



PRACTICAL TIPS

REVISED Twelve tips for integrating Virtual Reality Simulation into Health Professions Curricula

[version 2; peer review: 4 approved]

Yvonne Finn ¹, Siobhan Smyth²

¹School of Medicine, College of Medicine, Nursing & Health Sciences, University of Galway, Galway, H91 TK33, Ireland

²School of Nursing and Midwifery, College of Medicine, Nursing & Health Sciences, University of Galway, Galway, H91 TK33, Ireland

V2 First published: 16 Oct 2024, 14:233
<https://doi.org/10.12688/mep.20697.1>
Latest published: 19 Nov 2024, 14:233
<https://doi.org/10.12688/mep.20697.2>

Abstract

Virtual reality simulation (VRS) has the potential to disrupt and transform current understandings and practices in simulation-based education in health professions curricula. Recent technological developments, including AI applications, give the learner high levels of immersion into a virtual environment that even more closely mimic the real world than heretofore. At the same time, there are significant obstacles facing educators who strive to integrate VRS into their simulation curricula. We have written a VRS handbook for nurse educators, developed VR scenarios and delivered VRS workshops to undergraduate nursing students. Our twelve tips are aimed at undergraduate curriculum developers and simulation leaders, guiding them on how to support educators in integrating VRS into their curricula. The tips describe key considerations to be addressed in the development and integration of VRS into curricula. The tips are timely, as health professions education is on the cusp of entering technology-enhanced simulation, of which VRS will be a key player.

Keywords

Virtual Reality, VR simulation, Health professions, Simulation, Curriculum development

Open Peer Review

Approval Status    

	1	2	3	4
version 2				
(revision)				
19 Nov 2024	view		view	view
				
version 1				
16 Oct 2024	view	view		

1. **Tanisha Jowsey** , Bond University, Robina, Australia
2. **Elisabeth Coyne** , Griffith University, Brisbane, Australia
3. **Melanie Barlow** , Australian Catholic University, Fitzroy, Australia
4. **Luciana Mara Monti Fonseca**, Universidade de Sao Paulo, São Paulo, Brazil

Any reports and responses or comments on the article can be found at the end of the article.

Corresponding author: Yvonne Finn (yvonne.finn@universityofgalway.ie)

Author roles: **Finn Y:** Conceptualization, Formal Analysis, Funding Acquisition, Methodology, Project Administration, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Smyth S:** Conceptualization, Formal Analysis, Funding Acquisition, Methodology, Project Administration, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: The author(s) declared the funding from the ERASMUS+ programme of the European Union - Ref no. 2020-1-DE02-KA202-007647. Funds assigned to University of Galway in this project have been used to support this manuscript preparation and publication. The funder had no role in preparation of the manuscript.

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Copyright: © 2024 Finn Y and Smyth S. This is an open access article distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

How to cite this article: Finn Y and Smyth S. **Twelve tips for integrating Virtual Reality Simulation into Health Professions Curricula [version 2; peer review: 4 approved]** MedEdPublish 2024, 14:233 <https://doi.org/10.12688/mep.20697.2>

First published: 16 Oct 2024, 14:233 <https://doi.org/10.12688/mep.20697.1>

REVISED Amendments from Version 1

This latest version is in response to feedback from both reviewer 1 and reviewer 2. Small changes have been made to TIP 1, where a number of additional examples of educational theories that are relevant to VRS are presented in the text. In Tip 2 procedural skills are added as additional examples of skills that are taught in VRS. A sentence on avoidance of learner fatigue and adverse reactions by consideration to the number competencies and duration of immersion in VRS is also added to Tip 2. Finally, in Tip 7 the authors discuss the risk of software developers ceasing to offer VR software compatible with VR hardware in use by educators.

