Virtual Simulation: An Educator's Toolkit

VIRTUAL SIMULATION: AN EDUCATOR'S TOOLKIT

An Educator's Toolkit

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ABOUT THIS TOOLKIT

About this etextbook

This open access etextbook was developed as a resource to help educators and simulationists use virtual simulations with learners in all educational settings. It is designed to highlight key concepts related to educator preparation, prebrief, enactment, debrief and evaluation stages required for providing an effective virtual simulation learning experience. The foundational information in this etextbook will benefit any educator who is using virtual simulation in a course, lab, clinical setting or to augment clinical practice.

This book includes **interactive content** and **videos** and is therefore **best viewed using the online pressbooks format.** *The book can also be downloaded in a pdf format.*

Funding

This project is made possible with funding by the Government of Ontario and the Virtual Learning Strategy. To learn more about the Virtual Learning Strategy visit eCampus Ontario's VLS webpage.

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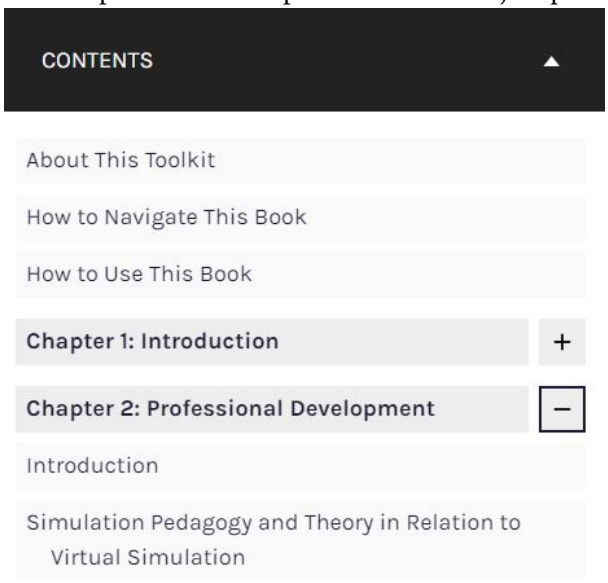

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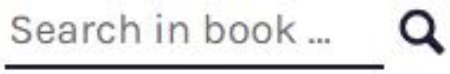

HOW TO USE THIS BOOK

Welcome to the Virtual Simulation Educator's Toolkit, a resource to promote emerging best practices in teaching with virtual simulation. This book was designed to help educators who are new to using virtual simulation get started and to help educators with virtual simulation experience take their practice to the next level. Excellence in teaching with virtual simulation is all about process and the chapters of this book are structured to reflect that process. Chapter 1 begins with an introduction to virtual simulation and key terms. Chapter 2 focuses on how educators can prepare to use virtual simulations with learners. Chapters 3, 4 and 5 take the reader through the process of teaching with virtual simulation: the prebrief, enactment, and debrief phases. Chapter 6 focuses on evaluating the virtual simulation, learner outcomes and facilitation skills.

The chapters include specific features designed to enhance learning and engagement. These include:

Three types of boxes:

- **Examples in Action**: Educators share actual examples of how they embed virtual simulation in the curriculum and use virtual simulation with learners.
- **Expert's Corner**: Educators, with expertise in virtual simulation, provide key points and recommendations.
- **Spotlight on Scholarship**: Scholarly articles on a specific aspect of virtual simulation are highlighted.

Videos:

Experts share their thoughts and strategies for teaching effectively with virtual simulation on short video clips.

Tables and checklists:

Numerous practical step-by-step strategies are provided in checklist format to be used as guide when teaching with virtual simulation.

Reflective questions:

Activities designed to encourage reflection on teaching with virtual simulation. Responses can be downloaded and saved it for future reference.

References and Resources:

The content for this resource was drawn from the exemplary work of numerous authors who are cited and recommended for further reading.

Glossary:

Hovering over specific words with the pointer will cause certain definitions to appear.

CHAPTER 1: INTRODUCTION

Learning Objectives

1. Define and differentiate among: virtual simulation, virtual gaming simulation, and virtual patients, virtual reality, augmented reality, mixed reality, screen-based simulation, and telesimulation.
2. Outline the different architectures that virtual simulations can take.
3. Find sources for virtual simulation platforms, and free simulations.
4. Describe considerations for integrating a virtual simulation into a curriculum, including pedagogical and logistical considerations.
5. Define psychological safety and its role in simulation-based education.

VIRTUAL SIMULATION COMES OF AGE

In general, virtual simulation has been a relatively niche area within the world of simulation. The Covid pandemic, with its associated disruptions in work placement learning, and restrictions on simulation laboratory bandwidth, thrust virtual simulation modalities into the spotlight.

Beyond offering a form of simulation that can be done without requiring in-person gatherings, virtual simulation modalities offer opportunities for engagement, types of interactions, and forms of fidelity or realism that more traditional forms of simulation (physiologically-enabled manikins, standardized/simulated actors, mock equipment, and part task trainers) cannot. Virtual simulations are quickly becoming an essential part of the educator's toolkit.

As a relatively nascent and rapidly expanding technological and pedagogical field, there is currently no standardized or broadly-accepted taxonomy of modalities that fall under the umbrella of "virtual simulation." Similarly, the evidence base for best practices in the design and implementation of virtual simulations is still evolving.

In this e-book, the state of the art science and technology of virtual simulation, reflecting the best evidence available at the time of writing, is presented. The evidence base does not yet allow the articulation of definitive best practice guidelines, however, this toolkit should be useful to educators who wish to implement and optimize the impact of virtual simulations for their learners.

TECHNOLOGICAL VARIETY

The term "virtual simulation" is not well-defined and can mean different things to different people. Rather than trying to provide a canonical definition, examples of the scope of activities that may fall under the umbrella term are provided. When discussing virtual simulation with others it is important to be as specific as possible about which modality and technology the educator has in mind. Describing virtual simulation in terms of fidelity (realism), immersion (level of interactivity) and how people are represented (e.g., videos or avatars) has been recommended (Cant et al., 2019).

In one sense, "virtual simulation" is used to describe physical simulation modalities (manikins, actors, or equipment) that are facilitated virtually, that is, by webconference. The term has also been used to describe an in-person simulation conducted in a room where images, typically of a certain environment, are projected on the walls to help the participants feel immersed in a certain scene. This makes use of Cave Automatic Virtual Environment (CAVE) technology. Both physical simulation modalities and CAVE technology are beyond the scope of this book.

In another sense, and one that is the focus of this book, the simulation modality itself is virtual, with images, and interactions generated by computer software. This includes the suite of extended reality technologies (virtual reality, augmented reality, and mixed reality), and screen-based simulations, which are rendered on a standard computer or tablet screen. The taxonomy of virtual simulation appears in Figure 1.1. This taxonomic tree depicts the breadth of activities that have been called "virtual simulation." The modalities in green are the focus of this book; the ones in orange are outside of this book's scope (though a virtual simulation may be enacted in real-time during a webconference, similar to telesimulation).

Definitions of the terms presented in the taxonomy appear when a term is selected.

Click here to download an accessible PDF version of Figure 1.1.

Figure 1.1: Taxonomy of Virtual Simulation

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=356#h5p-18

Expert's Corner: Virtual Simulation Examples

New to virtual simulation, and looking for some examples? Here are a few samples to illustrate some options. Note these are selected simply to illustrate a breadth of examples, and are not endorsements. Some are free or open and some are commercial examples. A more complete list of options is presented later in this chapter.

- Virtual Healthcare Experience. Video-based simulations for nursing students to practice decision-making in a variety of fields.
- Turbulent Sky. Virtual disaster response for paramedic, and nursing students to explore.
- CyberPatient. A virtual patient simulator for medical and nursing students to practice information gathering and analysis.
- Immersive Healthcare. Voice-controlled virtual reality simulations on personal protective equipment (PPE).
- REVIT from Autodesk. Create 3D models for construction, engineering or architecture, then third party apps can bring these into virtual or augmented reality.

STRUCTURES/ARCHITECTURES

Regardless of the technology used for a virtual simulation, the simulation itself will have a certain structure or architecture, meaning the way the case is built, how it unfolds, and how the learner interacts with the simulation (Figure 1.2).

There is no “right” or “wrong” architecture for a virtual simulation, though certain architectures are better suited to certain types of learning objectives.

Click here to download an accessible PDF version of Figure 1.2.

Figure 1.2: Structures/Architectures in Simulation

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Synchronous and Asynchronous Interactions

Notwithstanding the technology being used and the architecture of the simulation, some virtual simulation platforms are designed to be used synchronously, where the educator and learners come together within the simulation in real time to work through the situation. Some virtual simulation platforms are designed to be asynchronous where learners independently access the simulation. Some platforms are flexible and can be used either way.

Teamwork and Interprofessional Collaboration

A final design feature of virtual simulation platforms is that they may be programmed to facilitate uni-professional teamwork or interprofessional collaboration. On these platforms, learners access the same scenario, either synchronously or asynchronously, and must work together within the simulation.

FINDING VIRTUAL SIMULATIONS

There are now many virtual simulation platforms available; some are commercial and some are academic or open-source. There are also many freely available virtual simulations.

Suggested places to look:

Extended Reality Platforms

1. List of Canadian AR and VR companies from The Manifest.
2. List of international AR and VR companies from The Manifest.
3. Some VR, AR, and MR companies are included in the SIM Company Directory hosted by Simulation Canada.
4. An extensive personal list collected by Rob Theriault MET, BHSc, CCP(f), Immersive Technology Manager, Centre for Teaching, and Learning at Georgian College, has kindly been shared for this publication.

Virtual Patient and Virtual Gaming Simulation Platforms

1. An extensive list of platforms is maintained by Simulation Canada.
2. See the personal list from Rob Theriault, linked above.

Free Virtual Simulations

1. Search in the SIM Scenario Exchange maintained by Simulation Canada.
2. The healthcare Virtual Simulation Community of Learning maintains a list.
3. The Catalogue de formation CNFS from Canada's Consortium national de formation en santé includes some French virtual simulations.
4. Several of the Virtual Patient, and Virtual Gaming Simulation platforms linked to above, particularly the free, and open sources ones, have lists of free scenarios available on their platform.
5. The National League for Nursing in the United States has a collection of virtual simulation resources.
6. MedEdPortal from the Association of American Medical Colleges has many types of resources for medical education, some of which are virtual simulations.
7. MERLOT can be searched for simulations, and virtual labs across any field of study.

8. Free French Virtual Simulations

ROLES FOR VIRTUAL SIMULATIONS

There are several ways that virtual simulations can be used within a broader curriculum (Verkuyl et al., 2021). Descriptions of ways to integrate virtual simulations in the curriculum, along with advice on how to enact the simulations, are further explored in the chapter for enactment.

Never use a virtual simulation as an isolated activity. Pair it with other learning activities before or after virtual simulation, or even with another simulation modality to optimize impact.

As with any teaching strategy, virtual simulations are not intended to be used in isolation; they are most effective when integrated into the curriculum with other learning activities and as part of a process. Broadly speaking there are five common patterns for how virtual simulations can be used (Ellaway et al., 2015):

1. **Independent study activities** – used to augment, complement, or replace didactic curriculum with a more interactive experience, or to provide an experience that cannot be otherwise assured (such as a high-acuity, low-frequency emergency). Learners typically access these independently and rely heavily on feedback provided within the simulation, though a facilitated group debriefing is highly beneficial.
2. **Collaborative group activities** – learners work in small or large groups, either online or in-person, to work through the simulation. Some platforms allow this to be done within the simulation, but it can also be done with one person in the group 'driving' the simulation while everyone in the group contributes to decisions.
3. **Blended activities** – combine a series of virtual simulation activities with other in-person or online learning activities.
4. **Bridging activities** – virtual simulations are specifically used to prepare learners for a more challenging or realistic activity, such as an in-person simulation or a clinical/work placement.
5. **Reference activities** – learners self-initiate access to the simulation on demand, as a self-regulated learning activity. More commonly seen in continuing professional development.

Expert's Corner: An Example of a Blended Activity

There are many ways to use virtual simulations in an educational program, one of which is in-person simulation. One limitation of in-person simulation is the time it takes for all students in a class to participate; often only one or two students per group can be in the "hot seat." Consider combining a virtual simulation, which focuses on the cognitive and decision-making aspects of a situation, and which all students can complete independently, with an in-person simulation that emphasizes the social and interpersonal aspects of the situation. You can explicitly explore the experiences and learning from both during the debriefing.

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CURRICULUM INTEGRATION

Regardless of the technology being used, the subject area, or the architecture of the virtual simulation, there is a robust process for effectively integrating the virtual simulation activity into a curriculum. That process is the focus of this book and the chapters are structured to focus on considerations and evidence-based practices for each step.

This graphic appears throughout this book as the process of integrating a virtual simulation is explored. Here is a brief introduction to the different steps that make up the process of integrating virtual simulation in the curriculum:

1. **Prebrief** – An information or orientation session held prior to the start of a virtual simulation activity in which instructions regarding activities, expectations, and safety considerations are shared with learners.
2. **Enactment** – learners participate in the virtual simulation itself, whether individually or in a group, synchronously or asynchronously, online or in-person.
3. **Debrief** – a systematic process where learners identify and express their reactions to the simulation providing an opportunity for reflection and deep learning. Debriefing may involve feedback from the simulation software, self-debriefing, and/or facilitated debriefing.
4. **Evaluation** – The systematic examination of the learning activity, learners' experiences, and the facilitation process to ensure quality, and safety.

PSYCHOLOGICAL SAFETY

Psychological safety in simulation is defined as "a feeling (explicit or implicit) within a simulation-based activity that participants are comfortable participating, speaking up, sharing thoughts, and asking for help as needed without concern for retribution or embarrassment" (The Terminology and Concepts Working Group, 2020, p. 38). Fostering a safe learning environment where learners feel safe to make mistakes, are free from humiliation (or repercussions), and feel respected is critical to the learner outcomes and experience with virtual simulation.

In virtual simulation there are a number of important nuances to be considered in each of the phases of simulation to ensure a psychologically safe environment for learners. The preparatory phase of simulation is where all components of the virtual simulation are planned, including considerations for maintaining a safe learning environment. The purpose of the prebrief phase is to 'set the stage' for learners to have a clear understanding of the learning objectives, the ground rules, how to engage with the simulation, and technology requirements (INACSL Standards Committee, 2021). During the enactment phase of the simulation, making mistakes without negative consequences is a key factor for promoting a safe learning environment for learners (Turner & Harder, 2018). In the debrief phase, psychological safety can be fostered by such strategies as previewing the debrief process, outlining how confidentiality will be maintained, and providing learners with options (e.g., video on or off, use of chat box, and trying to find an area free of distractions for the debrief) (Goldsworthy & Verkuyl, 2021). Strategies for creating a psychologically safe learning environment will be discussed in each chapter in this book in more detail.

