

Chapter 18: Designing simulation-based learning activities: A systematic approach

Authors: Debra Nestel and Suzanne Gough

Key messages

- The literature reports many approaches to designing simulations and simulation frameworks.
- Systematic approaches can assist the quality of the educational experience.
- Irrespective of simulation modality, professional discipline and setting there are commonalities in simulation-based education.
- Phases of simulation include preparing, briefing, simulation activity, debriefing/feedback, reflecting and evaluating.

Overview

In this chapter we provide an overview of simulation practices relevant for any immersive simulation experience. We start by describing a simulation framework used in a national training program in Australia (NHET-Sim) – preparing, briefing, simulation activity, debriefing/feedback, reflecting and evaluating. We illustrate the simulation phases using a hybrid simulation for trainee surgeons in a formative assessment. We acknowledge there are many alternative approaches but offer this as one which has widespread application.

Introduction

The literature offers several valuable approaches to designing simulation-based learning activities. For example, Jeffries (2005) published a simulation framework for application in nursing education[1]. Dieckmann (2009) based his framework on interprofessional manikin-based simulations[2] while Gough (2015) describes a framework for simulation derived from her studies in cardio-respiratory physiotherapy education[3]. Although from different professional practices and based on different simulation modalities, these frameworks have commonalities that reflect effective educational design. Systematic approaches to simulation design can strengthen practice and promote learning[4, 5]. Chapter 2 acknowledges theories that inform healthcare simulation education including instructional design, which offers further guidance to simulation practice.

Simulation practices are also informed by standards offered by professional associations (See additional resources). These standards have relevance at different levels of application – centre, program, scenarios, facilitators etc. Our focus in this chapter is consideration of simulation design at the level of the individual simulation event.

We use a systematic approach offered by a national simulation educator program in Australia[6]. The NHET-Sim program was designed for individuals working with any simulation modality, in any setting and across professions. The systematic approach focuses on the design of simulation events rather than a whole curriculum but can be scaled to accommodate the system in which the simulation event is to be located. That is, the broader workplace and curriculum activities of the learners. The

phases enable practitioners to share a common language for designing and communicating about simulation-based education (SBE). We illustrate this systematic approach with a simulation designed to support trainee surgeons in managing effective communication with a patient undergoing removal of a mole (Box 18.1).

Figure 18.1 illustrates the phases and their cyclical relationship. The figure appears in its most basic form and can be adjusted to accommodate contextual variations. The *preparing* phase refers to all the activities that take place before the simulation event starts such as: identifying learners' needs; setting learning objectives; designing the scenario, sourcing simulators, medical equipment, props etc.; booking rooms; recruiting and identifying faculty, confederates and simulated patients (SPs); scheduling the learners; catering etc. The range of tasks will depend on the local simulation facility and practices.

In our example, the activities associated with *preparing* will include identifying competencies required for trainees, their prior experiences, anticipated challenges for learner(s) etc. Given the scenario (in figure 18.1) involves communication, an SP-based scenario is most likely to be appropriate and because the task involves a procedural skill that can be easily simulated with a task trainer, a hybrid simulation will be suitable (See Box 18.1). The scenario will need to be developed to offer a level of sufficient challenge to trainees. Approaches to scenario design vary and when SP-based usually include an SP role in which the character and personal history of the SP are set out as well as clinical features relevant to this particular scenario [3,6]. To ensure that a patient voice is represented, seeking advice from lay

people and SPs is important to ensure authenticity and feasibility. The SP will need to be trained to play the role including the extent to which standardization is important. As this scenario is being used in a formative assessment, a tight 'bandwidth' of performance will be less important than if the scenario was a summative assessment. The scenario may trigger an emotional response for the SP that could make their performance unsettling for them so they will need to be asked whether they think they will be able to manage. Approaches to training SPs are beyond the scope of this chapter but refer to the additional resources. The simulated setting in which the simulation takes place will need to be created, consumables and other medical equipment checked for availability and functionality. It is important to do a 'run through' of the whole procedure to ensure the timings are appropriate for the task. Positioning of the SP and equipment within the setting will also need to be tested to ensure observers have audiovisual access. The debriefing will be facilitator led and observers will use the rating form in Box 18.1. In this scenario the SP will provide verbal feedback on the trainee's performances with respect to the learning objectives. The facilitator will assist them in sharing this information using a protocol.