Any further responses from the reviewers can be found at the end of the article

Introduction

Experiential learning is embedded in modern competency-based health profession curricula, the hallmark of which is the immersion of the learner “in an experience”, followed by “reflection about the experience to develop new skills, new attitudes, or new ways of thinking” (Lewis & Williams, 1994, p.5). Simulation-based education facilitates experiential learning, supporting the learner in acquiring essential competencies required for safe and effective patient care in their future clinical practice. A core component of simulation-based education is the scenario or patient story, which mimics the clinical and social circumstances of patients that the learner will encounter in future clinical practice. There are challenges in delivering simulation-based education, however; these include infrastructure, timetabling, availability of suitably qualified staff and costs of equipment and consumables. At the same time, the number of learners enrolled in health profession programmes has increased globally, with the number of medical students doubled and the number of nursing students increased by a third in the last decade (Frenk *et al.*, 2022). Virtual reality simulation (VRS), defined as simulation that uses “a variety of immersive, highly visual, 3D characteristics to replicate real-life situations and/or health care procedures” can complement physical simulation and overcome some of the barriers in delivering simulation-based education to all learners during their training (Lioce *et al.*, 2020, p.56). The advantages of VRS include flexibility in time and location, lower demand on resources and repeatability.

With the increasing growth of VRS, it is important for educators to have guidance and support to use this technology. The following twelve tips describe measures curriculum developers and simulation programme leaders can take to support health profession educators to integrate VRS into their undergraduate clinical skills and simulation curricula.

Tip 1 Define educational theories

Define educational theories for VRS that are aligned to the existing curriculum. Curriculum developers need to guide

educators on educational theories they can use to inform the development of VRS, taking into account overall curriculum design and educational context. The educational theory will inform the design, content and delivery, as well as the selection of VR scenarios to deliver VRS. Kolb’s experiential learning (Kolb, 1984), Gibbs’ reflective cycle learning theory (Gibbs, 1988), situativity cognitive learning theory of Durning and Artino (Durning & Artino, 2011), and McCarthy’s 4MAT learning system (McCarthy, 1980) are some of the educational theories that can inform VRS in health profession education. Adapting an educational theory from the start will drive the educational quality of VRS.

Tip 2 Prioritise clinical competencies for VRS

Identify desired competencies VRS should address. Curriculum developers should identify which competencies their learners need more training and practice, such that they can achieve the predetermined competence level to transition to the next level of training or to graduate from the curriculum. The core competencies addressed in clinical simulation are technical skills, such as critical thinking, clinical decision-making and patient assessment, non-technical skills, such as communicating, teamwork and situation awareness, and procedural skills, such as urinary catheter insertion and NG tube insertion. Due to the complex, busy and ‘messy’ environment of health services, learners may not have achieved certain competencies to the required level of acquisition while on clinical placements. VRS provides additional experiential learning, offering opportunities for repeated practice and feedback, key factors for effective learning in simulations (Issenberg *et al.*, 2005; Jallad & Isik, 2022). Due consideration to risk of learner fatigue and adverse effects on learners associated with longer durations of immersion in VRS e.g. nausea and dizziness, should guide decisions on the combination of, and, number of competencies to include in VR scenarios.

Curriculum developers can identify competency-training gaps through various methods, such as analysis of assessment results, learner, simulated person and educator evaluations, and focus groups or interviews with learners, educators and clinical staff. This can then inform key competencies that should be included in the VRS aspects of the curriculum.

Tip 3 Engage key supporting staff

Engage simulation technicians and learning technologists in VRS. Key support staff for VRS are simulation technicians and learning technologists. Simulation technicians have responsibility for space set-up, checking headsets, hand controllers, PCs/laptops and other necessary hardware, ‘booting up’ the VR software and doing initial checks, running the VR scenario software and being available in case of technical glitches during a VRS. Other duties include health and safety checks, maintenance, and cleaning and storage of VR hardware. Training of simulation technicians in the necessary skills to competently fulfil these duties is key to the success of implementing VRS into health professions curricula.