Expert's Corner: Psychological Safety

Creating a psychologically safe environment in simulation is critical since it allows learners to fully engage with the scenario and the debriefing, ultimately leading to better learning outcomes.

In the following **video** Dr. Sandra Goldsworthy, PhD, MSc, RN, CNCC(C), CMSN(C), CCSNE, from Nipissing University provides an overview of psychological safety related to using virtual simulations.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=375#h5p-23

INFRASTRUCTURE AND LEADERSHIP SUPPORT

Two important issues to address when adopting virtual simulation in education are funding and team support. Administrators generally endorse ongoing professional development and the use of technology in the teaching-learning processes. The administrator's role is to ensure that technological systems are effectively transformed and that financial, ethical, and legal implications are considered. Technologies should reduce the administrative burden on educators, allowing them to manage their workload more efficiently, providing more time to meet learners' educational needs.

Expert's Corner: Investment in Virtual Simulation

A three- to five-year plan, where the educator and administrator commit to a new technology, method, or approach, is a practical strategy to make time and cost investments for virtual simulation adoption viable.

Administrators can act to:

- Ensure there is an adequate number of dedicated simulation educators with training and expertise in the pedagogy of simulation.
- Support the development of simulation leaders among educators and budget for professional development.
- Develop simulation teams. Include operational support staff as a part of the simulation team (i.e. technologists, web developers, media developers, learning management system integration teams).
- Align outcomes across programs and curriculum and explore inter-professional opportunities.

- Create partnerships with other institutions and clinical agencies to capitalize on shared simulation resources.

The cost of virtual simulations ranges considerably; some are open source, available at no cost, while others have upfront and annual costs. Some institutions outsource the cost directly to students, while others build it into their operational budgets. It is important to note, funding for educator development is necessary to support virtual simulation teaching and learning experiences throughout the curriculum. Failing to adequately support educators as they embrace new technology often leaves both educators and learners frustrated. In addition, failure to adequately support the integration of new technology and associated pedagogy is a frequent theme noted with the integration of traditional simulation modalities.

When initiating the adoption of virtual simulation, assigning a champion to the project or forming a committee devoted to the project is recommended. With new virtual simulation products emerging rapidly, educators may benefit from demonstrations and trials from vendors. After deciding on a product, and determining cost, identifying a source of funding is necessary. Funding for the purchase of the product as well as professional development may be available through an existing simulation budget or program development grant. Internal innovation and learning grants may also be a funding source. External grant funding is available through international professional organizations such as the Society for Simulation in Healthcare, International Nursing Association for Clinical Simulation, and Learning, Sigma Theta Tau International, and various local professional organizations in simulation, education, and nursing. A project development plan must be devised including time for staff/educator training, scenario development, and learner orientation.

EVIDENCE FOR VIRTUAL SIMULATION

Although beyond the focus of this book, there have been many individual studies and systematic reviews investigating the effectiveness of virtual simulation and supporting its use in education. Some key reviews which might be useful to educators who are planning to use virtual simulation are:

- Cook et al., 2010: Computerized virtual patients in health professions education: a systematic review and meta-analysis.
- Foronda et al., 2020: Virtual Simulation in Nursing Education: A Systematic Review Spanning 1996 to 2018.
- Kononowicz et al., 2019: Virtual patient simulations in health professions education: Systematic review and meta-analysis by the digital health education collaboration.
- Kyaw et al., 2019: Virtual reality for health professions education: Systematic review and meta-analysis by the digital health education collaboration.
- Woon et al., 2021: Effectiveness of virtual reality training in improving knowledge among nursing students: A systematic review, meta-analysis and meta-regression.
- Li et al,. 2018: A critical review of virtual and augmented reality (VR/AR) applications in construction safety.

CONCLUSION

Virtual simulation modalities provide opportunities for engagement and realism and they are quickly becoming an essential part of the educator's toolkit. This introductory chapter describes the process of implementing virtual simulation, outlines key concepts and terms, and directs educators to a range of commercial, and open-source resources and scholarly references.

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CHAPTER 2: PROFESSIONAL DEVELOPMENT

Learning Objectives

1. Discuss simulation pedagogy related to virtual simulation.
2. Examine ways of integrating virtual simulation in the curriculum.
3. Explore effective techniques for facilitating virtual simulation.

INTRODUCTION

Education is moving rapidly from didactic learning to experiential learning experiences like virtual simulation. The flexibility of virtual simulations as a synchronous or asynchronous, individual, small or large group experience provides students with ample opportunity to explore, repeat experiences, learn from their mistakes and reflect on their experiences. As a result of this pedagogical shift, educators are moving from the role of information dispensers to learning facilitators.

Uptake of virtual simulation increased markedly during the COVID pandemic when educators turned to this innovative teaching strategy to provide experiential learning opportunities. Educators quickly adapted their teaching practices; many with limited guidance. Because virtual simulations are a flexible teaching strategy, and because there is a move in education to provide learners with more experiential learning activities, virtual simulations will increasingly be used in education post-pandemic. As a result, there is a pressing need for professional development to help educators embed virtual simulations effectively in their programs.

Teaching with virtual simulation requires educators to develop a new skill set. The transition to virtual simulation is not easy because educators cannot simply transfer their usual in-person simulation practices to the virtual environment. Educators without in-person simulation experience are presented with an even greater challenge because, unlike in-person simulation, there are no clear practice guidelines for virtual simulation implementation. Fortunately, there are many formal and informal professional development opportunities available to help educators achieve those skills.

Professional development plays a critical role in the educator's ability to teach effectively with virtual simulation. In this chapter, virtual simulation pedagogy and theory are discussed. Key components and considerations related to effective virtual simulation teaching in courses and programs are also presented.

SIMULATION PEDAGOGY AND THEORY

Virtual simulation designers draw on many different theories when developing their games. A basic understanding of some of these theories is helpful to educators planning to use virtual simulation.

Kolb Experiential Learning

Kolb's Experiential Learning Model is a commonly used theory underpinning interactive experiences such as virtual simulation. The authors of this text developed a suite of virtual simulations for nursing students based on this model. The essence of the model is that transformative experiences result in knowledge gains. Kolb (2015) developed his four-stage model (Figure 2.1) to demonstrate how concrete experiences, combined with active experimentation, demand reflection resulting in insight and learning. Figure 2 demonstrates how Kolb's model can be applied to the role of the**simulationist** (Figure 2.2). Review these diagrams to gain a greater understanding of Kolb's model as applied to virtual simulation.

Click here to download an accessible version of Figures 2.1 and 2.2.

Figure 2.1: Kolb's Model Applied to the Learner using VS, and

Figure 2.2: Kolb's Model Applied to the Simulationist Facilitating VS.

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=215#h5p-21

In the following **video** Treva Job PhD(c), MA Ed, PHCNP, BScN, CCSNE, CHSE, from Georgian College provides an overview on Kolb's Experiential Learning.

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=215#h5p-37

Virtual simulations provide an excellent opportunity for learners to undergo a concrete experience, and freely experiment with it, in a relatively safe environment. Virtual simulation, and the accompanying debrief, provide multiple opportunities for critical reflection about the experience and related concepts; a process which is essential for learning. Because learners can replay virtual simulations as often as they want, they can explore different decision pathways, thereby extending reflection and increasing learning.

Constructivism

Constructivism is another theory that provides a foundation for many virtual simulations. Constructivism views learning as a "process of constructing meaning; it is how people make sense of their experience" (Merriam, Caffarella, & Baumgartner, 2007, p. 291). The educator's role in this student-centered approach is one of facilitator rather than information-dispenser. The educator resists telling the students what to do, and instead, allows learners to construct new meaning from virtual experiences through a carefully planned approach that is scaffolded to the curriculum, program or educational learning outcomes.

Constructivism maintains that learning is an active, social, and fundamentally constructive process which is cognitively demanding. New information and experiences are linked to the students' prior knowledge which is then reactivated, revised, and reinforced. Mindful of this, it is important that educators do not overload learners' information processing abilities.

Cognitive Load Theory

Cognitive Load Theory was developed by John Sweller (1988). It is based on the premise that when there is stimulus overload, learners have limited working memory, and as a result, they are unable to absorb or retain new knowledge, reducing their ability to problem-solve. It is important to consider that working memory has limited capacity and educators should avoid using activities that overload and do not directly contribute to the intended learning. This means that it is important to consider the expectations, the amount of new information, and how that information is presented when designing virtual simulation experiences for learners.

Social Cognitive Learning

Another theory, congruent with constructivism and relevant to virtual simulation is Albert Bandura's (1977) social cognitive learning theory. Bandura claimed that much of a person's life is rooted in social experiences and that by observing and modeling others' behaviours during these experiences, learners gain knowledge, and skills. Bandura noted that four conditions are required for learning to take place through modeling, and observation. These are: attention (i.e. paying attention), retention (storing information/behaviour learned), reproduction (performing), and motivation (modeling the behaviour observed). Social cognitive learning is important to the virtual simulation enactment and the debrief as much of the learning from virtual simulation comes from modeling and observation within the simulation. It also occurs through facilitator and peer interactions during and after the simulation.

CURRICULAR INTEGRATION

It is important for educators to thoughtfully adopt virtual simulation in the curriculum rather than just adding virtual simulation randomly.

Spotlight on Scholarship: Curricular Uptake

The following scholarly article, 'Curricular uptake of virtual gaming simulation in nursing education' provides an historical account of one team's successful uptake of virtual gaming simulation in a nursing curriculum. The authors share lessons learned about how to maximize curricular uptake. Educators can use this team's experience to develop their path for embedding virtual gaming simulation in curriculum.

In the following **video** Dr. Daria Romaniuk, RN, Ph.D. from Ryerson University discusses the 'Curricular uptake of virtual gaming simulation in nursing education' article:

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=218#h5p-22

Expert's Corner: Use of Technology

Don't let technology drive your educational needs, instead, let learning outcomes drive your use of virtual simulation.

Strategic integration of virtual simulation in education programs is foundational to using them effectively and enhancing outcomes. Virtual simulations are enacted in diverse environments; a collaborative or team approach is helpful to identify where virtual simulations are currently provided in the program, where they should be offered, and how.

Effective integration starts with conducting a needs assessment and then developing recommendations for simulation hours (Fogg et al., 2020). The next step is to conduct an analysis of current simulation use and practice in a course or program. Finally, the curriculum should be examined to identify areas where there are experiential learning gaps or less than optimal learning experiences. Once the analysis is completed, it can be used to determine if the different types or modalities of simulations complement each other, and meet course/program learning outcomes. The evaluation can also point to parts of the curriculum that would be improved through more or better active learning. All classroom, laboratory, simulation lab and clinical educators within a program should be involved in the curricular integration evaluation process. This team approach is important because the versatile nature of virtual simulation means that they are used in many settings besides the simulation lab. They are used in a variety of educational settings and ways such as a large class setting, hospital simulation centres, clinical practice groups, clinical placements, professional development, individual assignment, and as part of an in-person simulation activity. The next step is to identify available simulations i.e. virtual, in-person, standardized patients or simulated participants https://advancesinsimulation.biomedcentral.com/articles/10.1186/s41077-017-0043-4, choose ones that meet learning objectives and are within budget constraints. Finally, take the time to document when and where virtual simulations will be used in a particular program.

Expert's Corner: Collaborative Approach

A collaborative approach to the use of virtual simulation is recommended in order to provide professional development, augment learning, and enhance the student experience.

As noted above, careful, systematic planning is needed for in-depth integration of simulation-based resources to align with course content and content sequencing. Keeping a record of simulation experiences used is helpful for educators but also for administrators (Fogg et al., 2020). When administrators are involved, and understand the full trajectory of simulations used, support is more likely for professional development and educational materials to meet faculty learning needs.

Expert's Corner: Process Matters

Finding the right virtual simulation to meet learning outcomes is important. Learning is enhanced when educators follow a process for embedding the virtual simulation instead of just adding them to a course or sending learners the link to a virtual simulation.

PRINCIPLES FOR USING VIRTUAL SIMULATION

Before choosing a virtual simulation as a learning activity, ensure the virtual simulation learning objectives are congruent with course outcomes. Aligning virtual simulation activities with learning outcomes helps to ensure that the adult learning principle of completing activities that are educationally relevant is met. In order to do this, educators need to be clear on the virtual simulation's purpose and see the benefit of using it (Fiedler et al., 2014). When learners see a clear connection between a virtual simulation's learning objectives and course objectives, they are more motivated to complete an activity.

The timing of the virtual simulation is essential for effective uptake and learning. Virtual simulations are predominately used as a way to apply knowledge; ideally, students are exposed to any new content prior to the experience. In addition, virtual simulation can be used before an in-person experience to prepare students to apply their knowledge in a face-to-face simulation. Virtual simulation can also be used for 'just in time learning' or 'in-situ learning,' just before a particular clinical situation.

Sometimes, learning objectives within a simulation do not align perfectly with course content. To decrease confusion or frustration, learners should be informed of this before they complete the virtual simulation. To further mitigate confusion, educators should provide learners with tools to be successful, and identify where in the program/course that new learning is situated.

Expert's Corner: Preparing Students

Nursing students in a health assessment course are asked to do a virtual simulation that includes a minor component on medication administration which they have not yet studied. In the prebrief, the learners are made aware of this and are provided with the tools to answer the medication administration content or they are told to skip over any medication-related questions.

Simple to Complex

Virtual simulations should be used regularly through a program rather than as a one-time experience. It is important to start with simple situations then progress to more complex simulations (Dubovi, 2018). Strengthening learners' knowledge of the virtual simulation experience by providing a detailed, clearly outlined sequence of steps before going on to tackle in-depth,complex simulations enhances learning and increases time on task.

Applying Cognitive Overload Theory

Cognitive Load Theory has important implications for how virtual simulation is used. Here are some steps to reduce cognitive overload when using virtual simulation.

1. Choose a virtual simulation with manageable amounts of information that targets an area related to your learning outcomes.
2. Start learners with simple virtual simulation to teach manageable skills.
3. Gradually increase the complexity and difficulty of virtual simulation.
4. Teach new concepts before assigning the virtual simulation.
5. Ensure learners can access the virtual simulation.
6. Provide orientation to navigate the technology.
7. Identify contact for technology support.
8. Encourage repetition of virtual simulation (when applicable).
9. Provide options for conducting the virtual simulation at varied times (when applicable).

Facilitation

Skilled virtual simulation facilitation is crucial to learning; it can either enhance or negatively affect the learning experience for both the learner and the educator. Facilitation is a learned skill; fortunately, there are numerous courses and certificate programs available to help educators develop the foundational skills they need to effectively guide learners. Another way to advance facilitation skills is to take advantage of mentorship opportunities within and outside of an institution. Even experienced facilitators may benefit through ongoing mentoring or team-teaching activities.

