Simulation is more than Technology – The Simulation Setting

Dr. Peter Dieckmann, Head of Research
Danish Institute for Medical Simulation (DIMS)
Herlev Hospital
University of Copenhagen
Capital Region of Denmark
www.herlevsimulator.dk
www.eusim.org

Introduction

Simulation is spreading around the world, across disciplines, across professions and simulation modalities. More educational aims and objectives are tackled and also the "non-educational" use of simulation is increasing: simulation-based research (Dieckmann, et al., accepted; Issenberg, Ringsted, Østergaard, & Dieckmann, 2011), simulation-based work system analysis and improvements, or testing devices and procedures in simulation settings. The following text summarizes core elements from a chapter in (Dieckmann, 2009b).

Simulation Contexts

Wherever simulation is used, it is important to consider the conceptual basis for the use (Curran, 2008; Issenberg, McGaghie, Petrusa, Lee Gordon, & Scalese, 2005). At times it is easy to get dragged away with the technical possibilities of the tools, and the reasons for using simulation for certain goals might not be very clear. In this text, I explore context factors that influence the use of simulation.

Any simulation scenario is integrated in the context of a simulation setting. The simulation setting can be a course, a research setting, a simulation demonstration – all activities that bring people together in time and space around a simulator, I call a simulation setting (Peter Dieckmann, 2009a). Educational settings have the aim of providing learning opportunities for the participants, research settings aim at answering research questions, demonstrations aim for spreading the news around simulation.

Each simulation setting is a "social practice", in which humans interact with each other, the simulator and other equipment according to certain rules, trying to reach individual or shared goals. In a learning setting, for example, you will find rules for the instructors and learners. The instructors are responsible for creating learning opportunities, while learners are responsible for seizing those opportunities. Their interactions are based on these fundamental and further rules. Which rules are actually relevant for the learning setting depend further on the context in which they are integrated. There may be conceptual constraints and requirements by curricula in which the course takes place, there may also be physical constraints in terms of personnel and equipment available. Curricula and resources are influenced by the profession by which the simulation is organised and finally also by national culture. For example, there are considerable differences in the way that the instructor – learner relationship is seen in different countries. The instructor may be seen as *teacher, facilitator, coach, friend, mother,* etc., the student might be seen as *partner, dummy, customer, workload*, etc. Any use of simulation will need to take those different context levels into account, as they shape the aims and objectives and the concrete way in which simulation is used.

The Simulation Setting

A simulation setting itself can be divided analytically in different, interconnected phases (see Figure 1). I will describe the phases, using a simulation-based course as an example.

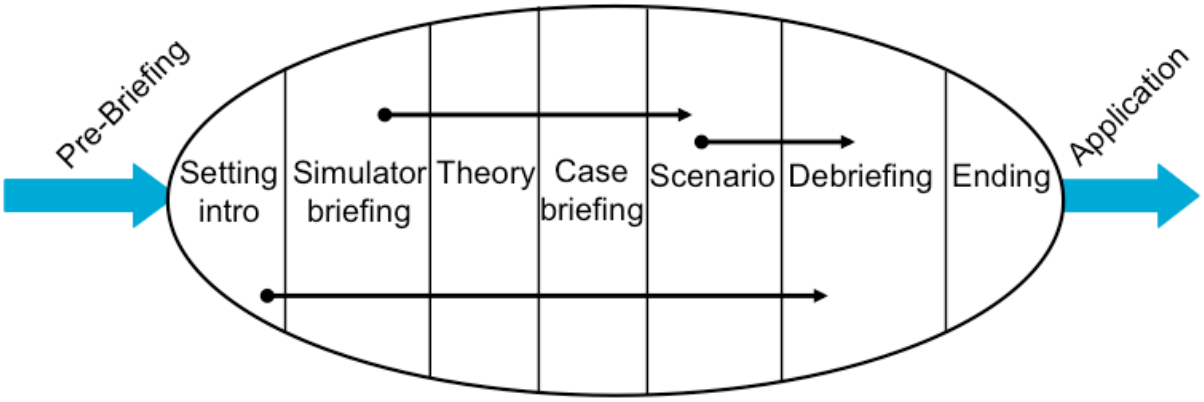

Figure 1: The simulation setting with its different, connected phases. Not all phases need to be present (e.g. theory input), one could also consider breaks as own phases, and some phases might be repeated (e.g. several scenarios in one course) (Adapted from Dieckmann 2009).