Curriculum developers also have access to learning technologists, who the [Association for Learning Technology](#) define as “people who are actively involved in managing, researching, supporting or enabling learning with the use of learning technology” (<https://www.alt.ac.uk>). Learning technologists can champion VRS and run seminars and workshops for curriculum developers, educators and technicians. They can also take on a supervisory role in the initial introduction of VRS into health profession curricula. Finally, they can support educators as they develop teaching skills and expertise in VRS.

Tip 4 Training of educators in VRS

Facilitate training of educators to enable them to integrate VRS into their teaching. Educators need guidance and training in VRS to enable them to incorporate VRS into their teaching. An educational framework can guide and inform integration of VRS into clinical modules. The ViReTrain project developed an educational module structure, derived from a pedagogical framework, which can be used and adapted by educators in nursing education (Smyth *et al.*, 2023). This module structure contains three core elements, namely, learning activities, simulation-based training (which includes VRS) and evaluation. A set of competencies inform the learning outcomes, which in turn are aligned to the learning activities, simulation-based training and evaluation activities of the module. Examples of learning activities are didactic lectures, group-work and case-based learning. Simulation-based training can include low-fidelity and high-fidelity simulation, and VRS. Evaluation activities can be in the form of reflective workshops, questionnaires and pre- and post-assessments.

Like physical simulation, VRS should have a prebrief phase before, and a debriefing phase after the VRS. The purpose of prebriefing is to establish a psychologically safe environment to optimize learner engagement and acquisition of skills; debriefing is a reflective process that takes place immediately after VRS, led by an educator who facilitates the process with the aid of evidence-based debriefing models and related tools. Examples include the 3D Model of Debriefing (Zigmont *et al.*, 2011), PEARLS Healthcare Debriefing tool (Eppich & Cheng, 2015) and Plus-Delta Debriefing (Cheng *et al.*, 2021). There is insufficient evidence currently on the ideal functions of the educator during the VRS but most experts in VRS agree that the educator has a supervisory role during the VRS. The educator should be given control to pause or end the VRS at any time, should that be in the best interest of the learner's safety and their learning. Leaders in healthcare simulation, such as [Harvard Center for Medical Simulation](#) (<https://harvardmedsim.org>) and [CAN-Sim](#) (<https://can-sim.ca>) offer a range of courses in simulation instruction.

Tip 5 Educational materials for VRS

Create a repository of educational materials to guide the integration of VRS into health profession curricula. With support from learning technologists and simulation programme leaders, curriculum developers should set up a VRS repository of educational materials. Using modern information

technology (IT) and multimedia, resources can be accessed by educators at a time and place of their choosing. Educational materials can be in written, audio, video and even in VR software formats, sourced from formal websites, scientific journal databases, social media platforms, blogs and apps.

Leading healthcare education simulation organizations provide useful resources, which can be linked to local repositories. These include the [International Nursing Association for Clinical Simulation and Learning](#) (<https://www.inacsl.org/>), the [Association for Simulation Practice in Healthcare](#) (<https://aspih.org.uk/>) and the [Society for Simulation in Healthcare](#) (<https://www.ssih.org/>). These organisations also publish standards for simulation in healthcare education, which include VRS.

Tip 6 Source high-quality VR scenarios

Help source high-quality VR scenarios that meet curriculum requirements. The quality of VR scenarios should be high, in terms of their design being informed by educational theories and frameworks, provision of a high level of immersion and being aligned to the intended competencies of the VRS. High levels of immersion are achieved when the learner perceives they are physically and mentally immersed in the VR environment. There is an emerging evidence base that high-immersion VRS is effective in the acquisition of cognitive and psychomotor competencies (Pernica *et al.*, 2023).

VR scenarios can be purchased from commercial VR companies, or, more recently, VR scenarios can be sourced that have been created by academic institutions in collaboration with software developers. Whatever the source, curriculum developers and simulation leaders should aim to use VR scenarios that are of high quality and meet their curricular needs.