The goal of this next section is to identify some of the nuances inherent in virtual simulation facilitation so that educators can thoughtfully plan the experience in ways that will support learner engagement and help them to meet the intended learning objectives.

The Healthcare Simulation Standards of Best Practice™ Facilitation provide facilitators with guidelines

and strategies to help facilitators enhance their learners' experiences. The first step in using virtual simulations is to review the simulation objectives and make the connection to the course learning outcomes.

The next step is for facilitators to define their roles during the virtual simulation. The facilitator's role will depend on whether learners are using the virtual simulation synchronously or asynchronously (See Chapter 4: Enactment). In either case, learners will need clear instructions about how to play the simulation. Also, it will be easier for educators to answer learners' questions if they have an intimate knowledge of the experience. It is therefore imperative that facilitators have played the virtual simulation sufficiently to understand the possible options and branches that the learners will explore. This understanding will make facilitating both the experience and the debriefing more effective.

Expert's Corner: Facilitator Expectations

It is important that facilitators have intimate, experiential knowledge of the virtual simulation so they understand what the student is expected to do, as well as the student experience.

In the following video Tara mcCulloch provides facilitation strategies to enhance the learners' experience.

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=221#h5p-42

Before the virtual simulation is enacted it is important for the facilitator to develop and assign preparatory activities and to conduct a pre-briefing with learners to prepare them for the experience Chapter 3: Prebriefing. During the preparatory phase, the facilitator works to establish a psychologically safe environment for learning, acknowledging that mistakes will happen during the virtual simulation and confirming that this is how learning occurs. Facilitators continue to use their skills during the enactment and the debriefing

phases of virtual simulation (See Chapter 4: Enactment; Chapter 5: Debriefing). The debriefing phase in particular requires specific skills; it is important that facilitators are trained to facilitate the debrief. As with in-person simulation, effective debriefing enhances learning, leads to new insights, increases self-awareness and the transfer of knowledge, skills, and, attitudes. Specifically, the Debriefing standard can be used as a starting point to guide the debriefing.

Examples in Action: Dr. Jennifer Lapum

The following podcast by Dr. Jennifer Lapum provides a few examples of how virtual gaming simulation was embedded in different courses.

Click here to download a transcript of the podcast below.

Jennifer Lapum, RN, PhD, Professor, Associate Director of Quality Assurance, Daphne Cockwell School of Nursing, Ryerson University

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=221#h5p-14

Examples in Action: Sufia Turner RN, MN, CCSNE

In the following **video** Sufia Turner RN, MN, CCSNE from the University of Manitoba provides an example of their process to prepare faculty to teach using virtual simulation.

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=221#h5p-25

Technology

All virtual simulations require technology. When learners experience technical challenges they become less engaged and report a lower satisfaction level with the learning experience (Corbett & Snelgrove-Clarke, 2016). It is therefore essential to provide a 'glitch-free' experience for learners. There are times, however, when the learner will encounter technical problems in spite of the best preparation; providing prompt, responsive technical support is essential. This technical support may be provided by the virtual simulation developers or it could be provided by the institution's technology support staff. Either way, educators and learners need to know who they can contact for any technology issues.

Being proficient with the virtual simulation technology and navigation is an important part of effective integration. When educators are confident with the technology there is increased satisfaction with the teaching-learning experience for both educators, and learners (Fiedler et al., 2014).

Strategies to boost proficiency with virtual simulation technology

- Ask for designated time to become familiar with the technology and to create a plan to deliver the experience effectively.
- Work through all aspects of the virtual simulation before learners use the simulation. "Playing" with the virtual simulation is helpful because it gives educators an understanding of the learner's experience.
- Keep track of common challenges and ways to resolve them, ideally in a manual. This will help educators provide guidance and reduce frustration for the learner.
- Provide learners with an orientation session to trial the equipment and familiarize them with the virtual simulation process. An effective orientation decreases student anticipatory anxiety about using new equipment or software. A more robust orientation is needed when learners use the virtual simulation individually without the support of a facilitator.

In summary, when you facilitate the virtual simulation, you need a solid understanding of both the equipment and the software so the learner's experience is as seamless as possible. You need to be able to quickly, and effectively troubleshoot any technological challenges.

When learners have technology challenges they are less satisfied with the experience negatively affecting their learning.

In order to enact a virtual simulation individually, specific computer requirements must be met. When assigning a virtual simulation learners should be provided with the following information:

1. Computer specifications
2. Necessary Internet bandwidth
3. Compatible Browser
4. Software program
5. Technical Support (internal Virtual Simulation external)
6. Additional equipment (as applicable i.e. microphone/camera)

The information above is important for playability of the experience and learner satisfaction. The need to address technology/computer requirements before the experience cannot be overstated. For example, when high resolution graphics or videos are used in the virtual simulation, limited internet bandwidth will cause pages/videos to load slowly, negatively affecting the learner's experience. In addition, it is important to inform learners of accessibility options related to sound control, and subtitle (closed captions). Being proactive to ensure the simulation is 'glitch free' will enhance the learner's experience.

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Grading Options

In many settings virtual simulations are not graded, instead, they are used for formative evaluation and professional development (Verkuyl et al., 2020). The reason for this is to encourage the learner to explore the virtual simulation freely,and augment learning without penalty. Other educators grade the learner's virtual simulation work for summative evaluation purposes with satisfactory results. Two important factors to consider before making grading decisions are the level of the learners and goals regarding the learning outcomes. There are no right or wrong ways to proceed, the decision of whether or not to grade the virtual simulation will be reflective of the educator's pedological approach when using virtual simulation. Whether the virtual simulation will be graded or not, learners must be informed of that decision before starting the virtual simulation. Any grading requires a marking rubric or an existing tool that aligns with course or learning outcomes. Here are a few considerations related to summative evaluation of virtual simulation (Table 2.1).

Click here to download an accessible PDF version of Table 2.1.

Table 2.1: Grading Options for Virtual Simulation

Approach	Grading	Rationale
Learners are free to play the game freely without fear of a grading penalty.	No grade is assigned.	Reflects the belief that learning occurs by making mistakes in a safe environment and reflecting on those decisions.
Learners are encouraged through marks to complete the virtual simulation. Learners are free to select correct and incorrect responses and replay the experience without fear of a grading penalty.	Assigning a grade for participation.	Reflects the belief that learning occurs by making mistakes in a safe environment and reflecting on those decisions. Acknowledges learner time and effort. May act as an incentive to complete the virtual simulation.
Learners will not explore different options for fear of getting a lower mark. Instead, they will take time to respond at each decision point so they have a higher chance of getting the right answer.	Virtual simulation is graded.	Reflects the goal of using the virtual simulation for summative evaluation purposes. When using virtual simulation for summative evaluation, it is important that students have earlier, regular experiences to familiarize themselves with the simulation. Many commercial virtual simulations have analytics that can be used to calculate a summative grade. When using the analytics for grading, it is important to understand the analytics available and how to use them.

Expert's Corner: Participation Grade Examples

A participation grade of 1% is provided for each virtual gaming simulation assigned to students in a health assessment course. Participation is confirmed when learners submit their individual summary report of their experience. In this course, 99% of the learners complete the virtual simulation on time.

When completing a virtual simulation with scores, some educators assign a participation mark when the learner gets a specific grade. The learner can repeat the experience till mastery.

The post virtual simulation reflection activity has a rubric and is marked. The virtual simulation and student decisions in the simulation are not graded.

Expert's Corner: Grading Example

Educators have required a specific grade on a virtual simulation of 80% in order to calculate a summative grade. In many cases, learners can repeat the experience as often as they need to in order to attain the 80%.

Unclear expectations related to the virtual simulation evaluation will increase learner confusion and anxiety.

Analytics

Many virtual simulations automatically collect a large amount of data that can be used by both the facilitator, and the learner. The analytics provide information related to the learner's actions or decisions. At the end of many virtual simulations, learners may obtain a summary report of their experience and the results can be used to assess their strengths and weaknesses. The report can also be used as a tool by the learner to debrief their experience. Lastly, if educators retrieve their learners' analytics, they can use that information to identify topics to focus on in the debrief or in class. It is important for the facilitator to determine what analytics are available, which will be useful, and how to retrieve them.

In the following **video** Margaret Verkuyl NP:PHC, MN from Centennial College provides information on the learning analytics available through the virtual gaming simulations.

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=221#h5p-29

EXAMPLES FROM EDUCATION

Here are 5 examples of educators embedding virtual simulation in education. The 5 examples are:

1. Virtual Reality
2. Social Work
3. Architecture
4. Business Administration
5. Nursing

Examples in Action: Virtual Reality

In the following **videos** Dr. Bill Kapralos, PhD, from Ontario Tech University provides a brief overview of immersive technology (Part 1) and curricular integration (Part 2).

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=1439#h5p-26

An interactive H5P element has been excluded from this version of the text. You can view it online

here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=1439#h5p-27

Examples in Action: Social Work

In the following **video** Sophie Séguin, B.T.S, M.S.S Professor in the technical social work program at Collège La Cité in Ottawa present a virtual simulation projet.. This video is in French. For English subtitles, click on the subtitle icon on the bottom right of the video.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=1439#h5p-34

Examples in Action: Architecture

In the following **video** Nicole Dubois MEd, GrDip Adult Education, BArch, AScT, P.Tech, Professor and coordinator of the Archtiectural technology program at Collège La Cité in Ottawa shares un a virtual simulation exercice in the field of architecture.. This video is in French. For English subtitles, click on the subtitle icon on the bottom right of the video.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=1439#h5p-35

Examples in Action: Business Administration

In the following **video** Alain Piorier MBA Professor in the business administration program at Collège La Cité in Ottawa explain how he uses virtual simulation exercices with his students.n. This video is in French. For English subtitles, click on the subtitle icon on the bottom right of the video.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=1439#h5p-36

Examples in Action: Nursing

In the video below, Danaiet Teame MN, RN, CHSC discusses the principles for using virtual simulation.

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=1439#h5p-24

CONCLUSION

Using virtual simulation can transform both the teaching and the learning experience. Ideally, the educator works with a collaborative team to determine where to strategically place virtual simulation in curriculum, how to embed it in the curriculum and how to evaluate the learners' experiences. To teach effectively with virtual simulation, ongoing learning and professional development is required.

Recognizing that facilitating virtual simulation is an evolving area of development and research, we encourage you to gain experience through multiple methods such as mentorship, informal, and formal learning. The Healthcare Simulation Standards of Best Practice™ is another excellent resource for using virtual simulation. We hope that the information provided in this chapter and subsequent chapters will inspire and challenge you to try teaching with virtual simulation or to further develop your virtual simulation teaching skills.

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CHAPTER 3: PREBRIEFING

Learning Objectives

1. Define prebriefing.
2. Describe the elements of standards for best practice in prebriefing.
3. Describe the rationale for conducting a prebriefing.
4. Discuss considerations for what to include in a prebriefing.

INTRODUCTION

Prebriefing occurs before the virtual simulation and its purpose is to set the stage for a scenario and assist participants in achieving scenario objectives. It also begins the process of creating a psychologically safe learning environment for participants that continues through the simulation learning experience. The Healthcare Simulation Standards of Best Practice Prebriefing: Preparation, and Briefing (INACSL Standards Committee, McDermott, et al., 2021) describe a standardized, evidence-based approach to prebriefing.

PREBRIEFING DEFINITION

Prebriefing is “a process which involves preparation and briefing. Prebriefing ensures that simulation learners are prepared for the educational content and are aware of the ground rules for the simulation-based experience” (INACSL Standards Committee, McDermott, et al., 2021, p. 9). Prebriefing may also be thought of as an information or orientation session held prior to the start of a simulation activity in which instructions or information is given to the participants. Prebriefing is the time when educators, researchers, facilitators or staff plan their roles prior to the simulation. The prebriefing should include an orientation to the equipment, environment, technology, roles, time allotment, objectives and patient situation (Lioce et al., 2020).

Prebriefing = Preparation + Briefing

Preparatory activities are provided in advance of the briefing and give background to the learning activity. Prebriefing includes preparation and briefing phases. One recommended preparatory activity is to provide learners with related course materials to review prior to their virtual simulation experience.

WHY PREBRIEF?

Prebriefing is considered a critical step in the virtual simulation learning process. The way an educator introduces the virtual simulation sets the stage for the learner's experience and subsequent interactions. Current evidence suggests that prebriefing increases confidence, learning and the overall effectiveness of a simulation**.**

The goals of the prebrief are to:

1. Establish an environment of integrity, trust and respect.
2. Set the stage for the simulation activity.
3. Assist the learners to achieve the scenario learning objectives.

CREATING A SAFE LEARNING ENVIRONMENT

Educators should focus on preparing learners for a simulation experience that is free from hindrances or distractors such as lack of experience with the virtual platform or apprehension about making a mistake.

In the spirit of establishing trust, the intent of the simulation experience and whether it will be evaluated should be made clear to the learner. Confidentiality should be discussed; participants should be informed of how participation is tracked in the virtual setting and whether the session will be recorded or not.

The prebrief presents an opportunity to discuss ground rules for the simulation and to review the overall learning objectives for the session. This is the time when the educator sets the tone for the simulation by providing clear expectations regarding participation.

The educator should also address the limitations of the simulation and ensure that all participants engage in a fiction contract. This means that learners acknowledge that educators have done all that they can to make the simulation as true to life as possible. Both educators and learners commit to treating the situation as real and stay in character when interacting with the simulation patient and team.

PSYCHOLOGICAL SAFETY

Providing the learner with a psychologically safe environment is a key component of the prebrief and continues through the enactment and the debrief.

Psychological safety may be defined as, "a feeling (explicit or implicit) within a simulation-based activity that participants are comfortable participating, speaking up, sharing thoughts, and asking for help as needed without concern for retribution or embarrassment" (Lioce et al., 2020, p. 38).

When the virtual simulation is a facilitated experience, the educator can detect psychological safety concerns early in the experience. When the simulation is completed asynchronously, the impact of psychological safety may only be visible to educators during the debrief. Either way it is played, the learners' feelings of being safe have an impact on how comfortable they are to make decisions and initiate actions during the simulation. Safety is threatened if learners feel they are going to be judged or might experience negative consequences as a result of their choices or if the content is of a sensitive nature. The goal is not to completely eliminate feelings of interpersonal risk, but rather to create a setting where the learners feel safe enough to embrace being uncomfortable.

A sense of psychological safety will result in a more free exchange of information during the enactment of the simulation and debrief. Learners are more likely to surface and discuss privately held information rather than just discussing information that is common to all. It is important to create a safe environment throughout the virtual simulation and this process starts with the prebrief.