Any course actually begins before the participants arrive, with the *pre-briefing*. Where participants get some kind of prior information about the course and simulation in general which will influence their expectations. Information about the course might be delivered in your invitation letter or flyer, but also by previous participants in the course, rumours about the course and via many routes and information sources. This holds also for information about simulation. Some participants may have prior experiences with simulation. This can be simulation in health care, but also the home computer flight simulation programme, wild rides in amusement parks etc. As a practical consideration it is important to know, understand and effectively use the different routes to provide such *pre-briefing*. Not all sources are under your control, but some are and it is helpful to effectively use the pre-briefing. This can also be achieved by sending participants pre-course reading and learning material, by asking for their expectations, and requiring certain elements of prior knowledge, etc.

In the *Setting Introduction*, participants arrive and get information on what the course is about, principle potentials and boundaries of simulation-based training, how the course will be run, etc. The beginning is important to set the scene for the whole course. The more active the beginning, the higher the chances participants stay active during the course. It is also important to create a positive, welcoming atmosphere – which can very well be combined with constructive challenges in case of potentials for improvement. The setting introduction is also suitable to investigate the expectations participants formed during pre-briefing and to potentially correct wrong or non helpful assumptions, for example, when participants are scared of being tested, but you do not intend to do so.

During the *simulator briefing* participants get to know the simulator and the simulated environment. They hear about how to use the simulator as a technical tool, what is "normal" in the simulator and how they can interact with the environment, call for help etc. This phase is very important to help participants make the best use of the simulation experience. The more comfortable they feel with the simulator, the less they will be scared or tensed during the scenario. It is important to take enough time for the briefing and help participants lose their fear with regard to using the simulator, one quality indicator in this phase, you can clearly see. In the beginning, participants might stand as far away from the simulator as possible. However, in the end they are checking pulses, auscultating the patient, examining pupils. The plastic manikin is on the way to become a patient and is treated as such.

Theory input may or may not be a part of courses – mostly it is. Participants get some theoretical information on the contents of the course, e.g. CRM-principles, algorithms, background on specific procedures or drugs. It is an interesting task for simulation instructors to explore methods to deliver theoretical content outside of the lecture format. Many methods of active learning are available – how about asking participants to construct a collage of pictures that describe the different aspects of the theoretical content?

During *Scenario briefings* participants receive information concerning the case simulated in the scenario: Patient history and problem, tasks to do, but also the "here and now" of the scenario: Where and when does it take place? What resources are available? Participants also get information on their own role and the roles of other people involved. Figure 2 provides some questions that are used in the theatre. You and your participants ideally know the answers to all the questions after a good scenario briefing (or you have good educational reasons for leaving some information open). If not all answers are available, participants will have problems understanding your scenario – just like at times it is difficult in the theatre to understand what is happening on stage. The scenario briefing helps participants to enter the scenario reality.

- **Who** is acting?
- **What** is being done?
- **Where** does the situation take place?
- **When** does the situation take place?
- **Why** did this situation evolve?
- **Which motives** do people follow?
- **What** do people want to obtain?

Figure 2: Questions that help in creating an understandable scenario.

Scenarios form the basis of experiential learning. The scenario and the debriefing together form the core of the learning experience during simulation – if the other parts of the simulation setting support this function. Scenarios are more than clinical cases. During the design and conduction of the scenario, the simulation team should keep the educational objectives in mind. The goal is not to create a realistic scenario – that is just a means for some objectives. There are several groups, ours included, that provide help in designing scenarios by providing "scripts" (see www.eusim.org/downloads). In many cases it maybe "necessary to depart from realism to enhance the learning" (Hays & Singer, 1989). Many unrealistic elements have high educational values. The possibility to directly repeat a case is unrealistic, but helps the learning. The physiology of the patient can also be changed (more obvious, more complicated, slower changes, etc) to make it easier for the participants to reach the goal of the scenario. Like in a movie, from the sides of the simulation team, little, if anything should happen during a scenario that has not a specific purpose to enhance the learning opportunities for the participants. A golden rule is to keep it simple. Participants very often do something unexpected that makes it necessary to "save the scenario", bringing it back on track to the original plan, or maybe going with the flow and changing the scenario on the fly, as long as the goal can still be reached (Dieckmann, Lippert, Rall, & Glavin, 2010). There should be only few occasions, where a stop and restart is necessary. Many "life savers" can be used within the logic of the scenario and thus in a way that does not disrupt the experience. The role played consultant might be on the way home, hearing a commotion in the simulation room and just pops in to see what is going on and then provides some help in solving the problem.

