Commentary on "Towards Sociomaterial Approaches in Simulation Education: Lessons from Complexity Theory."

Janet Lefroy, Sarah Yardley

Embracing Complexity Theory can clarify best practice frameworks for simulation education

In this issue, Cross Cutting Edge authors, [INSERT NAMES] assert that simulation education (SE) contains inherent sociomaterial contradictions. For educators and practitioners making use of SE this may initially make for uncomfortable reading. The reason d'être of SE is to provide learners with opportunities to develop knowledge, skills and behaviours that transfer into 'real world' clinical practices. Contradictions, with implied gaps within and between simulation scenarios may be considered very unwelcome. However, we encourage readers to restrain from falling into defensive mode, instead reading [INSERT AUTHORS NAMES] in full to gain understanding of how complexity theory provides a good example of the possibilities opened up by using sociomaterial approaches to improve design, delivery and potential outcomes in SE.

Crucial to the arguments presented are three questions: What is actually being simulated? What is real? How will the differences between these be played out?

Educators who use SE and want to make use of complexity theory to improve their practice could usefully start with a self-critique of their interventions using these questions to generate understanding of sociomaterial contradictions within their SE, and why these matter. A sociomaterial examination of the elements, both people (agents) and things (materials) within SE interventions is likely to make transparent gaps and contradictions between the SE intervention and clinical practice. Educators can then seek to address these either by changing the intervention or explicitly sharing differences with learners in order to increase learning value (1).

[INSERT NAMES] offer four key elements of complexity theory as a basic framework for well-designed SE interventions, as listed below with our interpretations of how these can translate into improved SE:

- Emergence – allowing the SE intervention to include negotiations so that both learning and consequences emerge from interpersonal and sociomaterial interactions. For example, simulated patients may be primed to behave differently depending on what path of inaction/actions the learner takes
- Attunement – fostering awareness of cues within the SE intervention among learners i.e. drawing attention to how the learner observes people and things around them and modifies their interactions in the light of these observances
- Disturbance – permitting new and unexpected, possibly untoward occurrences to arise within SE as a result of the context or learner action/inaction, either with use of high-tech equipment or the reactions of others within the SE scenario
- Experimentation – creating opportunities to use imagination and 'try out' different possibilities while receiving feedback on the consequences – not just what happens but also why.

And so, while it is recognised that simulation is not perfect as a method of learning, when done well its major virtues, such as allowing gradual development of whole task learning through the use of part task building blocks and sequencing with support and experimenting with practical and interpersonal components of healthcare activities, can be further advanced by embracing complexity within SE and rapidly building up pace and complexity within scenarios. It is knowing what action to take when and the linking of components, rather than each part-task that is most challenging for novice learners. Learners do not need to 'get it right first time'; learning can and should occur from 'mistakes' and SE offers important opportunities to do so (2–4)

To address this requires a shift from arguments about what fidelity (physical, psychological, emotional etc) is necessary, to recognition that simulation offers a tool to engage learners in a 'fiction contract' (5) that will allow them to learn the best approaches to handle 'certain uncertainty' in clinical practice. A fiction contract describes the deliberate choosing by both learners and teachers to treat a SE intervention as if it were real, in order to practice – that is, to experiment and see what occurs through the emergent interactions, attunement and disturbances which complexity theory makes explicit. This alongside a clear understanding of what a given SE intervention is for and deliberate use of necessary materials can bring simulation close enough to real practice to be useful (6). A necessary material is one which cannot be mimicked even with the aid of a fiction contract.

There may be times when a disturbance arises as a result of breakdown in the fiction but this can also be incorporated into debriefing and feedback to further learning. We must be honest with our students about the way real clinical practice will feel rather different from simulation. So having learned how to do a task in simulation the student should be able to do it in real life, but he or she will not have learned to deal with all of the associated feelings – such as fear of harming the patient - and will not have assumed the burden of responsibility for risk. The fiction contract helps here but only goes so far. Thus in addition to our attempts to narrow the gap we can 'mind the gap' between simulation and clinical practice (1). The gap can be used as a substrate for learning when differences are noted.

Furthermore, allowing uncertainty about the 'right way' of doing things in a complex scenario will enable better transfer of learning to other contexts depending on the materials and humans. The mantra 'how might it be done differently?' assists experimentation, and then trying out the options suggested and discussing the outcomes helps. In a clinical team working in a complex situation it is important for team members to interact with clarity to enable coordinated action. Thinking aloud is encouraged. Learners may not have been exposed to this in clinical practice and simulation offers good opportunities to try such an approach and to experience the difference it makes.

In a chance conversation SY had with a pilot, he commented that his employer had a rule that for certain airports 'You cannot go there unless you have been there' – this was not a contradiction in terms but a recognition that for some airports at which landing is more challenging, the flight simulator cannot facilitate the same experience of risk and feeling of both danger and responsibility that actually flying into the airport would. The step between simulator and full practice was to go with someone who had been and who would go with you to help and direct you. Given that there is evidence that learning a skill without then practising it soon afterwards leads to the skill being lost (7) the equivalent of only being allowed to 'go there when you have been there' might be achieved through linking SE interventions with other emergent theoretical developments in medical education

such as entrustable professional activities in workplaces. In these learners are gradually given more responsibility as they gain experience of knowing what it feels like to 'go there'(8).

People are never free from complications, complexity and uncertainty in practice. SE that draws on sociomaterial theories can provide a framework for learning approaches to handling dilemmas arising from these 'truths' of the human condition. The value of introducing complexity is that it makes SE more like the messiness of real world clinical practice while permitting experimentation and useful questioning of accepted practice.

1. Yardley S, Irvine AW, Lefroy J. Minding the gap between communication skills simulation and authentic experience. Med Educ. 2013 May;47(5):495–510.

2. Yardley S, Hookey C, Lefroy J. Designing whole-task learning opportunities for integrated end-of-life care: a practitioner-derived enquiry. Educ Prim care. 2013 Sep;24(6):436–43.

3. Van Merriënboer J, Kester L. No Title. In: PA SJ and H, editor. Whole task models in education In:Handbook of Research on Educational Communications and Technology. 3rd ed. Taylor & Francis; 2008. p. 441–56.

4. Van Merriënboer J. Training Complex Cognitive Skills. Educational Technology Publications. Englewood Cliffs NJ: Educational Technology Publications; 1997.

5. Dieckmann P, Manser T, Wehner T, Rall M. Reality and fiction cues in medical patient simulation. J Cogn Eng Decis Mak. 2007;1(2):148–68.

6. Kneebone RL, Scott W, Darzi A, Horrocks M. Simulation and clinical practice: strengthening the relationship. Med Educ. Department of Surgical Oncology and Technology, Imperial College London, London W2 1NY, UK. r.kneebone@imperial.ac.uk; 2004 Oct;38(10):1095–102.

7. Ericsson K, Krampe R, Heizmann S. Can we create gifted people? Ciba Found Symp. 1993;178:222–31.

8. Ten Cate O. Nuts and Bolts of Entrustable Professional Activities. J Gen Intern Med. 2013 Jun;5(1):157–8.

9. Lefroy J, Yardley S. Embracing complexity theory can clarify best practice frameworks for simulation education. Med Educ. 2015;49(4):344–6.

This is the accepted version of the following article: Janet Lefroy and Sarah Yardley, 'Embracing Complexity Theory Can Clarify Best Practice Frameworks for Simulation Education', *Medical Education*, 49 (2015), 344–346 <doi:10.1111/medu.12662>.