Spotlight on Scholarship: Prebriefing

The following scholarly paper describes the process of setting up a psychologically safe learning environment during prebriefing:

Turner, S., & Harder, N. (2018, May). Psychological safe environment: A concept analysis. Clinical Simulation in Nursing, 18, 47-55. https://doi.org/10.1016/j.ecns.2018.02.004.

PREBRIEFING CONSIDERATIONS

There are a number of considerations for the educator to address when planning a virtual simulation prebrief:

When to Prebrief?

Usually the day of the simulation or immediately in advance of the simulation.

How much time should be spent on the prebrief?

Approximately 5-10% of the time for the entire simulation experience should be spent in prebriefing. The amount of time will depend on the level of learner and their experience with simulation. It is important not to overwhelm learners with too much information; focus on 'need to know'.

What should be included in the prebrief?

A briefing script may be used to ensure that all participants consistently hear the same information (INACSL Standards Committee, McDermott, et al., 2021). There are several important topics or points for educators to review in the prebrief. These include:

- The fiction contract.
- Rules of engagement.
- Ground rules regarding learner expectations. Learners need to know it is okay to make mistakes and that those mistakes will be discussed during debriefing. This gives learners the opportunity to learn from their mistakes and improve.
- Confidentiality regarding the performance of other learners and the scenario content. Clarify what information from the simulation may be shared with others versus what needs to be kept confidential to protect the integrity of the simulation for future learners or evaluations.
- The virtual environment: what to expect.
- Simulation learning objectives.
- Recording the session: Clarify whether or not the session will be recorded.
- Simulation environment/equipment: Review the appropriate use of video, microphone and chat. Recommend learners find a quiet space to enhance their sense of psychological safety. Encourage

learners to use their video to foster engagement through non-verbal communication, however, acknowledge that some learners are uncomfortable turning on their video due to their personal circumstances or their environment (i.e. at home or work).

- Sensitive content: Virtual simulations portraying sensitive situations require a more in-depth prebrief. The prebrief is a balancing act: educators want to prepare learners, particularly for disturbing content, however, they don't want to "give too much away". Learners should be advised that resources are available if they would like to talk with someone about their experience.

Examples in Action: Fiction Contract

During the following virtual simulation, you will interact with different actors depending on the specific scenario. Virtual simulation fosters an environment for active engagement in a relatively safe environment. As the developers of the virtual simulations, we do all we can to make the simulation as real as possible. We do recognize that in this scenario the (*input what is not realistic*) is not realistic. We ask you to engage in the simulation with healthcare professionals and the patient as if they were real. This approach will give you the best possible active learning opportunity.

Examples in Action: Confidentiality

During the virtual simulations, we ask you to be non-judgmental, to be open to learning from others in your group, and from the simulation. It is important to remember that what happens in the discussion stays within the group. By maintaining confidentiality related to the virtual simulation experience, other learners' choices/comments, and the summary report, you help to create a psychologically safe learning environment and an effective experience for all learners. Does everyone agree to maintain confidentiality related to the class discussion? (*Ask for permission to record any part of the virtual simulations if you plan on recording it*).

Examples in Action: Psychological Safety

Some of the virtual simulations deal with potentially disturbing content, for example, suicide, and domestic violence content in a virtual simulation. It is important to address this with learners in the prebrief. Explain that the virtual simulation is designed for mature learners who are healthcare workers. Advise learners that if they have any unsettled feelings before, during, or after the virtual simulation, they should talk with their educator or contact counseling services at their institution.

Other factors to consider:

Timing

- Most educators conduct the prebrief right before the virtual simulation. It can be conducted the day or the week before the virtual simulation if necessary, however, prebriefing as close to the start of the simulation as possible is recommended.

Where to Prebrief?

- The prebrief can be conducted using different formats: online (i.e. Zoom, Blackboard, Teams), recorded in advance or, held in person (face-to-face) prior to the virtual simulation.

Types of Prebriefing

There are several types of prebriefing strategies including self asynchronous, synchronous and self. Each of these strategies is outlined below.

- **Self asynchronous**: the learner is provided with written, audio or video information to prepare them for the simulation environment, scenario, participant roles, and learning objectives without facilitation. As there is no synchronous facilitation, this approach does not provide the opportunity to clarify the process. The participant can engage in the prebriefing separately from the simulation.
- **Synchronous:** The prebriefing is staged to occur just prior to the simulation and can be held in different ways: written, audio, video or facilitated from a distance.
- **In person:** the prebriefing is conducted in real time by a facilitator.

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=251#h5p-8

Expert's Corner: Prebriefing

In the video below, Elizabeth Horsely MSMS, RN, CHSE, discusses best practices for prebriefing.

Click here to download an accessible PowerPoint copy of the video below.

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=251#h5p-17

PREBRIEFING TEMPLATE

This prebriefing template that can be adapted to a specific educational context. Click here to download an accessible PDF version of Table 3.1.

Table 3.1: Prebriefing Template

Objective	Activity
1. Promote social presence and a sense of inclusion.	• Welcome all learners when they arrive. • Introduce facilitator.
2. Provide all participants with an overview of the simulation purpose and goal.	• Simulation overview and review of learning outcomes/assessment process. • Review the simulation learning objectives; with virtual simulation learners time elapsed since playing the simulation will vary. This gets everyone back on the "same page" to start.
3. Identify prebriefing expectations for the learners and the facilitators.	• Clarify roles and expectations.
4. Discuss confidentiality regarding performances, case, discussions.	• Ask learners not to share details of the simulation. Discuss time invested in developing cases and their repeated use in future simulations.
5. Orientate learners to: ◦ The virtual space, simulation technology and process including setting, equipment, chat function limitations. ◦ Orientation to method of evaluation and grading (if any).	• Create a cheat sheet, slides, pictures video tutorial or use web conferencing screen sharing to assist learners with virtual simulation environment. • Less tech-savvy learners may benefit from an in-person tutorial.
6. Discuss the fiction contract.	• Learners and facilitators acknowledge challenges due to fidelity/realism/and virtual technology.

Objective	Activity
7. Review simulation logistics: Start/stop times, breaks, time outs.	• Review Flow: Time allotment • Describe what will happen in the debrief i.e. initial reactions, what went well, what did not go as well, take home messages, final thoughts. • Advise learners about how to access analytics or feedback or how to call for help if needed. mention use of hand raising to minimize interruptions.
8. Incorporate activities that help establish an environment of integrity, trust, respect and psychological safety.	• Provide technology guidelines: advise learners if the session will be recorded, the appropriate use of video, microphone and chat. Recommend they find a quiet space to enhance sense of psychological safety. • Learners need to know it is okay to make mistakes, and that those mistakes will be discussed during debriefing. Making mistakes gives learners the opportunity to learn from their mistakes and reflect on how to improve. It is also important that all learners show respect for other's comments and maintain confidentiality of those remarks. • Virtual simulations portraying sensitive situations require a more in-depth prebrief. • Let learners know you will be calling on each of them briefly to share initial reactions to the simulation so they will be prepared; this enhances psychosocial safety. • Avoid making it mandatory for learners to turn on their video during the session.
9. Review case description.	• Consider using a written or recorded prebriefing plan to standardize the process and content for each scenario/case. A written or recorded prebriefing plan should be required for simulation-based experiences when used for high-stakes evaluations.
10. Explore questions from learners	• Ask learners if they have any questions.

KEY POINTS

Key takeaway messages for prebriefing are that it:

- Sets the stage for the simulation and the debriefing.
- Creates the ‘safe container’ for learning which fosters psychological safety.
- Makes expectations clear for learners and educators.
- Standardizes the process so that every participant receives the same instructions.
- Engages learners before the simulation.

There are many potential negative consequences for learners if a comprehensive prebrief is not conducted. These include: decreased confidence, increased anxiety and feeling unprepared for the enactment and the debriefing (McDermott, 2016). .

As with in-person simulation, without a structured, planned prebrief prior to virtual simulation, learners may not be set up for success. This may result in a frustrating and de-motivating learner experience that could create negative attitudes regarding future simulations.

CONCLUSION

Preparing learners for an effective and safe virtual learning experience starts with the prebriefing. Through preparation and briefing, the educator prepares learners for both the educational content and the virtual simulation experience. This preparatory work helps to ensure a smooth, satisfactory and safe experience for learners which contributes to meeting learning outcomes.

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CHAPTER 4: ENACTMENT

Learning Objectives

1. Explore aspects of the virtual learning experiences that support and promote successful enactment of virtual technology.
2. Explore challenges unique to the adoption of virtual simulation.
3. Review practical considerations on how to enact virtual simulations.

INTRODUCTION

Enactment of virtual simulation can be offered in a variety of different modalities including computer (e.g. 2D or 3D), fully or semi-immersive technologies (e.g. head mounted device, android phone), and live telesimulation (e.g. web conferencing). When deciding which of the many different types of virtual learning experiences to use, the decision should be based on the learner's needs and align with course outcomes. This chapter focuses on the practicalities and considerations of the enactment phase and the role of the educator.

ENACTMENT: DEFINITION

Enactment is the term used for playing virtual simulations. Different types of virtual simulation options are available for learners; the choice of which to use will depend on the learning outcomes for the specific activity and learner needs (see Figure 4.1). Choosing the appropriate type of delivery is important as this will affect the facilitator's prebriefing, enactment, and debriefing options. Subsequently, the type of application the educator chooses will determine the environment required to use the application. Educators also need to ensure that the learners have a 'glitch free' experience during the virtual simulation as this will influence learner engagement and satisfaction.

PREBRIEFING PRIOR TO ENACTMENT

As mentioned in an earlier chapter, it is important to include a prebriefing phase where learners are orientated to the virtual learning option, technology and educator expectations during enactment. Information will vary depending on whether the prebrief is synchronously or asynchronously delivered (See Chapter 3: prebriefing).

TYPES OF VIRTUAL SIMULATION

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=557#h5p-16

Figure 4.1 below outlines various types of virtual simulations. This is not an exhaustive table but it can assist educators in deciding the method of enactment they would consider for a particular activity they wish to integrate into their course/curriculum.

Expert's Corner: Educator's Use of Simulation

To ease the educator's workload, it may be best for educators to use virtual simulations that already exist or that are readily available as the functionality and format of those have already been validated, and tested. As educators, it is important to take the time to test the virtual simulation before embedding it in the course to make sure that it aligns with the course learning outcomes or objectives, usability, accessibility, and inclusion.

Click here to download an accessible PDF version of Figure 4.1.

Figure 4.1: Types of Virtual Simulation, and Factors to Consider for Implementation

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=557#h5p-15

When selecting a virtual simulation technology it is important that the platform has accessibility features including closed captions, screen reader compatibility and transcripts. Educators need to understand how to access these features so they can help learners where required. An optimal language translation feature is also of benefit to translate text and voice to the learners' language preference.

There are environmental and non-environmental challenges/advantages to facilitating a virtual simulation depending on the program or software that is used. The facilitator may be able to monitor how the learners are progressing in the simulation and then provide immediate or impromptu feedback.

ASYNCHRONOUS VIRTUAL ENACTMENT

Asynchronous individual simulations are the most easily adapted for virtual delivery. These simulations can be assigned and played by learners individually ahead of class. This relieves instructors of the burden of trying to troubleshoot with an entire class at once, thereby avoiding using up valuable simulation run time (Table 4.1).

Expert's Corner: Benefits of Asynchronous Simulations

In this video interview, Dr. David Topps discusses the benefits of asynchronous simulations. Hosted by Treva Job, Simulation Lead, Georgian College.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=559#h5p-30

Click here to download an accessible PDF version of Table 4.1.

Table 4.1: Asynchronous Virtual Simulation Sample Class Plan: Individual

Asynchronous Individual Class Plans
Introduce and assign the simulation by email or at the end of the previous class session. (5 minutes)
Play the simulation outside of class time. (20-90 minutes)
Debrief with learners using one of the formats discussed in Chapter 5 during online class time. (20-90 minutes, depending on learning objectives)
Optionally, reset the simulation so learners can apply their learning by replaying the simulation after the debrief.

Many educators using asynchronous simulations divide learners into small groups so that the entire class does not have to perform the simulation at the same time. Groups are assigned in advance. Each learner works on their own computer/device. This means that learners in the same group can be remote from each other, however, they do need to be online at the same time. This will take some coordination on the part of the learners (Vargas, 2021). Alternatively, the class may enact the simulation together, as a large group (Table 4.2).

Click here to download an accessible PDF version of Table 4.2.

Table 4.2: Asynchronous Virtual Simulation Sample Class Plan: Group

Asynchronous Group Class Plans
Introduce and assign the simulation by email or at the end of the previous class session. (5 minutes)
Assign learners to a group, inform them which learners are in their group, and ask the group to coordinate a time to perform the simulation prior to the set class debrief session.
Perform the simulation outside of class time. (20-90 minutes)
Debrief with learners using one of the formats discussed in Chapter 5 during online class time. (20-90 minutes, depending on learning objectives)

Asynchronous components can include learners engaging with material, viewing videos, and engaging in discussion boards, and then have weekly live meetings using a virtual meeting platform (i.e., Zoom). When the

facilitator has this kind of real-time synchronous interaction with learners, the differences between in-person and online teaching are decreased.

If the debrief is to be delivered using a discussion board, it is recommended that learners be separated into small groups. Too many learners will make it difficult to deal with all the information and engage in discussion.

Expert's Corner: Facilitator's Perspective of Enactment

In this video interview, Dr. David Topps discusses asynchronous enactment from a facilitator's perspective. Hosted by Treva Job, Simulation Lead, Georgian College.

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https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=559#h5p-31

SYNCHRONOUS VIRTUAL ENACTMENT

Synchronous simulations can be used when all learners are online at the same time. Groups are formed just before the simulation begins and learners do not communicate with each other except through the simulation (Vargas, 2021).

Synchronous simulations allow facilitators to provide instructions if clarification is required and to facilitate learning in the moment. The facilitator needs to create an online atmosphere that promotes psychological safety, and includes open communication, emotional expression, and group cohesion. This is important because synchronous virtual simulations can have the effect of diminishing the learner's feelings of psychological safety; some learners may feel self-conscious and not participate as readily as in a real-life simulation. Additionally, if learners are accessing the simulation from a public space, they may be anxious about being overheard and be reluctant to share thoughts and ideas. On a more positive note, some learners feel safer because they are enacting the virtual simulation from their own home or selected environment (Table 4.3).

Click here to download an accessible PDF version of Table 4.3.

