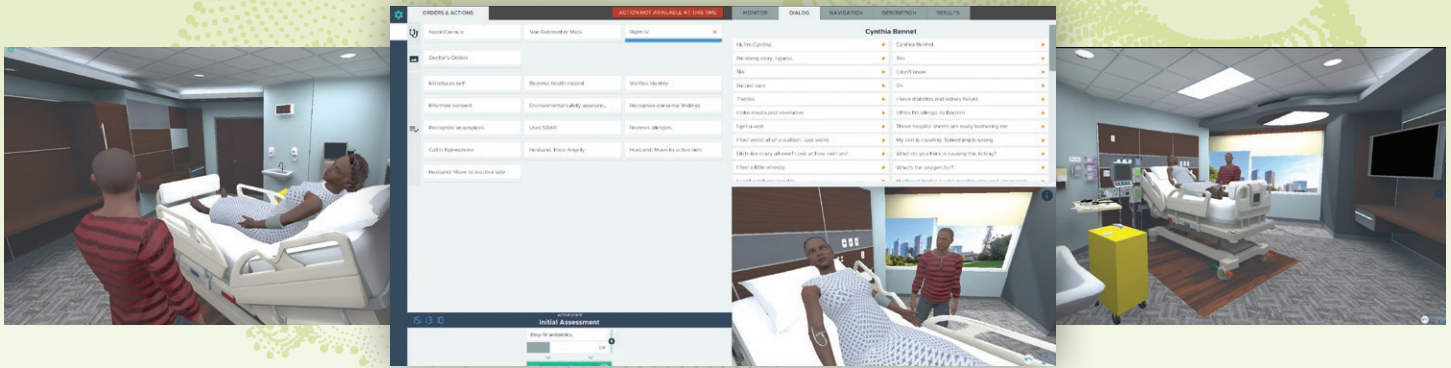
Students Working Together in the Virtual Reality Environment

One of the unique strengths of virtual reality (VR) is allowing for the creation of customized simulated scenarios that can replicate the stressful or high yield moments of a clinical experience. **Unlike many traditional simulation scenarios, students can be dramatically immersed into a virtual case that takes the form of any number of real-life clinical environments.** Improving this quality of realism can elicit more genuine evaluation of decision-making capability, critical thinking, and communication, thereby identifying opportunities for improvement. Providing students with the guidance they need during these simulations in VR can enhance their learning experience and hone their clinical skills.

Using VR to Develop Learning

Many students may be unfamiliar with VR simulation, so it is important to set expectations for learning objectives and the user experience as bound by the limitations of the VR environment. This will also be dependent on the software program being used, as some products allow for enhanced physical mobility through a wireless system, or the ability to have multiple learners inside a clinical scenario, as available through our offering. The degree of patient interaction is also software-dependent and requires adequate orientation to the VR environment.

Depending on the core objectives of the case, students should be able to develop interventions along the way. These interventions can be time-sensitive and may ultimately change the outcome of the case. In general, students can be evaluated on the tasks completed or by the effectiveness of their team-based communication and critical thinking.



Using the Multiplayer Scenario

In a multiplayer scenario, virtual reality provides unique opportunities for collaboration amongst learner populations. These scenarios can empower students to develop a team-based approach in navigating a case, allowing learners to establish lines of communication between students, the patient, and non-playable characters (NPCs), or by delegating certain responsibilities amongst team members. Students should be able to interact with each other as they would in a real-life clinical scenario. This could be as basic as identifying who obtained what type of clinical data, including vital signs, physical exam findings, patient history, and point of care testing, or identifying gaps in that data acquisition and “filling in the blanks.”

Delegating responsibility in an immersive VR environment can also be advantageous in a multiplayer case. For example, one student may be focused on a clinical intervention, while the second student is attempting to interact with a difficult family member. The ability for interprofessional simulation can enhance this experience. For example, learners in nursing and case management can collaborate within the same case and demonstrate interprofessional communication while also focusing on their core skills. A case that involves a pharmacist and a clinical nurse could evaluate skills in resource utilization and closed loop communication. An advanced learner could collaborate with a novice learner, allowing for assessment of both clinical knowledge and development as a mentor.

Using VR to Simulate Real Life

Understanding that there are inherent limitations of a virtual environment, students can navigate a clinical case as they would in a real-life scenario, and the high-quality immersion allows learners to better “feel” the stress of the moment. Being able to recall these moments is a core intent of simulation in education. Virtual reality simulation experiences can use repetition to develop core skills, such as by performing each step of a certain procedure, and even troubleshooting common issues that may be encountered along the way. More so, this is true for protocols or quality and safety measures that are crucial to clinical practice. Examples include ACLS, preoperative checklists, or questionnaires.

Virtual reality simulation experiences are also very useful for the less common clinical scenarios that students may rarely encounter in practice. More often than not, students will make mistakes in these specific cases that may be less familiar. This provides a unique learning moment for students, both during the course of the simulation case and in the debriefing after the case is completed. When these similar situations arise in real life, the students can refer to their simulation training, and that familiar stress of the immersive VR case, as they have “been there before.”