An alternative or complementary way of securing high-quality VR scenarios is to support educators to develop scenarios in collaboration with a software partner. If this path is chosen, a health simulation authoring platform, such as [iRIS](#) (<https://www.irissimulationauthoring.com>), whose templates meet international standards of best practice in simulation scenario development, is highly recommended. iRIS also gives educators access to a shared library of scenarios, which includes VR scenarios.

Finally, consideration should be given to designing a curriculum with VR scenarios, which are of increasing complexity as the learner advances from the first year to the final year of their undergraduate training.

Tip 7 Identify suitable VR hardware

Source VR hardware that gives the learner high-immersion VR experiences. Examples of manufacturers of VR hardware are [Meta](#) (www.meta.com), [STEAM VR](#) (<https://store.steampowered.com/steamvr>), [Apple](#) (www.apple.com) and [Zhuoyuan](#) (www.funinvr.com). VR hardware include headsets, hand-controllers and some models have base stations. Headsets have cameras, sensors, headphones and speakers, and can

be adjusted to fit the head size of the learner. Designs vary and this can impact comfort, weight and cleansing processes. Some headsets require cable connections to electricity supply and/or computers during use. Hand controllers also have different designs and functionality. Hand controllers allow the learners to interact in the virtual environment; hands-free interactions are also possible, depending on the software in use. Manufacturers offer advice on using their VR hardware and provide training VR software on the use, functionality, cleaning and storage of their VR hardware to clients. The cost of VR kits varies between manufacturers and the latest versions of VR kits are more expensive than earlier versions. It is recommended that educators are given opportunities to trial and compare different VR hardware before a decision is made on which model best meets their needs. Finally, educators should know that, frequently, VR software is designed to work with a particular manufacturer's VR hardware. This may also be limited to compatibility with certain VR products from the same manufacturer. Software developers sometimes cease to offer or support VR software, putting pressure on educators to buy their latest software and newer VR hardware products. Co-design of VR software between educators and software developers may protect educators from these market pressures, as a contract can be put in place where the software developer agrees to offer and maintain the VR software for a number of years.

Finally, where educators wish to 'cast' the VRS onto screens, a computer is needed to run the VR scenario software.

Tip 8 Health and safety policy for VRS

Implement a health and safety policy for VRS. Educators should be supported in drawing up a health and safety policy. VRS policies should cover learner eligibility, practices to minimise adverse reactions, space requirements, and cleaning and storage of VR equipment. Learners can be assessed using an eligibility assessment tool or a user declaration form. The ViReTrain group adapted an eligibility assessment tool, developed by Southgate *et al.* (2017) (Smyth *et al.*, 2023, section 1.4).

Minimum space requirements should be provided for VRS, avoiding close proximity to windows, doors or stairs, and keeping the space free from furniture and equipment.

A 'spotter', who can ensure that the learner is safe in the physical environment during the VRS, should always be in place. Breaks can be built into the VRS, particularly when the learner verbalises signs of discomfort or the educator notes signs of discomfort. Some VR software allows the learner to be seated, which can reduce the risk of dizziness and nausea. The health and safety policy should include cleaning procedures for VR hardware; this can include cleaning wipes, soaps, cleaning solutions, and clean rooms. VRS health and safety policies should be reviewed regularly and updated as required.

Tip 9 Evaluation of VRS

Develop an evaluation strategy for VRS. Curriculum developers and simulation programme leaders should assist educators in developing an evaluation strategy for VRS. Specific evaluation tools exist to evaluate the usability of VRS, such as the System Usability Scale (Brooke, 1986). Other tools measure learner perceptions and satisfaction; examples are the Student Perception of Effective Teaching in Simulation Scale and the Educational Satisfaction Scale. The Debriefing Assessment for Simulation in Healthcare tool evaluates strategies and techniques used by educators in the debriefing. The International Nursing Association of Clinical Simulation and Learning (INACSL) has a comprehensive repository of evaluation instruments on its website (<https://www.inacsl.org/repository-of-instruments>). Other measures of evaluation can include assessment results, and the use of surveys and focus groups. It is strongly recommended that the creation of an evaluation strategy is a collaborative process with the involvement of key stakeholders, such as technical support staff, educators and students, and follows principles and practices of best practice in the evaluation of health profession education (O'Sullivan, 2005).