Table 4.3: Synchronous Enactment Sample Class Plan

Synchronous Class Plan
Introduce and assign the simulation by email or at the end of the previous class session, or at the beginning of the class time in which the simulation will be performed. (5 minutes)
If learners are divided into groups, make sure to assign learners to their groups within the simulation before learners log in.
Play the simulation when all learners are "in" your online class. (20-90 minutes)
Debrief with learners using one of the formats discussed in Chapter 5 during online class time. (20-90 minutes, depending on learning objectives)

Spotlight on Scholarship: Debriefing Preparation

When considering the enactment phase of virtual simulation it is important to think ahead to the debriefing. This article provides insight and practical suggestions on effectively managing virtual debriefings: Cheng, A., Kolbe, M., Grant, V., Eller, S., Hales, R., Symon, B., Griswold. S., & Eppich, W. (2020). A practical guide to virtual debriefings: Communities of inquiry perspective. *Advanced Simulation 5*(18), 1-9.

LARGE GROUP ENACTMENT

With this approach, the virtual gaming simulation is enacted in a large group of ten to thirty learners. It can be enacted in two ways: with the entire group playing the virtual simulation and debriefing together, or with the group breaking into smaller groups for debriefing. Typically, educators show the virtual simulation on a large screen or with screen sharing capabilities and stop at each decision point to ask questions. This approach encourages problem-solving and critical thinking from the group as they work through the scenario together. An advantage of this format is that it allows for a rich discussion of different perceptions of the client scenario and decisions, and builds teamwork and conflict management skills (Verkuyl et al., 2020).

The disadvantage or challenge with the large group enactment is creating a psychologically safe environment in which all learners feel free to engage in the experience. It is critical to make sure learners are aware, right from the start, that making mistakes is how learning occurs. One way to mitigate this challenge is to use audience polling systems for decision- making during the virtual simulations. Another option is to mix the small and large group formats. The large group is initially divided into groups of two to three learners who complete the virtual simulation together. After they enact the simulation, they come together as a large group to debrief. The result is a large group whose members have taken different pathways through the virtual simulation allowing for a rich debrief.

Expert's Corner: Group Enactment

When facilitating a group to work through a virtual simulation, each decision point becomes an opportunity for reflection and debrief. Since the content has been debriefed, the post virtual simulation debrief can take a different focus such as teamwork and conflict management during the group decision making.

PRACTICAL CONSIDERATIONS

How should the educator redirect learners during an enactment?

- Sometimes learners lose focus or become stalled while enacting a virtual simulation. The facilitator can use questions to redirect the learner and can directly or indirectly suggest different methods to work through the problem.
- A simulated overhead PA system can be built into the scenario using the facilitator as the voice of the PA. This may be useful when a direction needs to be conveyed to the learner without disrupting the flow of the scenario and is incorporated directly into the simulation itself. For example, learners using a simulated defibrillator forget to give the "all clear" command.

Expert's Corner: Pearls of Wisdom

In this video interview, Dr. David Topps provides "Pearls of Wisdom" on virtual simulation. Hosted by Treva Job, Simulation Lead, Georgian College.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=1130#h5p-32

What are some practical considerations regarding enacting virtual simulations?

Participation in synchronous simulations requires learners to have reliable high-speed internet access, a computer/device (ideally with a webcam), and a headset with a microphone. An overview of the human-hardware-software components and process is shown in Figure 4.2.

Personal Computer:

Learners will need regular access to a computer, preferably a personal computer, with administrator privileges and be comfortable managing software and hardware. For an optimal experience learners need to have a laptop or desktop computer (Windows 10 or higher or Mac OS X 10.14 or higher is recommended). They may need to verify computer software if using a head mounted device as these often require the computer to have a graphics card and at least 8GB + RAM available to run the program software. Refer to the technical data sheets of the equipment being used for the virtual simulation for up-to-date technical requirements.

Head Mounted Device:

(depending on who purchases the head set) the most common head mounted displays that are available in educational settings include: Oculus RIFT, Oculus QUEST, and the QUEST2, Microsoft Halolens, or an Android or iOS phone in some instances.

Internet Connection:

High speed broadband access (LAN, Cable or DSL) is highly recommended for an optimal learning experience. Note, that relying on a library or a café for internet access is not recommended.

A Web Browser is required for access to many learning systems and/or applications. In some instances it may be necessary for some users to upgrade their web browser programs. Refer to the technical data sheets for up-to- date browser requirements.

Speaker, and Headphones:

When enacting virtual simulations learners may have synchronous (live) online meetings using webinar software. It is preferable to use headphones with an attached microphone for these sessions.

Software:

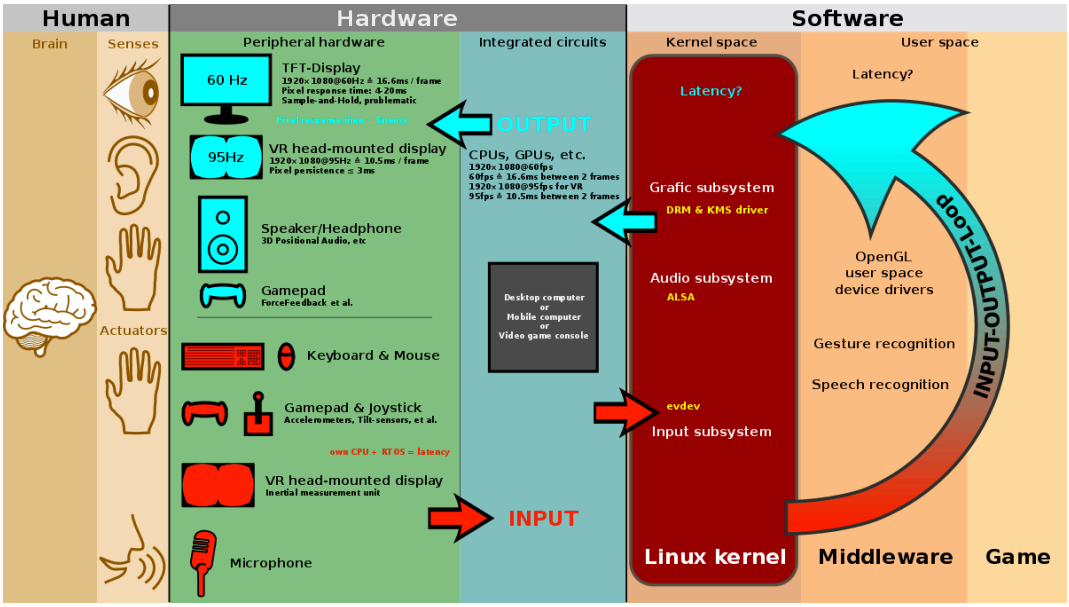
Many courses require word processing software (such as Office 365).

As shown in Figure 4.2 In order for the learner to have a fully immersive experience the activity must meet the criteria shown in the diagram. This depends on the type of immersive experience you are looking for.

For example, in order for a student not to experience nausea during a virtual reality experience with a virtual headset (moving their head), the resolution must be less than 3 milliseconds. This is called pixel persistence. Moreover, this image shows the links between the human (learner), the equipment and the applications (experience) that is possible.

For alternative text description of Figure 4.2, please click the following link: Figure 4.2 Alternative Text Description

Figure 4.2: VR/AR Hardware, and Software Diagram



SCREENING LEARNERS BEFORE USING A VIRTUAL REALITY HEADSET

It is important to screen learners before they use a virtual reality headset as there are several potential health risks associated with the technology.

Health Risks from Using VR Headsets

1. Anxiety – The immersive nature of virtual and augmented reality can induce stress or anxiety after wearing a headset for more than a few minutes.
2. Nausea – Some people may complain of dizziness and nausea. Realistic simulated motions can affect a person's perception of time and space and can induce fatigue, nausea or wooziness.
3. Eye Strain – VR headsets can cause eye strain among users. Users may strain their eyes in order to focus on a pixelated screen that uses a single refractive optic element. Headsets do not usually address the optic issues with near-to-eye devices and they can quickly become uncomfortable.
4. "Virtual reality sickness" or "cyber sickness"- Exposure to virtual reality can disrupt the sensory system and lead to symptoms such as nausea, dizziness, sweating, pallor, loss of balance, etc. In sensitive individuals these symptoms may appear within the first few minutes of use.
5. Post session change in sensory, motor, and perceptual abilities, affecting their manual dexterity or ability to orientate their body.
6. Epileptic seizures in susceptible people. Exposure to the temporal modulation of the light emitted by LED screens – flashing light that is sometimes imperceptible to the eye (Vest. n.d.).

Click here to download an accessible PDF version of Table 4.4.

Click here to download an accessible PDF version of Table 4.5.

Table 4.4: Checklist to Screen Learners

Question	Checklist
1. Do you have any cold or flu symptoms?	Yes ☐ No ☐
2. Do you have any open cuts or sores on your face or hands?	Yes ☐ No ☐
3. Do you have an empty stomach (have not eaten today)?	Yes ☐ No ☐
If you answered yes to any question above, we do not recommend you participate today.	
4. Do you have any pre-existing medical conditions e.g.? Epilepsy or do you identify as vulnerable: pregnant, people suffering from motion sickness or balance problems such as vertigo, Meniere's, or susceptible to migraines, etc.	Yes ☐ No ☐
5. Have you experienced eye strain?	Yes ☐ No ☐
6. Have you experienced stress induced anxiety?	Yes ☐ No ☐
If you answered yes to any questions above, please proceed with caution and let the facilitator know if you are experiencing any symptoms throughout the VR experience.	

According to Anses (2021), a number of practical strategies for managing VR-related cyber sickness that educators may find helpful have been identified (Table 4.5).

Table 4.5: Strategies for Managing VR-Related Cyber Sickness

Factors that may heighten risk of VR-induced cyber sickness	Recommended Strategies
"Presence" in a virtual space - the more immersive the content, the greater chance to experience VR-induced cyber sickness	• Limit VR exposure time e.g., 30 minutes • Build in breaks to limit VR exposure time if needed. • Build in breaks between different components and ask users: ◦ are you ok? ▪ Learner answers 'yes', move on. ▪ Learner answers 'no', remove headset and take a break. • Learners can rest for one to two hours after using AR/VR devices and before resuming an activity that requires a high level of consciousness. • Stop using AR/VR devices immediately if symptoms such as nausea, dizziness, sweating and pallor appear. • Avoid all exposure to screens two hours before bedtime, especially for those who may be more sensitive to blue light
Empty stomach	• Learners should not participate if they have not eaten recently.
Pre-existing medical conditions e.g. Epilepsy or anyone identified as vulnerable: pregnant, people suffering from motion sickness or balance problems such as vertigo, Meniere's, or susceptible to migraines, etc.	• Please proceed with caution and let the facilitator know if you are experiencing any symptoms throughout the VR experience.
Symptoms of a cold or flu are present.	• Learners should not participate.
Learner has open cuts or sores on the face or hands (non-intact skin)	• Learners should not participate.
Walking around in VR environment	• Learner should be seated.

Factors that may heighten risk of VR-induced cyber sickness	Recommended Strategies
Little to no experience in VR	• Educators should continuously assess/monitor user during session for signs of physical and mental distress due to cyber sickness. • Signs of mental and physical distress: sweating, changes in breathing pattern, restlessness. • If learners experience cyber sickness during the session, they can either remove the headset themselves or signal to an educator to help remove the headset. • Educators can ask comment: "If you feel nauseous and need to stop, please remove the headset by lifting it off OR let me know if you need to stop the simulation." • Provide bottled water • Offer space to lay down. • Rest for 5-10 minutes. • Can masks/PPE be removed temporarily under this circumstance? Be proactive and check with your Health & Safety team and follow your organization's recommendations.

LEARNER DISTRESS DURING VIRTUAL SIMULATION

How should educators handle learners' distress during the virtual simulation?

- Plan in advance for the unexpected. Know whom to call for assistance, and how. Although only one learner may be having a crisis, others in the same group will need supervision to be able to continue the simulation activity.
- Plan for a "backup" facilitator, administrator, or staff member who can be readily available in case a learner needs assistance. Co-facilitators may assist with cross-monitoring, facilitating recognition, and management of frustrated, angry, or upset learners.

Enacting virtual simulations can make recognizing non-verbal cues such as body language, facial expressions, and eye contact difficult. If learners get upset or a difficult debriefing situation evolves, educators may not react effectively, inadvertently threatening psychological safety. Educators should substitute implied acknowledgment with clear verbal explanations. This will take more effort on the part of the educator and more time for the learner to process. More time will be needed to clarify issues and manage the discussion. Overall, more effort from the educator may be required to achieve group cohesion in virtual simulation. See Chapter 1, Chapter 3, and Chapter 5 for more on psychological safety.

Spotlight on Scholarship: Learner Distress

When considering the enactment phase of virtual simulation it is important to think ahead to how learner distress in the simulation will be managed. This article provides insight and practical suggestions on managing learner distress: Willhaus, J., Averette, M., Gates, M., Jackson, J., & Windnagel, S. (2014). Proactive policy planning for unexpected student distress during simulation, *Nurse Educator 39*(5), 232-235.

How do educators handle learners who get 'stuck' in a virtual simulation?

- Educators should know the case/scenario so they can ask questions or prompt the learner to help them move on.
- Consider introducing a "helper" into the case, or in the case of a health simulation, a "nurse", who will suddenly call into the case to provide a crucial hint or additional information.
- If the critical action the learner is missing is trivial, the educator may consider manually advancing the case

To facilitate communication among all course participants, it is helpful if the simulation the educator chooses has a communication feature, such as a messaging function, integrated into the simulation platform, especially for team-based simulations. If this is not the case, the educator must provide another easy way for learners to communicate throughout the exercise; for example, through the online course platform's messaging board (i.e. Canvas messaging).

PROMOTING INTERPROFESSIONAL COMPETENCY IN VIRTUAL SIMULATION

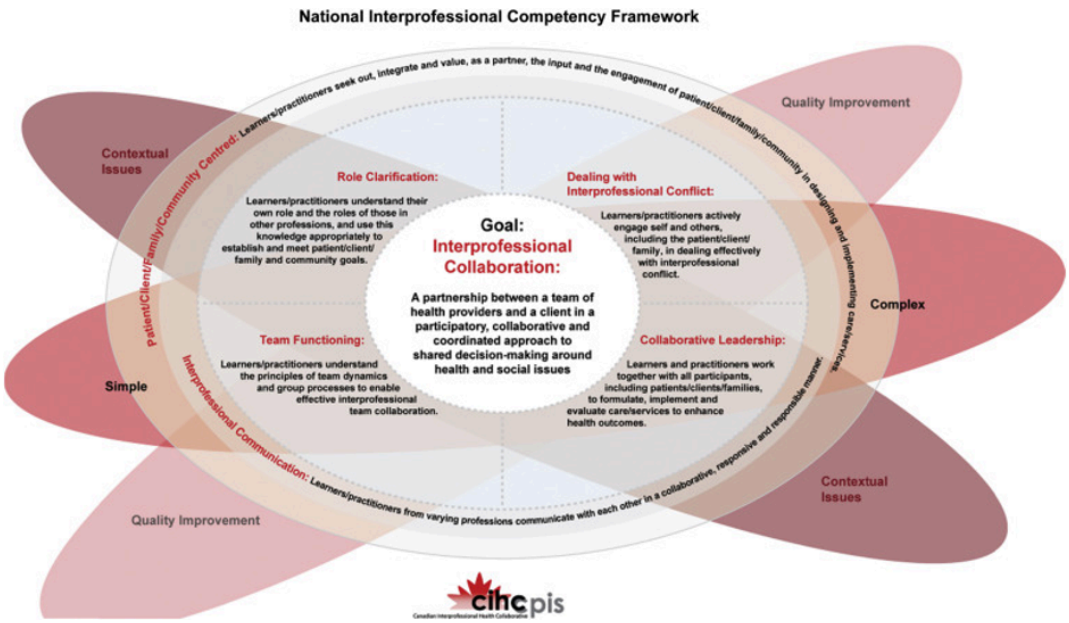
How does the educator promote team/group based interprofessional competencies in virtual simulations?