Debriefing, the facilitated discussion of the scenario, including reflections on the experience during the scenario and feedback by the active participants themselves, possible observers as well as the facilitator. The debriefing is a key element in simulation and distinguishes the

simulation setting from many clinical learning settings and clinical practice. It provides time and a framework for the systematic analysis of the scenario and what went well or not so well. The facilitator guides the self reflection of the participants and supplements with feedback in some cases (Dieckmann, Molin Friis, Lippert, & Østergaard, 2009). Self discovered learning points are more relevant and most of the time, cover to a very large extent, the feedback that the facilitator would provide. There are many possible methods and structures according to which debriefing can be performed (Dismukes & Smith, 2000; Fanning & Gaba, 2007; Lederman, 1992). One structure that proved helpful in our practice was described by Barbara Steinwachs and describes three phases of a debriefing (Steinwachs, 1992):

> The description phase, in which participants reconstruct what happened during the scenario. This is often an impressive moment, when team members find out from the recount that they perceived the problem and the treatment of the patient substantially differently. For example, some members of the team might actually not be aware of the fact that a certain medication was administered. Typical questions in this phase are: "What happened?" or "What was good or not so good?"
>
> The analysis phase, is where the group digs deeper into the causes and reasons for the actions that took place (Rudolph, Simon, Dufresne, & Raemer, 2006; Rudolph, Simon, Raemer, & Eppich, 2008). The questions here help participants explore why they were successful or not during the scenario. They take into consideration how to reproduce the strengths in other contexts and how to avoid the weaknesses the next time – or at least avoid those weaknesses that have actual negative consequences for the patient. During this phase it is also possible to challenge the group in a constructive way. By exploring the mental models behind actions, by openly exchanging opinions in a constructive and meaningful conversation, participants and facilitators can co-construct a reflective learning space that allows for deep learning. During debriefing, ideally actions are not only prescribed in the sense of "next time, remember to do x". The analysis phase is about helping the participants to find out, why x was not done and what it would take for them to do x the next time. The drill of actions is not the goal in many cases (it may well be in some), but rather insightful learning and change of mental models. Another interesting question is how much learning and change can address issues beyond cognition, like emotions, or bodily sensations when considering learning. The overarching goal is to help participants make those changes that would increase the safety and quality of care for their patients. This may be elements of clinical diagnosis and treatment, but can also encompass communication, resource management, situation awareness and other human factor-oriented aspects. Safety always evolves from the interplay between human, technology and organisation. This interplay can be analysed in debriefings.
>
> In the application phase, participants reflect on the messages that they can take away from the scenario and debriefing. The questions help explore those learning elements that can be helpful in the clinical setting. The group might also discuss difficulties that may arise when participants try to apply in the clinical setting what they learned in the simulation setting. A typical debriefing might be approximately twice the time of a scenario.

The *course ending* might be seen as the debriefing of the overall course. During this last phase the course is closed, summaries are made and participants get some help in applying what they learned during the course. Again, it might be discussed what participants can take away from the course and apply in their clinical practice and how they can achieve such an application of the learning during the course.

Optimizing simulation settings

To optimize simulation-based education and training, the interconnected phases of the simulation setting need to be jointly optimized. Where the simulator briefing is flawed, problems during scenarios might arise because participants may have problems in properly using the simulator. Consequently, debriefing might be less effective as participants might lose trust in the simulation, or become frustrated because they could not treat the patient as

well as possible in principle etc. The role of the simulation instructor changes throughout the different phases of the simulation setting – from providing instruction in the beginning of a course to facilitating learning during debriefing for example. Growing into this role is a long learning process, requiring practice and reflection. A structured course to learn the basics can help to get started. Several groups offer such courses, one of which is the EuSim Group, of which I am a part (www.eusim.org). In a Basic and an Advanced Course we work with participants around optimizing the conduction of simulation settings. Simulation conferences also offer great insights and workshops, for example the Annual Meeting of the Society in Europe for Simulation Applied to Medicine (www.sesam-web.org) or the Society for Simulation in Health Care (www.ssih.org). Increasingly, the European and Latin American Community connect in a joint meeting, the European/Latin American Meeting on Simulation Health Care and Patient Safety. The meeting is established to take place bi-annually. Please visit http://www.sesam-web.org/eurolatin-american-meeting/ for more information,

Certainly there is also interesting reading material to grow into the role as simulation-instructor. SESAM has asked simulation experts to provide reading recommendations in different areas of simulation. The lists are freely available on the internet: http://www.sesam-web.org/literature-top-5s/.

Conclusion

Simulation offers high potentials for learning and other uses. In order to make the best use of the potentials, it is important to optimize the conceptual basis for the use and to help all people involved understand and go by the rules required to reach the specific goal of the simulation event.