Tip 10 Networking across disciplines and institutions

Support educators in engaging in a range of networking activities. By supporting networking activities, such as attendance at conferences, seminars and webinars, and through membership activities of relevant international health professions education organisations, curriculum developers can encourage collaborations in VRS, across disciplines, institutions and geographical regions. This will provide opportunities to connect with educators, learn about different approaches, barriers and facilitators to this relatively new teaching method, share innovations in VRS and co-create VR scenarios.

Tip 11 Support research in VRS

Advance research in VRS in health professions education. Research in health professions education is essential to advance knowledge and innovations, especially in emerging new teaching and learning methods, such as VRS. This can support improvements in the design and delivery of VRS, which can lead to the development of high-quality VR scenarios and high-immersion VRS in health professions curricula. Research in VRS is limited at this time, with reports of limited studies, low numbers of participants and conflicting results (Chen *et al.*, 2020; Steen *et al.*, 2024). This adds to the call on curriculum developers to support educators to engage in VRS research.

Tip 12 Resources/Budget allocation

Review simulation budgets to include VRS. VRS offers experiential learning with the advantage of lower running costs than physical simulation. Therefore, integration of VRS into simulation programmes can reduce dependency on physical simulation alone and reduce overall costs, leaving some budget

to fund VRS initiatives in the curriculum. Consequently, an increase in simulation programme budgets is not essential to fund the integration of VRS into health profession education. At the same time, the provision of additional funding to support scholarly activities, such as VR scenario development and research in VRS, is highly recommended.

Conclusions

There is an increasing recognition that VRS complements physical simulation and, with rapid developments in VR and AI technologies, VRS can offer experiential learning opportunities for learners that closely mimic the real world of clinical practice. To overcome barriers, such as IT issues and lack of expertise with VRS, these 12 tips can guide curriculum developers and simulation leaders on how best they can

support their educators to integrate high-quality, high-immersion VRS into their curricula.

Ethics and consent

Ethical approval and consent were not required.

Data availability

No data are associated with this paper.

Acknowledgements

The authors would like to acknowledge the members of the ViReTrain project (2-20-2023), with whom they collaborated in the creation of VR scenarios in nursing education and led on writing of an educator's handbook in VRS.