Interprofessional (IP) education is essential to reflect real-world clinical practice. Clinical practice is highly collaborative and team-based, and virtual simulation enactment, when played in small or large groups, is an excellent way to build these competencies. An IP competency framework should be integrated within the virtual simulation curriculum as a way to build on participants' existing knowledge, values, skills, and attitudes, and to broaden awareness of all scopes of practice within the teams (CIHC, 2010; See Figure 4.3.)

- Select a software program that supports multi-user real-time interaction.
- Consider synchronous and asynchronous enactments.
- Prepare to address negative hierarchy and power differentials that may occur in the simulation to ensure that the participants' developing role clarity is not impacted.
- Prepare to debunk healthcare professional stereotypes prior to these taking root in the novice practitioner's own role identity and in their understanding of the role of others.
- When designing the simulation, it's important to acknowledge all professions that would typically be present for the scenario you are developing. Avoid valuing one profession over another.

Click here to download an Alternative Text Description of Figure 4.3

Figure 4.3: National Interprofessional Competency Framework



National Competency Framework by CIHI, ©Her Majesty the Queen in Right of Canada. For non-commercial re-use only. http://www.cihc-cpis.com/publications1.html

Expert's Corner: Facilitator Tips

Tips & Tricks for Facilitators Enacting Interprofessional Virtual Simulations

Before the Session:

- Divide interprofessional team members evenly based on their roles into smaller breakout rooms on ZOOM or any other communication platform to increase diversity and representation within rooms.
- Explore various interprofessional virtual simulation platforms that you can use based on your

learning objectives: https://www.sim-one.ca/content/virtual-simulations-virtual-patients

After the Session:

- Ask interprofessional team members to include or edit their full names and professional titles and/or their assigned roles in the simulation under the 'Participants List' on the right side of the ZOOM window at the beginning or during the pre-brief (e.g. John Walsh, RN, Medication Nurse). This provides a shared mental model of the participants and their roles in the simulations.

Credit: Sunayna Vuppal BScN, RN, MN – Simulation Educator at The Hospital for Sick Children

Expert's Corner: Benefits of Simulation & IP Learning

In this video interview, Dr. David Topps discusses the benefits of virtual simulation and interprofessional learning. Hosted by Treva Job, Simulation Lead, Georgian College.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=573#h5p-33

CONCLUSION

Virtual simulations are effective tools that help learners develop the knowledge and skills required for client care. Virtual simulations also provide them with a range of opportunities that might be difficult to access in the real world. Choosing appropriate virtual simulations and enacting them effectively presents many educators with a considerable learning curve. The theory and practical considerations presented in this chapter are aimed at helping educators get over the curve and learn to use virtual simulations comfortably and effectively.

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CHAPTER 5: DEBRIEFING

Learning Objectives

1. Explain the purpose of debriefing a virtual simulation.
2. Identify practice principles for debriefing a virtual simulation.
3. Identify various debriefing styles and their corresponding characteristics/nuances.
4. Analyze and decide which style of debriefing best suits specific learning outcomes and available resources to support learners.

INTRODUCTION

Debriefing is an integral learning tool used in simulation-based learning across a range of educational programs. Post-simulation debriefing is widely considered to be the most critical component of simulation and the cornerstone of the learning experience (Eppich & Cheng, 2015).

The purpose of the debrief is to help learners:

- Identify and express their reactions to the simulation.
- Think critically about the experience and evaluate performance.
- Identify knowledge gaps and create a plan for future learning.

The debriefing process links theory and research to practice. Debriefing is a systematic approach that helps learners apply the requisite knowledge, skills, and abilities to complex clinical practice situations. The debrief experience also helps learners develop reflective practice skills (Taplay et al., 2021; Verkuyl et al., 2018). Debriefing in all its forms involves a facilitated learning opportunity that is linked to the learning outcomes. Virtual debriefing can be conducted in a variety of ways: facilitated synchronous or asynchronous, self or peer debrief, small or large group, and co-debriefing or combined debriefing. Typically, learners debrief by answering a series of questions crafted to facilitate reflection on a specific virtual simulation either in writing or verbally.

Expert's Corner: Dr. Sandra Goldsworthy

It is important to start the virtual debriefing by orienting the learners to the experience and by highlighting general or specific simulation learning objectives as time may have passed since the virtual simulation took place. The debriefing should always be underpinned by a debriefing

framework and facilitated by an experienced debriefer (Healthcare Simulation Standards of Best Practice™ (inacsl.org)

In the following video, Dr. Sandra Goldsworthy, PhD, MSc, RN, CNCC(C), CMSN(C), CCSNE, from Nipissing University provides an introduction into debriefing.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=286#h5p-28

DEFINITIONS

The following definitions are useful in understanding the many different styles of debriefing.

- **Debriefing:** A foundational component of simulation design where learning occurs through a facilitated, systematic process of reflection (Eppich & Cheng, 2015).
- **Virtual debriefing:** A post-simulation debrief that occurs virtually, in a partially immersive, screen-based experience where educators employ web-based video conferencing platforms to facilitate reflection on simulation events and decisions (Abraham et al., 2018; Cheng et al., 2020).
- **Analytics:** The individual summary or report of learner actions/decisions made during the simulation.
- **Facilitated synchronous**: A post-simulation debrief where all learners simultaneously attend a facilitated debriefing together on a computer-based platform (i.e., Zoom, Blackboard, Teams).
- **Facilitated asynchronous**: A post-simulation debrief where learners, at separate times, respond to a series of discussion questions using an online platform (i.e., forums within learning management software). Discussion questions are posted by the facilitator who is responsible for monitoring/ moderating the discussion and responding to learners' posts.
- **Co-debriefing**: A debriefing session that is facilitated by two or more individuals experienced in simulation debriefing.
- **Self-debrief**: A learning activity, typically written, that is individually completed by the learner after the simulation. The self-debrief includes a series of questions developed using a debriefing framework. This can be a standalone activity or done in preparation for a small or large group debriefing session (Goldsworthy & Verkuyl, 2021; Verkuyl et al., 2019).
- **Debriefing the debriefer**: A form of professional development where two or more educators, using observation and feedback, voluntarily work together to improve their debriefing skills.
- **Small group**: A post simulation debriefing conducted with two to ten learners (Adamason, 2015; Verkuyl et al., 2019).
- **Large group**: A debriefing that occurs with 12 to a maximum of 30 learners.
- **In-person debrief:** The simulation takes place virtually, however, the debrief takes place face- to- face. In-person debriefing is heavily documented and is not covered in this chapter. Please refer to Healthcare Simulation Standards of Best Practice™ (INACSL, 2021) for more on in-person debriefing.
- **Combined debrief**: The debriefing consists of a self-debrief followed by a synchronous or asynchronous group debrief which may be held virtually or in-person.
- **Debriefing Principles:** Foundational principles that guide the debriefing process that are well-articulated in the Healthcare Simulation Standards of Best Practice™ (INACSL, 2021).

HEALTHCARE SIMULATION STANDARDS OF BEST PRACTICE™

Expert's Corner: Healthcare Simulation Standards

Healthcare Simulation Standards of Best Practice™ (inacsl.org)

These debriefing standards were developed for in-person debriefing, however, they can be modified and applied to virtual debriefing.

Healthcare Simulation Standards of Best Practice™ (INACSL, 2021) modified for virtual debriefing note that:

- It is essential that debriefing be led by someone skilled in the process.
- Planning the debriefing style is part of the simulation design phase.
- Debriefing needs to be conducted in an environment where learners can safely and confidentially share their experiences and learning.
- A debriefing framework should be used (Visit the Debriefing Framework chapter).
- If the facilitator is not present during the enactment of the virtual simulation, the person moderating the debrief should have in-depth knowledge of the virtual simulation and all possible decision-making points.
- If learners conduct the virtual simulation asynchronously (or independently), and learner analytics are available, the debriefing facilitator can use them in the debrief by asking learners to refer to their individual analytics, and/or by reviewing the analytics prior to the debrief.

Analytics

When using virtual simulation there are data (analytics) that are automatically collected in many virtual simulations that can be used for learning. Analytics provide evidence about the learner's actions and decision points. Upon completing a simulation, learners can typically review a summary of the data and use it to identify strengths and knowledge gaps. This information can assist learners to debrief their experience and guide the facilitator in focusing the debriefing discussion. For example, if most learners made a poor decision regarding prioritizing emergency actions for a patient with asthma, this would be a content area to review in the debriefing or in class. When choosing a simulation, it is important to determine what analytics are available and how you plan to use them.

DEBRIEFING STYLES

There are numerous debriefing styles available to educators. Each style has its own benefits, challenges, considerations and strategies. Click on each of the debriefing styles below to learn more.

Click here to download an accessible PDF infographic of all the debriefing styles below.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=292#h5p-6

Expert's Corner: Key Points

Key points to remember for virtual debriefing:

- Competent debriefing and group facilitation skills are essential.
- Use open-ended questions and prompts to encourage learners to think more deeply or share their decision-making processes.
- Approach the debriefing with an open, friendly and non-judgemental attitude.

Spotlight on Scholarship: Step-by-Step Guide

A step-by-step guide to help educators conduct a facilitated virtual synchronous debrief is available at: Goldsworthy, S., & Verkuyl, M. (2021, October). Facilitated virtual synchronous debriefing: A practical approach. *Clinical Simulation in Nursing, 59*, 81-84. https://doi.org/10.1016/j.ecns.2021.06.002.

Examples in Action

This video is an example of a co-facilitated virtual synchronous debrief, after the students have engaged in a self-debrief.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=292#h5p-40

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=292#h5p-41

DEBRIEFING FRAMEWORKS

The Healthcare Simulation Standards of Best Practice™ (INACSL, 2021) state that the structure and format of any simulation needs to be informed by its purpose or objectives and supported with theory or a conceptual framework. Simulations should have a defined beginning point followed by a structured learning opportunity. They should also include engaging learning activities and end with realization and demonstration of learning outcomes. There are many different models or frameworks available to guide the debriefing process and educators will choose a model based on factors such as their teaching philosophy, time, and learner profile. The overriding principle is that a framework should be used to guide debriefing. All conceptual frameworks call for the use of a systematic approach and provide a structured, evidence-based approach to the debrief. Some examples of debriefing models, and the structure or process they employ, are summarized in Table 5.1.

Expert's Corner: Theoretical Frameworks

A major principle of simulation in education is that the debriefing process should be guided by a theoretical framework. The actual choice of a particular debriefing framework is of secondary importance.

Click here to download an accessible PDF version of Table 5.1.

Table 5.1: Debriefing Model Examples (Based on Pivec, 2011; Dreifuerst, 2012; Gardner, 2013; Lusk, 2013)

Debriefing Model/Author	Structure
Plus-Delta (Cheng et al., 2021)	• What went well? • What the learner would like to change? • How to change?
Lederman (1992)	• Systemic reflection and analysis • Intensification and personalization • Generalization and application
GREAT (Owen and Follows, 2006)	• Guidelines • Recommendations • Events • Analysis • Transfer
Fanning & Gaba (2007)	• Description • Analogy/analysis • Application
5-E Debriefing Model (Dreifuerst, 2010)	• Engage • Explain • Elaborate • Evaluate • Extend
3D Model of Debriefing (Zigmont et al., 2011)	• Defusing • Discovering • Deepening • The Environment
SHARP (Edgecombe et al., 2013)	• Set learning goals • Review experience • Address concerns • Review learning points • Plan ahead for future practice

Debriefing Model/Author	Structure
Promoting Excellence and Reflective Learning in Simulation (PEARLS) (Eppich & Cheng, 2015)	• Reaction • Description • Analysis • Summary
Trauma-informed Psychologically Safe (TiPS) debriefing framework (Harder et al., 2021)	• Orientation • Review • Catharsis • Psychoeducation • Recover **NOTE:** this debriefing framework attends to the emotional aspects of simulation-based experiences; particularly those that knowingly elicit emotional stress. For more information about this framework, click here to watch this video.

Expert's Corner: 3D-Model

One example of a commonly used debriefing model is the 3D-Model. This four-phase model includes: A) Defusing; B) Discovering; C) Deepening, and D) the Environment by Zigmont et al., 2011.

Defusing –This first phase involves facilitated discussions of how the simulation was experienced emotionally by the learner and how the activities or events in the simulation occurred. This stage permits learners to revisit the scenario and explore emotions elicited by the simulation.

Discovery- In this phase, learners actively analyze and evaluate their performance. This self-analysis assists learners to identify reasons for why they behaved as they did or why they made certain decisions during the simulation event.

Deepening – This stage focuses on examining the knowledge gained from the debrief. The learner

starts to actively apply the new knowledge gained from the simulation and connects that knowledge to clinical practice.

The environment is considered both a social and physical space where the debriefing is facilitated by the educator.

NUANCES: FACILITATED VIRTUAL DEBRIEF

Certain features of an in-person debriefing do not translate very well to virtual debriefings. To ensure that the debriefing continues to be efficient and meaningful, educators need to carefully consider factors such as timing, communication, environment and technology. Learners will perceive a debriefing positively or negatively depending on how well those factors are addressed in the virtual debrief (Cheng et al., 2020; Verkuyl et al., 2018).

Timing of Debrief after the Simulation

Many educators hold the debriefing almost immediately or as soon as possible after the simulation. During an in-person simulation it is common practice to conduct the debrief immediately after the simulation when emotions are strong and thoughts about the simulation are fresh in the learner's mind. Virtually, this can be achieved when the enactment is completed synchronously, however, it is not possible when learners enact the virtual simulation asynchronously. Learners often find an immediate debriefing beneficial, particularly if the simulation topic was sensitive (Verkuyl et al., 2020). One way to provide an immediate debrief when the virtual simulation is conducted asynchronously is through a self-debrief or facilitated asynchronous debrief. While the debriefing may be delayed by time or scheduling constraints, or by waiting for analytics, the debrief should be held within two weeks of the simulation.