The *briefing* phase is given relatively little attention in literature but is really important in setting up valuable learning experiences[3]. To other faculty and SPs, the briefing will include the learning objectives, the learners' characteristics, logistics such as time frames, starting, pausing and ending the simulation activity, simulator programming, technical support, communication with the control room, audiovisual capacity, debriefing and feedback processes, reflective exercises and evaluation forms etc. Additionally, during the briefing, it can be important to explore faculty's prior experiences of the scenario and their feelings about it. An opportunity for final

questions can ensure smooth functioning. Sometimes SPs are briefed separately to learners with their first encounter within the simulation. Briefing learners will include most of the above and may also include inviting learners to set their own goals relative to those prescribed and their experiences[7]. We provide an example in Box 18.1.

Orientation of learners to the simulation is important. This will include explicit discussion on what is similar and what is different to reality. This is linked to what is called a *fiction contract*.

Some learners find simulation stressful and it may be important to normalize the experience during the briefing. This involves acknowledgment that learners often find simulations stressful. Creating a safe learning environment involves several strategies and learner-centred attitudes from faculty. This can be achieved through several strategies including clear explanation of the simulation phases and their responsibilities in each, clarity over who is observing, what will happen with audiovisual recordings, confidentiality among those involved, seeking their buy in with respect to doing their best, the orientation or familiarization of the simulators and setting.

During the *simulation activity* the learner(s) participate in the simulation. It is important to indicate a clear start to the simulation and observe for physical and psychological safety of those within the simulation [5]. Minimal talking is often desirable to facilitate acute observation. Encouraging observers to make notes to

enable specific feedback during debriefing can be valuable (see Box 18.1). If there is a pause and discuss option, then enact as planned. Respond to cues for finishing the scenario. Depending on the simulation modalities, during the simulation activity cues may need to be pre-programmed on to the simulators (e.g. manikin) and/or given to confederates, SPs and learners [4,5]. Facilitators often develop their own approach to notation (electronic or hand written) and should be ready to commence as the simulation starts.

Once the simulation is over, observations of participants and observers can be really important in helping the facilitator to frame the opening debriefing statements.

During this transition period there can be a lot of emotion expressed that is relevant to the debriefing and feedback. Encouraging participants to regroup and spend a few minutes thinking about what has just happened can be useful including asking them to think about what worked well and what could have been improved.

If observer tools are being used, then this is a good time to complete them (an example is provided in Table 18.1).

On ending the scenario, participants move to the debriefing room. It is helpful to organize the physical space, paying attention to seating arrangements, whiteboard and/or TV screen if video-assisted debriefing is used. As facilitator, it is helpful to have the learning objectives in your notes to stay focused. It is easy to be side tracked by participants' responses. Remember to turn off recording devices. Stick to the processes outlined in the briefing although flexibility is also important to ensure learner-centredness. Invite observers, confederates and SPs to participate. Use

opportunities, especially for communication-based scenarios, to rehearse micro elements of the scenario. This can be a valuable way of getting observers involved.

The *debriefing and feedback* phase complements the briefing, almost as bookends to the simulation activity. See Chapter 21 for further information. This phase is often reported to be the most important part of SBE that leads to learning [8-10].

Facilitators explore participants' feelings, address goals and learning objectives, seek other perspectives, summarize, affirm positive behaviours, explore unplanned issues, and seek to establish new goals [11]. One goal of the debriefing is to promote reflection. However, we include this as a separate phase to highlight the importance of the locus of control for learning residing with the learner once they have left the simulation event.

Evidence of the effectiveness of debriefing has been reported [8, 9, 11-14].