References

- Apple Inc. [Viewed 7 August 2024].
[Reference Source](#)
- Association for learning technology. [Viewed 6 August 2024].
[Reference Source](#)
- Association for simulation practice in healthcare. [Viewed 31 July 2024].
[Reference Source](#)
- Brooke J: **System Usability Scale (SUS): a quick-and-dirty method of system evaluation user information**. Reading, UK: Digital equipment co, Ltd, 1986; **43**: 1–7.
- CAN-Sim Canadian Alliance of Nurse educators using simulation. [Viewed 6 August 2024].
[Reference Source](#)
- Chen FQ, Leng YF, Ge JF, *et al.*: **Effectiveness of virtual reality in nursing education: meta-analysis**. *J Med Internet Res*. 2020; **22**(9): e18290.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Cheng A, Eppich W, Epps C, *et al.*: **Embracing informed learner self-assessment during debriefing: the art of plus-delta**. *Adv Simul (Lond)*. 2021; **6**(1): 22.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Durning SJ, Artino AR: **Situativity theory: a perspective on how participants and the environment can interact: AMEE Guide no. 52**. *Med Teach*. 2011; **33**(3): 188–199.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Eppich W, Cheng A: **Promoting Excellence and Reflective Learning in Simulation (PEARLS): development and rationale for a blended approach to health care simulation debriefing**. *Simul Healthc*. 2015; **10**(2): 106–115.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Frenk J, Chen LC, Chandran L, *et al.*: **Challenges and opportunities for educating health professionals after the COVID-19 pandemic**. *Lancet*. 2022; **400**(10362): 1539–1556.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Gibbs G: **Learning by doing: a guide to teaching and learning methods**. Great Britain: FEU, 1988.
[Reference Source](#)
- Harvard Center for Medical Simulation. [Viewed 5 August 2024].
[Reference Source](#)
- International Nursing Association for Clinical Simulation and Learning. [Viewed 1 August 2024].
[Reference Source](#)
- iRIS Scenario Design System. [Viewed 05 August 2024].
[Reference Source](#)
- Issenberg SB, McGaghie WC, Petrusa ER, *et al.*: **Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review**. *Med Teach*. 2005; **27**(1): 10–28.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Jallad ST, İşık B: **The effectiveness of virtual reality simulation as learning strategy in the acquisition of medical skills in nursing education: a systematic review**. *Ir J Med Sci*. 2022; **191**(3): 1407–1426.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Kolb DA: **Experiential learning: experience as the source of learning and development**. Englewood Cliffs, NJ: Prentice-Hall, 1984; **1**.
[Reference Source](#)
- Lewis LH, Williams CJ: **Experiential learning: past and present**. *New Directions for Adult and Continuing Educ*. 1994; **1994**(62): 5–16.
[Publisher Full Text](#)
- Lioce L, Lopreiato J, Downing D, *et al.*: **Healthcare simulation dictionary-second edition**. Rockville, MD: Agency for Healthcare Research and Quality; AHRQ Publication. No. 20-0019. September 2020; [Viewed 3 August 2024].
[Publisher Full Text](#)
- McCarthy B: **The 4MAT system: teaching to learning styles with right/left mode techniques**. Arlington Heights, Illinois: EXCEL, 1980.
[Meta](#). [Viewed 4 August 2024].
[Reference Source](#)
- O'Sullivan R: **Practicing evaluation: a collaborative approach**. *Nurse Res*. 2005; **12**(4): 87–88.
- Pernica K, Virtanen H, Bager IL, *et al.*: **Scenarios for virtual reality simulation with high level of immersion in nursing education: a systematic literature review**. *J Nurs Educ Pract*. 2023; **13**(11): 17–27.
- Smyth S, Jordan F, Finn Y: **Virtual reality simulation in nursing education**. University of Galway, Ireland, 2023; [viewed 3 August 2024].
[Reference Source](#)
- Society for simulation in healthcare**. [Viewed 1 August 2024].
[Reference Source](#)
- Southgate E, Scevak J, Smith SP, *et al.*: **VR school health and safety survey, Newcastle, Australia: Digital Identity and Curation (DICE) research network**. 2017; [Viewed 7 August 2024].
[Reference Source](#)
- Steen CW, Söderström K, Stensrud B, *et al.*: **The effectiveness of virtual reality training on knowledge, skills and attitudes of health care professionals and students in assessing and treating mental health disorders: a systematic review**. *BMC Med Educ*. 2024; **24**(1): 480.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- STEAM**. [viewed 4 August 2024].
[Reference Source](#)
- The international nursing association of clinical simulation and learning: **Repository of instruments used in simulation research**. [Viewed 9 August 2024].
[Reference Source](#)
- Zhuoyuan. [Viewed 4 August 2024].
- Zigmont JJ, Kappus LJ, Sudikoff SN: **The 3D model of debriefing: defusing, discovering and deepening**. *Semin Perinatol*. 2011; **35**(2): 52–58.
[PubMed Abstract](#) | [Publisher Full Text](#)

Open Peer Review

Current Peer Review Status:    

Version 2

Reviewer Report 03 December 2024

<https://doi.org/10.21956/mep.22279.r40165>

© 2024 Fonseca L. This is an open access peer review report distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.