Communication

Non-verbal cues such as body language, facial expressions and eye contact play an important role in day-to-day conversations, and even more so in debriefings. Non-verbal communication aids in the expression of emotion and can provide subtleties about communication that are essential. Communication can be a challenge in a virtual debrief. For example:

- Eye contact can help provide validation, sympathy, or empathy. It may be difficult to evaluate eye contact during a virtual synchronous debrief and, therefore, may impede or undermine its significance (Cheng et al., 2020).
- The way people present themselves in a virtual environment may be different from their inherent personality. An extroverted person may come across as shy because of the different social cues (Cheng et al., 2020).

- Brief utterances, and acknowledgements such as "yeah, uh huh" may be missing or not heard in the online environment. This may negatively impact learner engagement and group cohesion (Cheng et al., 2020).
- Some learners may decide to turn off their cameras which can negatively impact the group. Some learners may feel reluctant to talk because they cannot actively see their peers' expressions. This can make it more difficult to facilitate the group because the facilitator cannot 'read' the group (Verkuyl et al., 2018).

Environment

When learners join the virtual synchronous debriefing from a private space, such as their home, it may help them to focus and to express themselves freely (Verkuyl et al., 2018). Learners who join the debriefing from public spaces may limit their participation and information-sharing for fear of being overheard. Privacy concerns may also hinder open communication. Effective management of interruptions in a facilitated virtual debrief is the responsibility of both the educator and the learners (Cheng et al., 2020).

Recommendations for learners that will help to create an environment conducive to learning include:

- Minimize visitors entering and leaving your screen as this may prevent other learners from sharing their thoughts and emotions.
- Access the virtual environment from a quiet, well-lit room with a good light source, preferably coming from the front.
- Sit in front of a neutral or plain background.
- Place the camera at eye level (by placing books/stand under a laptop if needed) and position the head centrally on the computer screen.
- Face the camera and look into it frequently to ensure eye contact is made. Wired headphones may help learners and educators to speak and hear clearly (Cheng et al., 2020).

Technology

Technology may prove to be a boon or a bane to debriefing. Although it allows learners to attend the debrief from different parts of the world, and from the comfort of their homes with options such as break out rooms, screen sharing, and chat functions, technical challenges may negatively impact the quality of debriefing. Educators, and learners need a reliable internet connection. A poor connection resulting in a sub-optimal video may interfere with reading facial expressions and poor-quality audio may influence learner responses or their interpretation of the discussion. Technical problems may also interfere with the screen sharing function which will limit sharing of important information or resources.

It can be rather overwhelming for educators to deliver content on new, unfamiliar platforms (Cheng et al., 2020). Educators may not be able to see all the participants at once which may limit dialogue and conversation. To avoid technology glitches, it is essential that educators familiarize themselves with the technology prior to using it. A solid orientation and ample ractice with the platform is essential. Additionally, educators should set up their cameras and check lighting to ensure a clear picture and test their audio in advance of a session (Goldsworthy et al,. 2021).

Chat Options on or off, and Managing the Chat during the Debrief

In a facilitated virtual debrief, the facilitator can either ask a question or post it in the chat box (Verkuyl et al., 2018). The chat allows learners to read the question over again at any time, reflect, and respond. Similarly, the learner can either use the chat box or microphone to respond, whichever they find more comfortable (Verkuyl et al., 2018 & Goldsworthy et al., 2021). When using the chat box function, the facilitator or another member of the team needs to continually monitor the chat and address the comments posted (Goldsworthy et al., 2021). If you are not able to monitor the chat function, it should be disabled. If you are monitoring the chat function, disable the private chat function so that all comments are viewed by the group.

Record Options

While it might be useful to record sessions in certain cases for participants who miss a session, most educators do not advise doing so; recording may negatively affect learner engagement and raise concerns regarding confidentiality (Goldsworthy et al., 2021) .

Remove Distractions

Learners and educators should limit distractions by turning their phones off prior to the debriefing and using the chat to interact only with the educator rather than with each other. Participants should keep themselves muted unless they are talking. Educators should advise learners to use technical features such as hand raising when they wish to speak. Multitasking, such as browsing the internet, checking email, or performing any other task during virtual debriefing should be discouraged. Participants should limit environmental distractions such as family members entering their room or excessive background noise (Cheng et al., 2020).

Limitations of Debriefing for Virtual Simulation

Conducting a debrief when the facilitator is not present, as in a virtual simulation, means that the facilitator cannot comment on hesitations or pauses during the simulation. The facilitator can only comment on forced decision points (See Chapter 1) and content, for example: "What were you thinking when this question came up?", and, "What were you thinking when you got it wrong?"

For an effective debrief, the facilitator needs an intimate knowledge of the simulation content and all decision pathways to understand learners' perspectives and optimize learning.

PSYCHOLOGICAL SAFETY

Debriefing in simulation drives learning. An effective debriefing can help learners make sense of events and encourage knowledge transfer from the simulation to the practice setting. Psychological safety is an important component of debriefing; it means that people feel safe taking risks and being vulnerable with others. When applied to a virtual simulation in education it means that the learners feel free to speak up, share thoughts and ask questions without being embarrassed or worrying that peers will respond negatively (Edmondson & Lei, 2014). A skilled facilitator is able to create a sense of psychological safety in the group; achieving a balance between learners' feelings of fear and defensiveness with a willingness to share, reflect, ask questions and discuss experiences openly (Kolbe et al., 2020).

Expert's Corner: Evaluation and Psychological Safety

If a simulation will be graded for evaluation purposes, this will likely reduce learners' sense of psychological safety.

Psychological Safety in Debriefing

While psychological safety is first established in the pre-briefing phase of a simulation-based learning experience (Chapter 3), Kolbe et al., (2020) describe recommendations for establishing and maintaining psychological safety during debriefings.

Establishing Psychological Safety

Setting the right tone at the beginning of the debriefing is an important aspect of psychological safety. To establish psychological safety, debriefers should:

- Explain the debriefing process – including roles of facilitators, learners, and potential observers.
- Explicitly invite active participation in debriefing and demonstrate appreciation for doing so.
- Commit to actions and behaviours that convey respect, curiosity, attentiveness, and understanding of the learners' perspectives.

Maintaining Psychological Safety

Given the dynamic, and at times delicate nature of psychological safety in the debriefing context, even apparently minor disrespectful behaviours can negatively impact perceptions of psychological safety (Kolbe et al., 2020). To maintain psychological safety, facilitators should:

- Consider behaviours that contribute to psychological safety during debriefings (e.g., explicit behaviours – clarify expectations, use inclusive language, demonstrate active listening; implicit behaviours – arrive early, respect confidentiality, convey empathy)
- Be aware of indicators that suggest learners' perceptions of psychological safety may be threatened, for example:
    - Engaged or conversant learners becoming quiet or reserved.
    - Closed body-language.
    - Defensive responses or comments.
    - Learners arguing or criticizing one another.
- Assume learners' reactions reflect how they feel; reticence or defensiveness means learners do not feel psychologically safe
- Focus on facilitator behaviours (rather than the learners) when attempting to restore psychological safety, for example:
    - Convey a positive affect (open body-language, eye contact).
    - Validate, and normalize learner concerns.
- Debrief the debriefing by regularly reflecting on own feelings of psychological safety and the ability to convey psychological safety in the debriefing process.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=297#h5p-11

Debriefing Emotionally or Psychologically Stressful Simulation Events

Simulation-based learning experiences have the potential to evoke psycho-social or emotional distress in learners (Harder et al., 2020). When simulation experiences involve known stressful events (e.g., patient death), debriefing should shift from focusing on clinical judgment and analysis of technical and nontechnical skills to addressing the emotional stress of the experience. Harder et al. (2021) developed a debriefing framework for health care practitioners and learners who experience patient death within the simulation experience: the Trauma-informed Psychologically Safe (TiPS) debriefing framework.

The TiPS Debriefing Framework

The TiPS debriefing framework is based on the principles of trauma-informed care: safety, choice, collaboration, trustworthiness and empowerment (Harris & Fallot, 2001). The purpose of the framework is to help learners feel prepared for exposure to potentially traumatic events (Harder et al., 2021). The TiPS framework includes guidance for facilitators on establishing psychological safety prior to the debriefing and procedures to follow during the debriefing. The framework also outlines what to do following the debriefing such as observing for the signs and symptoms of normal and abnormal stress or trauma reactions. It also outlines the importance of frequent self-monitoring following an emotionally stressful simulation experience.

In this video, Dr. Nicole Harder provides insight into the TiPS debriefing framework.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=297#h5p-12

Spotlight on Scholarship: TiPS

Read the paper, "Developing a trauma-informed psychologically safe debriefing framework for emotionally stressful simulation Events" by N. Harder, J. Lemoine, W. Chernomas, and T. Osachuk to learn more about the TiPS debriefing framework. https://doi.org/10.1016/j.ecns.2020.11.007.

Potentially Sensitive, and/or Distressing Topics

Facilitators should have an awareness of potentially sensitive and distressing topics and consider additional steps to enhance psychological safety that include:

- Select an appropriate debriefing framework (e.g., TiPS).
- Provide information on counseling services.
- Adopt strategies to prevent emotional distress and re-traumatization in learners.

Sensitive Topics

- Death/dying/end of life
- Terminal illness
- Violence/Gender-based Violence
- Suicide
- Child maltreatment
- Racism
- Cardiac arrest/emergencies
- Natural disaster

Strategies to Prevent Emotional Distress, and/or

Re-traumatization (Li et al., 2019)

Preventing emotional distress and re-traumatization is important. These are some preventative strategies educators can employ through the different stages of a simulation to minimize risk:

- Preparation
  - Include detailed information about the potentially distressing content in the pre-brief.
  - Inform learners about symptoms of emotional distress/re-traumatization (e.g., difficulty sleeping, distressing dreams).
- Ongoing Assessment
  - Maintain an ongoing assessment of learners' experiences throughout the simulation experience e.g., "check-in" at regular intervals.
- Respond to Disclosures
  - Supportively acknowledge learners' disclosures as an educator/facilitator (not as clinician).
  - Introduce available and affordable counseling and support services (e.g., learner or employee health services).
- Titrate exposure to traumatic material
  - Use breaks or pauses to prevent learners from becoming overwhelmed.
  - Ensure traumatic material is dispersed throughout the course or learning experience.
- Give learners control over material
  - Inform learners of their right to engage with material at their own comfort level.
- Promote Self-care
  - Stress the importance of relaxation, recreation and play.
  - Encourage learners to seek support from family, friends and mentors/supervisors.

CONCLUSION

Post-simulation debriefing is widely considered to be the most critical component of simulation and the cornerstone of the learning experience. While there are numerous guides to facilitating in-person simulation debriefings, this chapter describes ways for educators to debrief a virtual simulation and discusses the special nuances of virtual simulation debriefing. Educators are introduced to different theoretical models to guide the debriefing process and advised that a theoretical framework should guide debriefing; it is up to the educator to identify a process that works well for them, their learners, and the virtual simulation. When using a debriefing method, it is important to take time to prepare for the experience, consider ways to enhance a sense of psychological safety in learners and evaluate outcomes.

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CHAPTER 6: EVALUATION

Learning Objectives

1. Review the purposes of evaluation.
2. Explore different evaluation methods suitable for virtual simulation.
3. Discuss the role of evaluation in improving facilitation in virtual simulation.

INTRODUCTION

One of the most important principles of teaching with virtual simulation is that, to maximize learning, educators need to follow a sound pedagogical process. The process, as outlined in earlier chapters, includes prebriefing, enactment, and debriefing. A fourth stage, evaluation, is essential to complete that process. Evaluation in virtual simulation may be described as the systematic examination of the learning activity, learners' experiences and the facilitation process. Educators collect, and analyze data with the primary goal of improving the learning experience. Responsive evaluation, where educators evaluate, and apply what they learn to their practice, helps improve the virtual simulation experience, thereby promoting learning and learner satisfaction (Stake, 1975).

REASONS FOR EVALUATION IN VIRTUAL SIMULATION

There are numerous reasons for evaluating virtual simulation. Some of these include:

- Measuring achievement of specific learning objectives.
- Documenting what virtual simulation teaching and learning processes work and what needs to change.
- Taking stock of resources used to inform future resource allocation.
- Identifying best processes for integrating virtual simulation in the curriculum.
- Gathering quality evidence to share with other educators.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=307#h5p-13

An important principle of evaluation is not to try to answer all questions in one evaluation. It is a good idea to clarify the scope of the evaluation in the initial planning stage. A helpful way to get started is to develop a list of questions that the teaching team most wants answered, and which *can* be answered (Table 6.1).

Click here to download an accessible PDF version of Table 6.1.

Table 6.1: Key Questions for Planning the Evaluation

Questions
What do we really want to know and why?
What outcome do we want to measure?
How will the evaluation findings be used to improve the virtual simulation experience?
Which group should be the focus of the evaluaton?
Who should conduct the evaluation?
When should the evaluation be done and what are the timelines?
What data collection method best fits with the evaluation purpose?
How will data be analyzed and by whom?

The more specific the evaluation question, the more likely the educator is to get a clear answer. Also, when designing the evaluation plan, it is important to ensure that the plan is feasible (Freeth et al., 2005). Educators should reflect on how much time and energy the evaluation will take, what skills will be needed and if there are sufficient resources to get the job done. Many evaluation methods do not require any specialized data collection or analysis skills; however, some do. For example, a basic knowledge of how to run and interpret statistical tests will be needed for measuring pre and post activity knowledge gains. Educators should think through their choice of evaluation method and ensure they have the necessary resources. Avoid being overly ambitious!

Expert's Corner: Evaluating Learning

In response to the question, 'What do we really want to know?' educators decide they want to know if learners gained knowledge by playing the virtual simulation on neonatal care. They ask learners to complete a 10 item multiple choice quiz based on neonatal care virtual simulation learning outcomes, online, before playing the virtual simulation. They ask learners to complete the test again, one week after playing the virtual simulation. A member of their team agrees to analyze the data using statistics.

There are many different methods that can be used to evaluate the virtual simulation experience: learner testing, focus groups, surveys, facilitator self-reflection, peer observation, and feedback. Just as specific learning outcomes drive an educator's choice of virtual simulation, they also drive the evaluation strategy an educator will use (Figure. 6.1). For example, if an educator simply wants to know if learners gained knowledge, testing is an appropriate strategy. If, however, the educator wants an in-depth understanding of the impact of the simulation on clinical practice, discussion or focus group interviews would be the best approach.