Debriefing formats vary and are usually undertaken immediately after the simulation event/warm or delayed/cold [16]. Formats can be relatively unstructured to highly structured. Examples of debriefing tools include *the diamond debrief* [17] and others are provided in the London Handbook of debriefing [18]. Similarly, debriefer rating tools such as the *Objective Structured Assessment of Debriefing* [18-20] and *The Debriefing Assessment for Simulation in Healthcare* [21] have been developed to provide evidence-based guidelines for conducting debriefings in simulated and real clinical settings. Guidelines for video-assisted debriefing have been published [20-23] but optimal use remains unclear.

For the *reflecting* phase, learners (usually individually) are encouraged to make sense of the simulation in the light of their own experiences and those they plan. Similarly, faculty and SPs are encouraged to reflect on all facets of their contributions too. Reflecting is usually an individual activity, while debriefing is often collective and connected to the simulation activity, reflecting has a wider reach. During briefing, learners can be informed of reflecting activities and reinforced after the debriefing. Of course, there is overlap between these phases and reflecting can occur before the debriefing. There are several approaches to reflecting that have been adopted in SBE [24-26].

Learners can be directed to evidence their reflective practice following simulations by uploading and tagging digital learning resources (audio, photographs, video and podcasts etc.), within an e-portfolio [3] or blogs, social networking sites and wikis [27] Permissions need to be considered with respect to use and storage of these images. A case study example of using video-reflexivity following simulation is provided in chapter 23.

Evaluating refers to the success and limitations of the session in meeting its goals, rather than assessment of the individual. This phase benefits from involvement of all stakeholders although practically it is often only learners, faculty, confederates and SPs. It is well recognised in the literature and evident in simulation frameworks, that evaluation is a crucial element to drive improvements in education, healthcare practice and ultimately patient care [1,3,5,8-9].

Whilst, it is essential to consider the degree to which the simulation-based education intervention has supported learning, meaningful evaluations require more sophisticated methods. Complex learning interventions require equally complex evaluations, using qualitative and quantitative methods to draw on multiple sources and triangulating data alongside exploring multiple levels of impact can provide more meaningful evaluations [28].

Conclusion

This chapter has introduced typical practices simulation practices relevant for any immersive simulation experience. We acknowledge the restriction of the depth and detail permitted within this chapter, in relation to the phases and theoretical approaches which underpin the design, development and evaluation of SBE. However, reference has been made to other chapters within this book where more specific detail and examples can be located. This chapter has explored a systematic approach offered by an Australian national simulation educator program and exemplar resources within Box 18.1.

References

1. Jeffries, P., *A framework for designing, implementing, and evaluating simulations*. *Nurse Education Perspectives*, 2005. **26**(2): p. 97-104.
2. Dieckmann, P., ed. *Using Simulations for Education, Training and Research*. 2009, PABST: Lengerich.
3. Gough, S., *The use of simulation-based education in cardio-respiratory physiotherapy*. Unpublished, Manchester Metropolitan University.

4. Jeffries, P., ed. *Simulation in nursing education: From conceptualization to evaluation*. 2nd ed. 2012, National League for Nursing: New York.
5. Fenwick, T. and M.A. Dahlgren, *Towards socio-material approaches in simulation-based education: lessons from complexity theory*. *Med Educ*, 2015. **49**(4): p. 359-67.
6. The NHET-Sim Monash Team. *The National Health Education and Training - Simulation (NHET-Sim) Program*. 2012 [cited 2012 October 29]; Available from: <http://www.nhet-sim.edu.au>.
7. Kneebone, R. and D. Nestel, *Learning clinical skills - the place of simulation and feedback*. *The Clinical Teacher*, 2005. **2**(2): p. 86-90.
8. Issenberg, S.B., et al., *Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review*. *Med Teach*, 2005. **27**(1): p. 10-28.
9. Motola, I., et al., *Simulation in healthcare education: A best evidence practical guide*. *AMEE Guide No. 82*. *Medical Teacher*, 2013: p. 1-20.
10. Shinnick, M., et al., *Debriefing: The most important component in simulation?* . *Clinical Simulation in Nursing*, 2011. **7**: p. e105-111.
11. Decker, S., et al., *Standards of best practice: Simulation Standard VI: The debriefing process* *Clinical Simulation in Nursing*, 2013. **9**(6): p. S26-S29.
12. Fanning, R.M. and D.M. Gaba, *The role of debriefing in simulation-based learning*. *Simulation in healthcare : journal of the Society for Simulation in Healthcare*, 2007. **2**(2): p. 115-25.