Luciana Mara Monti Fonseca

Universidade de Sao Paulo, São Paulo, State of São Paulo, Brazil

The manuscript is appropriate, current, and relevant to the field. It discusses the integration of virtual reality simulation (VRS) in healthcare professional education, highlighting its transformative potential for teaching in areas such as nursing. The manuscript mentions the practical application of the tips in workshops and curriculum development, but it does not provide specific data or sufficient details for a complete reproduction of the described activities. The use of examples could be more detailed.

Is the topic of the practical tips discussed accurately in the context of the current literature

Yes

Are all factual statements correct and adequately supported by citations?

Yes

Are arguments sufficiently supported by evidence from the published literature and/or the authors' practice?

Yes

If evidence from practice is presented, are all the underlying source data available to ensure full reproducibility?

Partly

Are the conclusions drawn balanced and justified on the basis of the presented arguments?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Nursing education and Virtual simulation

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 30 November 2024

<https://doi.org/10.21956/mep.22279.r39995>

© 2024 Barlow M. This is an open access peer review report distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.



Melanie Barlow 

Australian Catholic University, Fitzroy, Victoria, Australia

It is a worthwhile topic as many higher education organizations are trying to work out how to implement VR into curriculum.

VR is often used as standalone deliberate practice where the feedback is automated in the activity. This is an important element in the scaffolding of learning and where VR can really support independent deliberate practice to enhance skill development. It appears from the paper that VR is being used only when a facilitator is present e.g., Tips 2& 4. Are the authors advocating for VR only to be used as a facilitated activity? I think it depends on learning objectives and level of learner. Maybe some clarification around this - does debriefing still occur if students have practiced at home for example and then come to class?

Is the topic of the practical tips discussed accurately in the context of the current literature

Yes

Are all factual statements correct and adequately supported by citations?

Yes

Are arguments sufficiently supported by evidence from the published literature and/or the authors' practice?

Yes

If evidence from practice is presented, are all the underlying source data available to ensure full reproducibility?

Not applicable

Are the conclusions drawn balanced and justified on the basis of the presented arguments?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Simulation, education - clinical and higher education

I confirm that I have read this submission and believe that I have an appropriate level of

expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 20 November 2024

<https://doi.org/10.21956/mep.22279.r40149>

© 2024 Jowsey T. This is an open access peer review report distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.



Tanisha Jowsey 

Bond University, Robina, Queensland, Australia

The paper is improved and reads well, thanks and best wishes for this.

Is the topic of the practical tips discussed accurately in the context of the current literature

Yes

Are all factual statements correct and adequately supported by citations?

Yes

Are arguments sufficiently supported by evidence from the published literature and/or the authors' practice?

Yes

If evidence from practice is presented, are all the underlying source data available to ensure full reproducibility?

Yes

Are the conclusions drawn balanced and justified on the basis of the presented arguments?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: I have ten years of teaching and research experience with healthcare simulation, including VR. I have previously taught clinical educators how to run simulation training and assessments. In my current role, I teach into a medical program and conduct medical education research.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 15 November 2024

<https://doi.org/10.21956/mep.22157.r39890>

© 2024 Coyne E. This is an open access peer review report distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.



Elisabeth Coyne 

Griffith University, Brisbane, Australia

This is a well written article providing a simple format to present the 12 tips. The background provides an explanation of virtual simulation and highlights the significance of ensuring VRS is set up correctly within curriculum and educators understand the process and educational aspects of VRS.

Each tip summarises one aspect required to ensure VRS is presented to students with underlying theory and clear aims for learning. Tip 1 presents the idea of ensuring that educational theories underpin and align with the VRS. A range of theories could have been presented as providing just one may influence readers.

In tip 2 the prioritise clinical competency could have also highlighted the need to review the time aspect of VRS to ensure students are not overloaded with concepts within a short period or expected to be emersed in VRS for a longer period. VRS works well as a short emersion to ensure students don't become fatigued by the situation.

Tip 7 and 8 are very important and may be better as an earlier tip to ensure the empathise on student and educator health and safety is not lost as educators become excited with the newer tools of VRS. Educator training and student debrief are major factors of VRS and need to be supported to ensure a good educational experience.