Examples in Action: Focus Groups

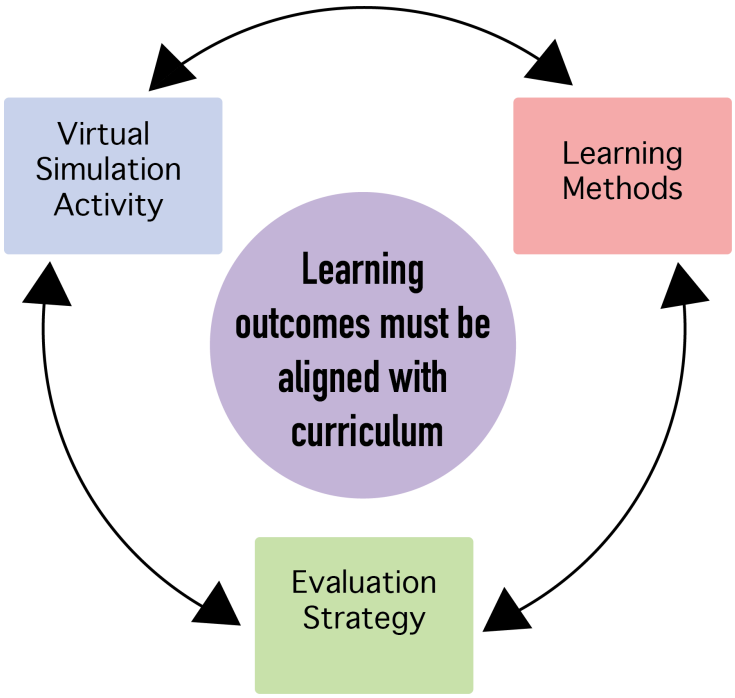
Educators used a virtual simulation to help developmental service worker (DSW) students prepare for their first community visit. The wanted to evaluate the impact of the virtual simulation on learners' knowledge and confidence levels. They conducted a focus group with learners and asked

these questions:

1. Tell me what you were thinking about your role as a DSW as you worked through the simulation.
2. Did the simulation help to prepare you for your first visit in the community? Tell me why or why not.
3. What were some key learnings you had as a result of using the simulation? How will they help you in the field?
4. How would you rate your confidence level about making your first visit before you played the simulation? After? Can you tell me about that?
5. What can we do differently with this virtual simulation to further promote your learning?

Click here to download an accessible PDF version of Figure 6.1.

Figure 6.1: The Evaluation Cycle



Many evaluation strategies can be conducted though a learning management system or survey administration site thereby streamlining data collection and analysis. Sample outcomes and evaluation strategies are outlined in Table 6.2.

Click here to download an accessible PDF version of Table 6.2.

Table 6.2: Evaluating Learner Outcomes and Evaluation Strategies in Virtual Simulation

Outcome	Possible Evaluation Strategies
Learner knowledge gains	• Pre-post multiple choice knowledge test • Survey with open-ended items • Reflective practice activities • Analytics • Pop quiz
Learner virtual simulation satisfaction (including the debrief)	• Informal discussions • Surveys • Focus group interviews • Pulse survey (anonymous)
Impact on practice	• Survey with open-ended items • Reflective practice activities • Learner feedback
Learner team building skills	• Informal discussions • Reflective practice activities • Surveys
Learner self-efficacy	• Informal discussions • Surveys
Facilitator skills	• Learner feedback • Peer mentoring/review • Co-debrief the virtual simulation

Another important point to consider is how the evaluation results will be used. There are two main types of evaluation that apply to virtual simulation: formative and summative.

STUDENT EVALUATION

Formative Evaluation

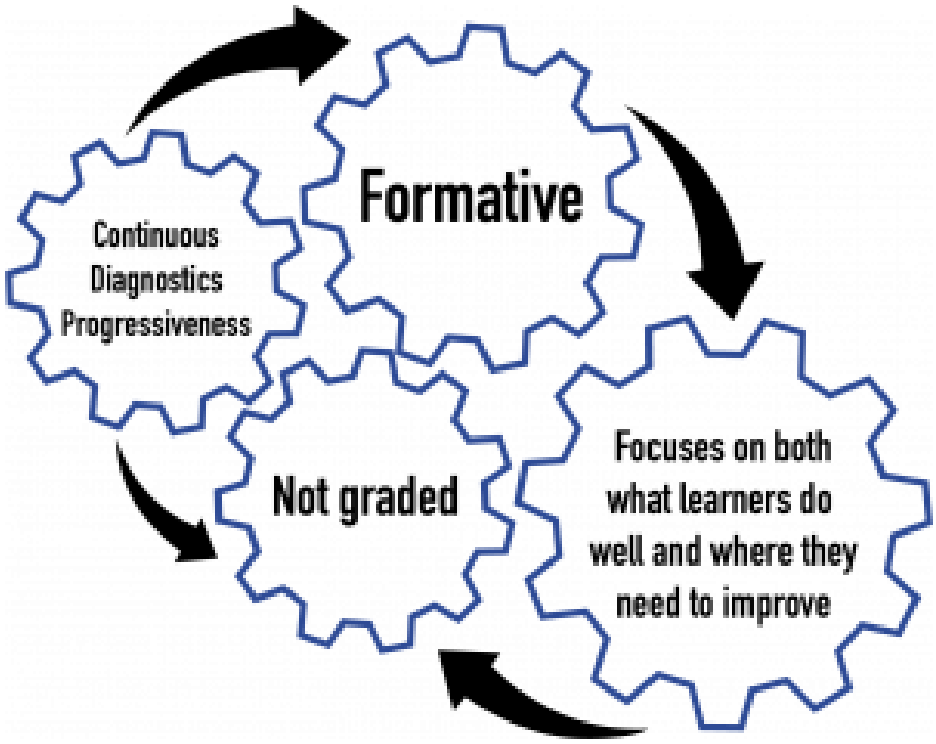
Formative evaluation is the most common evaluation associated with virtual simulations. The purpose of formative evaluation is to help educators and learners gauge whether or not learners are learning. It helps learners and educators act quickly to adjust teaching and learning strategies in a timely way to better meet learners' needs. If the virtual simulation generates a score, learners are encouraged to play the simulation often to improve their score without worrying about the impact of their score on their final grade. The score is simply used as a measuring stick for learners to gauge their own understanding of the simulation content. Formative evaluations are typically done informally and may not be graded or, if graded, the mark does not contribute to a final grade. Formative evaluation helps educators determine if they need to revisit a concept or explain it differently (Figure 6.2).

Examples of formative evaluation activities applied to virtual simulation include:

- Learners play a virtual simulation and receive a total score but the score does not contribute to their final grade.
- Learners are asked to describe a key concept learned from the virtual simulation in their own words.
- Learners are asked to take one minute and answer: "What is helping your learning with the virtual simulation process?" "What is making learning difficult? "

Click here to download an accessible PDF version of Figure 6.2.

Figure 6.2: Formative evaluation



Summative Evaluation

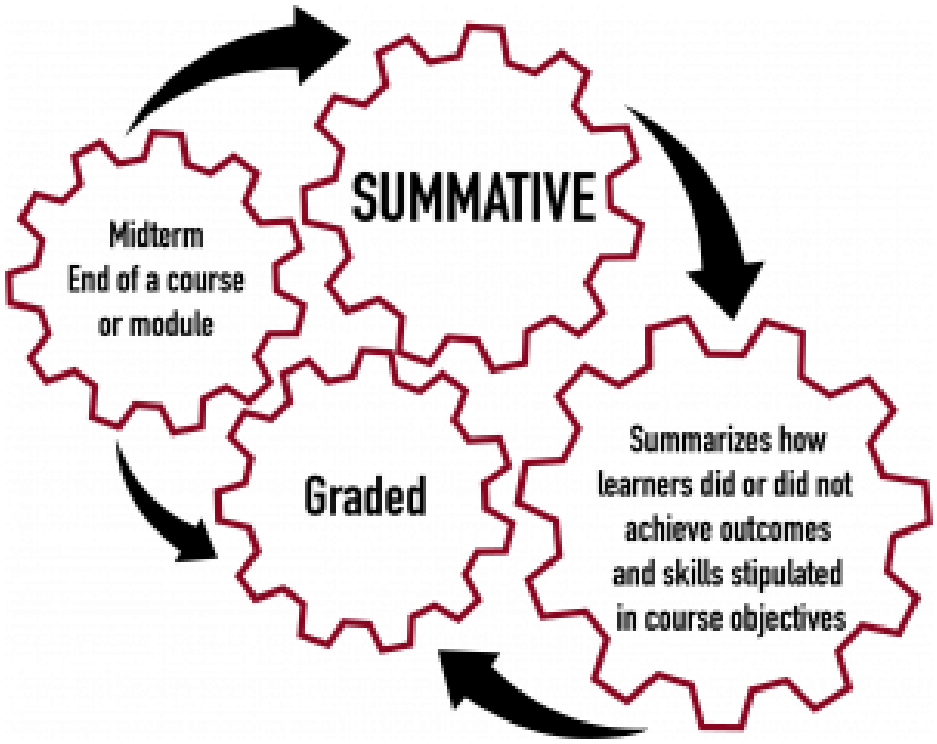
The purpose of summative evaluation is to evaluate learning by comparing it to specific learning outcomes. It is considered 'high stakes' evaluation because it is a formal process where the learner is graded and where the result counts towards the learner's overall grade (Figure 6.3). It is used less often in relation to virtual simulation because it runs contrary to the principle of using virtual simulation to encourage learners to learn through exploration. That said, summative evaluation can play a role in virtual simulation.

Examples of summative evaluation activities applied to virtual simulation include:

- Learners play a virtual simulation on mental health and their total score at the end of the simulation counts for 5% of their total grade.
- Learners play a pediatric virtual simulation with a focus on decision-making in a complex clinical case as part of an OSCE (objective structured clinical exam).

Click here to download an accessible PDF version of Figure 6.3.

Figure 6.3: Summative evaluation



Some important caveats when using virtual simulation for summative evaluation:

- It is essential learners are advised in advance if their virtual simulation scores/activities will count towards their grade in a course.
- If using a virtual simulation for summative evaluation the simulation is not shared with learners in advance of testing, and they just play it once.
- If using virtual simulations for summative purposes it is essential that learners have ample opportunities to practice with the virtual simulation process and technology before being tested.

FACILITATOR EVALUATION

Evaluating Facilitation Skills

Another group that benefits from evaluation is virtual simulation facilitators. Using a virtual simulation effectively requires planning and preparation to motivate and engage learners. A successful virtual simulation experience goes beyond simply offering learners access to a virtual simulation and requires a facilitator who understands learners' needs and creates a welcoming, inclusive virtual space. For this reason, it is important for educators who are facilitating virtual simulations to periodically evaluate their own techniques and skills (Cheng et al., 2015). There are several ways to do this.

Educators can:

- Ask learners for feedback formally through written feedback or informally through verbal feedback.
- Keep a reflective journal on the facilitation process.
- Ask an expert facilitator to co-facilitate some sessions and provide constructive feedback; known as co-facilitating and 'debriefing the debriefers.'
- Form a group of peers to review each other's sessions and provide constructive feedback.

Continuing professional development is also key to further strengthening facilitation skills. The Healthcare Simulation Standards of Best Practice™ provides excellent strategies for staying current in the evolving field of simulation. For further information on facilitation skills during debriefing, see Chapter 5.

One last word about evaluation: it is considered sound ethical practice to tell anyone who will be sharing their data about the purpose of the evaluation, how their data will be used, and what the educator is doing to ensure data confidentiality and security.

Expert's Corner: Feedback on Facilitation Skills

An evaluator posts this request on the learning management system:

Hello everyone. I am interested in learning what I can do better when facilitating our virtual simulation debriefing session. Please take one minute to answer the following questions. Please note: your responses will be anonymous, and I will be using this information to improve future sessions.

My questions are: "What am I doing well?", and, "What would you like me to change?". Thank you!

There are many resources available on the evaluation process and educators are encouraged to explore those resources. A checklist might also be useful in being systematic with evaluation (Table 6.3).

Click here to download the Evaluation Checklist.

Table 6.3: Evaluation Checklist

Evaluation Checklist	Checklist
Identify evaluation purpose.	☐
Clarify key evaluation questions and the information needed.	☐
Identify evaluation audience or target (who will read the results?).	☐
Determine the type of evaluation: formative or summative.	☐
Identify who will provide information (learners, facilitators, lab personnel, etc.).	☐
Determine data collection methods (survey, quiz, observation, interview, etc.).	☐
Consider data analysis strategies.	☐
Set timelines.	☐
Outline necessary resources (time, skills, etc.).	☐

Knowledge Check Activity 6.1

Facilitator Faraz wants to evaluate various outcomes for an upcoming virtual simulation. Unfortunately, the evaluation strategies have been jumbled! Can you help Faraz sort the evaluation strategies to the correct outcomes? Drag each of the outcomes into the appropriate evaluation strategy.

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=1148#h5p-19

Knowledge Check Activity 6.2

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://ecampusontario.pressbooks.pub/vlsvstoolkit/?p=1148#h5p-20

**Virtual Gaming Simulation (VGS)

CONCLUSION

Evaluation is an essential part of any learning activity and this holds true for virtual simulation. The evaluation process should be systematic and conducted thoughtfully. Evaluation questions should reflect educator and learner interests and concerns, and be measurable. A variety of evaluation designs are available to educators using virtual simulation; just a few possibilities have been introduced in this chapter. Educators need to choose a design that matches their evaluation question and one that they have the skills and resources to conduct. Evaluation-informed decisions strengthen the virtual learning experience and outcome achievement for learners.

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APPENDIX

This list contains and outline of the Figures, Tables, and Videos/Podcasts in this book. Each item on this list is linked to the page of the book where it can be found.

Figures:

Tables:

Videos & Podcasts:

- Psychological Safety (Dr. Sandra Goldsworthy)
- Kolb's Experiential Learning (Treva Job)
- Curricular Uptake of Virtual Gaming Simulation in Nursing Education (Dr. Daria Romaniuk)
- Examples of Embedding Virtual Simulation into Courses (Dr. Jennifer Lapum)
- Faculty Development (Sufia Turner)
- Learning Analytics (Margaret Verkuyl)
- Immersive Technology (AR/VR) in Health Professions Education Parts 1 and 2 (Dr. Bill Kapralos)
- Social Work (Sophie Seguin)
- Architecture (Nicole Dubois)
- Business Administration (Alain Piorier)
- Nursing (Danaiet Teame)
- Prebriefing Considerations (Elizabeth Horsely)
- Benefits of Asynchronous Simulations (Dr. David Topps)
- Facilitators Perspective of Enactment (Dr. David Topps)
- Pearls of Wisdom (Dr. David Topps)
- Benefits of Simulation & IP Learning (Dr. David Topps)
- Introduction to Debriefing (Dr. Sandra Goldsworthy)
- Facilitated Virtual Synchronous Debrief
- TiPS Debriefing Framework (Dr. Nicole Harder)