Information Resources

There are also great introduction books on simulation. Without possibly aiming for a complete list, here are some recommendations (new great books are coming out frequently):

Dieckmann, P. (Ed.). (2009). Using Simulations for Education, Training and Research. Lengerich: Pabst.

Dunn, W. F. (Ed.). (2004). Simulators in Critical Care and Beyond. Des Plaines: Society of Critical Care Medicine.

Kyle, R., & Murray, B. W. (2008). Clinical Simulation: Operations, Engineering, and Management. In R. Kyle & B. W. Murray (Eds.): Elsevier.

Rall, M., Gaba, D. M., Dieckmann, P., & Eich, C. (2010). Patient Simulation. In R. D. Miller (Ed.), Anaesthesia (pp. 151-192). New York: Elsevier.

Rall, M., Gaba, D. M., Howard, S. K., & Dieckmann, P. (2010). Human Performance and Patient Safety. In R. D. Miller (Ed.), Miller's Anaesthesia (pp. 93-149). Philadelphia: Elsevier Churchill Livingston.

Riley, R. H. (Ed.). (2008). A Manual of Simulation in Healthcare. Oxford: Oxford University Press.

Other relevant books address (medical) education in more detail – as simulation is only a tool to create learning opportunities, educational literature is very important.

In terms of journals, “Simulation in Health Care”, “Simulation and Gaming”, “Medical Education”, “Medical Teacher” feature relevant articles. Increasingly also specialty journals address simulation.

References

Curran, I. (2008). Creating Effective Learning Environments - Key Educational Concepts Applied to Simulation Training. In R. Kyle & B. W. Murray (Eds.), *Clinical Simulation: Operations, Engineering, and Management* (pp. 153-161). Burlington: Academic Press.

Dieckmann, P. (2009a). Simulation settings for learning in acute medical care. In P. Dieckmann (Ed.), *Using Simulations for Education, Training and Research* (pp. 40-138). Lengerich: Pabst.

Dieckmann, P. (Ed.). (2009b). *Using Simulations for Education, Training and Research*. Lengerich: Pabst.

Dieckmann, P., Lippert, A., Rall, M., & Glavin, R. (2010). When things do not go as expected: Scenario Life Savers. *Simulation in Health Care, 5*(4), 219-225.

Dieckmann, P., Molin Friis, S., Lippert, A., & Østergaard, D. (2009). The art and science of debriefing in simulation: Ideal and practice. *Med Teach, 31*(7), e287-294.

Dieckmann, P., Phero, J., Issenberg, B. S., Kardong-Edgren, S., Østergaard, D., & Ringsted, C. (accepted). The Society for Simulation in Health Care's Research Consensus Summit: Conduction and a synthesis of the results. *Simulation in Health Care*.

Dismukes, K. R., & Smith, G. M. (Eds.). (2000). *Facilitation and debriefing in aviation training and operations*. Aldershot: Ashgate.

Fanning, R. M., & Gaba, D. M. (2007). The role of debriefing in simulation-based learning. *Simulation in healthcare : journal of the Society for Simulation in Healthcare, 2*(2), 115-125.

Hays, R. T., & Singer, M. J. (1989). *Simulation Fidelity in Training System Design: Bridging the Gap Between Reality and Training*. New York: Springer.

Issenberg, B. S., Ringsted, C., Østergaard, D., & Dieckmann, P. (2011). Setting a Research Agenda for Simulation-based Healthcare Education: A Synthesis of the Outcome from an Utstein Style Meeting. *Simulation in Health Care, 6*(3), 155-167.

Issenberg, S. B., McGaghie, W. C., Petrusa, E. R., Lee Gordon, D., & Scalese, R. J. (2005). Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. *Med Teach, 27*(1), 10-28.

Lederman, L. C. (1992). Debriefing: Toward a Systematic Assessment of Theory and Practice. *Simulation & Gaming, 23*(2), 145-160.

Rudolph, J. W., Simon, R., Dufresne, R. L., & Raemer, D. B. (2006). There's no such thing as "nonjudgmental" debriefing: a theory and method for debriefing with good judgment. *Simul Healthc, 1*(1), 49-55.

Rudolph, J. W., Simon, R., Raemer, D. B., & Eppich, W. J. (2008). Debriefing as formative assessment: closing performance gaps in medical education. *Acad Emerg Med, 15*(11), 1010-1016.

Steinwachs, B. (1992). How to facilitate a debriefing. *Simulation & Gaming, 23*(2), 186-192.