The idea of a repository and sharing or VRS or networking is very important to enable a range of environments with less need for individual development.

References

1. Elisabeth Coyne, Valda Frommolt, Hazel Rands, Victoria Kain, Marion Mitchell: Simulation videos presented in a blended learning platform to improve Australian nursing students' knowledge of family assessment. [Publisher Full Text](#)
2. Elisabeth Coyne, Pauline Calleja, Elizabeth Forster, Frances Lin: A review of virtual-simulation for assessing healthcare students' clinical competency. [Publisher Full Text](#)

Is the topic of the practical tips discussed accurately in the context of the current literature

Yes

Are all factual statements correct and adequately supported by citations?

Partly

Are arguments sufficiently supported by evidence from the published literature and/or the authors' practice?

Partly

If evidence from practice is presented, are all the underlying source data available to ensure full reproducibility?

Yes

Are the conclusions drawn balanced and justified on the basis of the presented arguments?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: digital health virtual reality

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 17 Nov 2024

Yvonne Finn

Dear Elisabeth,

Many thanks for reviewing our article *Twelve tips for integrating Virtual Reality Simulation into Health Professions Curricula* and for your valuable feedback.

I agree presentation of a range of educational theories in Tip 1 will strengthen the information provided for readers and will update this tip accordingly.

Your comment on Tip 2, highlights the need to achieve balance between addressing prioritised clinical competencies identified with avoidance of overloading the learner and learner fatigue.

I will update the article to bring this valuable point into Tip 2.

Once again, many thanks for your feedback.

Competing Interests: No competing interests were disclosed.

Reviewer Report 12 November 2024

<https://doi.org/10.21956/mep.22157.r39895>

© 2024 Jowsey T. This is an open access peer review report distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.



Tanisha Jowsey 

Bond University, Robina, Queensland, Australia

Twelve tips is a great idea. It offers a digestible format and can be especially helpful for those who are new to a space. Indeed, I suspect this is where your audience will be. And virtual reality offers a rich space for learning across the health professions. I read this paper with interest. With your readers in mind, I offer these suggestions:

Tip 1: "Kolb's experiential learning (Kolb, 1984), constructivism, situated learning and social constructivism are some educational theories that can inform VRS in health profession education." - this could potentially be more helpful if the authors listed and referenced five or six other key theorists. Presently, Kolb is the only person referenced here and I found myself wondering, why Kolb? Why not Gibbs, Yardley, or McCarthy? It would be helpful to include reference to seminal works that use situated learning, constructivism, and social constructivism. Otherwise the reader is at risk of thinking that Kolb is the only person worth reading up on.

Tip 2: "The core competencies addressed in clinical simulation are technical skills, such as critical thinking, clinical decision-making and patient assessment, and, non-technical skills, such as communicating, teamwork and situation awareness" - what about procedural skills? I expected these to get a mention, since heaps of clinical simulation - including VR - learning includes procedural skills. You can VR simulate inserting a catheter or an NG tube, for example.

Tip 7 - it might be worth warning readers that one of the key issues educators experience with VR is that the software is wedded to the hardware and sometimes software developers simply cease to offer a software, thus making the hardware utterly useless. Rather than offering an update, they say 'buy our new fancy gadget.' This has major cost implications as well, of course, sustainability implications.

Overall, this is a helpful paper. Thanks and best wishes for it.

Is the topic of the practical tips discussed accurately in the context of the current literature

Yes

Are all factual statements correct and adequately supported by citations?

Yes

Are arguments sufficiently supported by evidence from the published literature and/or the authors' practice?

Yes

If evidence from practice is presented, are all the underlying source data available to ensure full reproducibility?

Yes

Are the conclusions drawn balanced and justified on the basis of the presented arguments?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: I have ten years of teaching and research experience with healthcare simulation, including VR. I have previously taught clinical educators how to run simulation training and assessments. In my current role, I teach into a medical program and conduct medical education research.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.