13. Cheng, A., et al., *Debriefing for technology-enhanced simulation: a systematic review and meta-analysis*. *Med Educ*, 2014. **48**(7): p. 657-66.
14. Rudolph, J.W., et al., *There's no such thing as "nonjudgmental" debriefing: a theory and method for debriefing with good judgment*. *Simulation in Healthcare: The Journal of The Society for Medical Simulation*, 2006. **1**(1): p. 49-55.
15. Benbow, E.W., et al., *Pathology and the OSCE: insights from pilot study*. *J Pathol*, 1998. **184**(1): p. 110-4.
16. MacKinnon, R. and Gough, S., *What Can We Learn About Debriefing From Other High-Risk/High-Stakes Industries?* *Cureus*, 2014. **6**(4): e174
17. Jaye, P., et al., *The Diamond: A Structure for Simulation Debrief*. *The clinical Teacher*. 12(3); p.171-175.
18. Imperial College London, *The London Handbook for Debriefing: Enhancing Performance Debriefing in Clinical and Simulated Settings*. 2012, London Deanery: London.
19. Centre for Medical Simulation. *Debriefing Assessment for Simulation in Healthcare*. 2011 [cited 2013 May 1]; Available from: <http://www.harvardmedsim.org/debriefing-assesment-simulation-healthcare.php>.
20. Krogh, K., M. Bearman, and D. Nestel, *Expert practice of video-assisted debriefing*. *Clinical Simulation in Nursing*, 2015. **11**: p. 180-187.
21. Grant, D.J. and S.C. Marriage, *Training using medical simulation*. *Arch Dis Child*, 2012. **97**(3): p. 255-9.

22. Grant, J., et al., *Using video-facilitated feedback to improve student performance following high-fidelity simulation*. *Clinical Simulation in Nursing*, 2010. **6**(5): p. e177-e184.
23. Levett-Jones, T. and S. Lapkin, *A systematic review of the effectiveness of simulation debriefing in health professional education*. *Nurse Education Today*, 2013. **34**(6): p. e58-e63.
24. Husebo, S., S. O'Regan, and D. Nestel, *Reflective practice and its role in simulation*. *Clinical Simulation in Nursing*, 2015. **11**(8): p. 368-375.
25. Schon, D., *Educating the Reflective Practitioner*. 1987, San Francisco: Jossey-Bass.
26. Kolb, D. and R. Fry, *Toward an applied theory of experiential learning*, in *Theories of Group Process*, C. Cooper, Editor. 1975, John Wiley: London.
27. Tochel, C., et al., *The effectiveness of portfolios for post-graduate assessment and education: BEME Guide No 12*. *Medical Teacher*, 2009. **31**: p. 299-318.
28. Drescher, U., Warren & Norton, K., *Towards evidence-based practice in medical training: making evaluations more meaningful*. *Medical Education*, 2004. **38**(12): p. 1288-1294.

Additional resources

- This website provides information for training simulated patients to participate in simulations: www.vspn.edu.au
- This link provides the standards associated with simulation as proposed by the International Nursing Association for Clinical Simulation and

Learning: [http://www.nursingsimulation.org/issue/S1876-1399\(11\)X0005-](http://www.nursingsimulation.org/issue/S1876-1399(11)X0005-)

[1](#)

- Core standards and the teaching and education standards are available from The Society for Simulation in Healthcare:

<http://www.sih.org>

Key words

Briefing; Debriefing; Reflecting; Evaluating; Fiction contract; Summative assessment; Formative assessment; Simulation framework; Simulation phases; NHET-Sim program