Students can ultimately use these simulation experiences to identify their strengths and weaknesses. Being able to recall specific scenarios, as well as broader tendencies, allows students to develop more comprehensive improvement plans vital to their practice in typical clinical settings. This may also hold true in the future for recertification and reevaluation throughout their clinical practice.



How Faculty Can Work with Students to Improve Virtual Reality Experience

Faculty play a critical role in VR learning experiences by setting expectations for the simulation, establishing a safe learning environment, and facilitating a debrief to support reflection throughout the scenario. Moderating and teaching in a virtual environment gives faculty control of additional tools that will help them monitor learners' progress and build their clinical judgement. This article provides strategies for faculty to guide students through cases and enhance the VR learning experience before, during, and after the simulation session.

Preparation and Orientation to a VR Simulation Session

Adequate preparation prior to the learning session is one of the most important phases when planning to teach students in VR. Prior to instruction, all teaching faculty should participate in simulation instructor and debriefing training, along with an orientation to the VR hardware and SimX moderating software. Next, to plan the simulation session, instructors should begin by selecting the desired clinical scenario(s) and learning objectives. When a case is created, the critical actions, requirements for state change, patient vital signs, and interventions are defined by the case author for each step. Especially those who are new to teaching and moderating in VR, the faculty member should rehearse the case prior to the learning session from both the perspective of the moderator and the learner to familiarize themselves with each element that will affect the flow of the case. Once the moderator is comfortable with the case and how the learning objectives are to be executed in the VR case, you are ready for your simulation session.

Performing an adequate orientation and pre-brief to the VR simulation session is important in cultivating a safe learning environment and setting expectations for the learners. To begin, make sure the learners have been oriented to the VR headset and the VR training environment. Typically, a learner will participate in a case from onset through completion in one setting. Inform learners how much time is planned for the case and debrief session.

VR TIP: If more than one learner is going to participate in a case, it is helpful to identify which learner will take primary responsibility as the “primary nurse” and which learner(s) will be secondary nurse(s).

Facilitating a VR Simulation

One of the challenging tasks for the moderator is to ensure that the learners have a fully immersive experience. Encouraging the learners to treat patients and non-playable characters in VR as they would interact with them in real life will allow learners to be fully engaged in the learning environment. Some of the most common ways to interrupt immersion is delayed response to learner questions and not activating animations at the appropriate times. Keeping the “Dialogue” tab open during most of the case will allow for quick responses to questions that are asked by the learners. Furthermore, in most cases, it is best to keep the VR pane in the third person view, to ensure the moderator can see the actions of all participants, switching to a first-person view only to troubleshoot.

Sustaining an immersive experience can be challenging when learners get stuck. Knowing the case well will allow for adapting the case in the moment to the learner's needs. If a learner is challenged by a particular portion of a case, there are several ways to proceed.

How Faculty Can Work with Students to Improve Virtual Reality Experience, *cont.*



For example, some moderators will introduce a “helper” into the case, a “nurse” or “consultant” who will suddenly call into the case to provide a crucial hint or additional information.

VR TIP: If the critical action they are missing is trivial, the moderator may consider manually advancing the case or using tools in the program like the “Jump to State” button, then plan to discuss the missed order or action during debriefing.

If time allows for the same learner to attempt a case multiple times, the moderator can allow the learner to fail a critical action and the patient to deteriorate. While not all cases are designed with this option, many will transition to a “deterioration” state if they do not perform required actions within a certain period of time. After a short debrief of the failed scenario, you can have the learner repeat the case and correct their mistakes. Notably, there is no option to modify a patient’s vitals manually in the SimX moderator client. This is done intentionally to encourage careful case design and to discourage drastic deviation from the learning points within a case. This also allows the moderator to focus less on manually adjusting patient vitals, and more on observing the learner in the case to maximize learning.

Reinforcing Clinical Judgment to Simulation Sessions

Following the completion of the case, assist the learner(s) with the transition safely out of the VR headset and give them time to complete any documentation exercises or reflections outside of VR. Using a structured, pre-planned debriefing tool will help structure the conversation to solidify learning objectives. The 3D model of debriefing (diffusing, deepening, discovery) or the PEARLS healthcare debriefing tool are just two examples of debriefing methods that can help guide and facilitate an effective debriefing session. Teaching in VR allows for learners to have a truly immersive learning experience. Optimizing the effectiveness of this platform requires some modifications unique to VR simulation but is ultimately rooted in the foundations of healthcare simulation.



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James Delgadillo, MD

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Footnotes

¹ <https://www.geospatialworld.net/blogs/common-myths-about-virtual-reality/>

² <https://www.linkedin.com/pulse/brief-history-ar-vr-healthcare-peek-future-mixed-reality-taniya-singh/>

³ <https://www.simxvr.com/>

⁴ [https://www.nursingsimulation.org/article/S1876-1399\(09\)00462-9/abstract#:~:text=In%20addition%20to%20providing%20a,advanced%20labs%20can%20cost%20millions.](https://www.nursingsimulation.org/article/S1876-1399(09)00462-9/abstract#:~:text=In%20addition%20to%20providing%20a,advanced%20labs%20can%20cost%20millions.)

⁵ <https://www.simxvr.com/>

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