

Blended Simulation Based Medical Education: A Durable Network for Learning?

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Abstract

Simulation based medical education (SBME) is gradually becoming an inseparable part of medical and Professionals Allied to Medicine (PAM) education. The demand to use this training approach in healthcare is increasing every year to meet the Department of Health's Standards for Better Health (NESC, 2008). As an alternative training approach SBME provides medical students and practitioners with near real-life opportunities to practice and improve clinical and non-clinical skills and improve health care services as a result. Although SBME is already a very popular training approach, Kneebone (2005) argues it is "often accepted uncritically, with undue emphasis being placed on technological sophistication at the expense of theory-based design" (p.549). SBME is "a complex service intervention" (McGaghie, 2009, p.50), which includes much more than a series of advanced technologies utilised for simulating an event. SBME is actualised by a network of closely knit human, non-human, and "conceptual and symbolic" (Bleakley, 2012, p.464) actors that work in an interrelated manner "as a basis to promoting learning and innovation" (Bleakley, p.464). It is not just the sophistication of the technology that supports learning but the dialogic relation of all the actors involved in creating the opportunities for learning. What is required to develop a 'healthy' and 'growing' network that promotes learning and innovation (Bleakley, 2012) or hinder effective learning hasn't widely been investigated. Bleakley argues that actor network theory (ANT) "serves to repair the historical separation of theory and practice" (p. 465). To understand SBME as a complex process involving technology, people, objects, artefacts, actions, and places, ANT may introduce new insight, "an interruption or intervention, a way to sense and draw nearer" (Fenwick & Edwards 2010: ix) to the phenomenon of SBME. This paper expands the understanding of how actors interact with each other within a network and the practices that support/hinder blended learning in the Lancashire Teaching Hospitals NHS Trust (LTHTR) Simulation Centre (SC). Outcomes provide insight into the design of a simulation session, describe the assemblage of a blended learning in SBME (B-SBME) actor network, and illustrate an example of the network effects of mediators' and intermediaries' capacities to form alliances between a B-SBME networked assemblage and broader Trust networks.

Keywords

Simulation Based Medical Education, Blended Learning, Actor Network Theory, Practices

Research Context

This study has been conducted in the LTHTR as part of a Knowledge Transfer Partnership Project (2011-2013). The SC, now located on the third floor of the Education Centre 2 in LTHTR, started its simulation practices in hospital theatres with low fidelity manikins (the technology available then), with less formal and unstructured educational approaches ten years ago. It gradually developed into the current expensive and high-tech SC with two simulation labs, debrief control rooms linked by a network of audio-visual equipment, computers, tablets, and telephones that enable facilitators to digitally monitor and communicate with simulation participants through the high resolution manikins' speech facility and physiological responses (e.g. blood pressure, respiration rate, etc) to simulated patient care and treatment. In addition, the labs are equipped with emergency

room hospital equipment and supplies. This assemblage includes the Matrix Marking System (MMS), which enables time-stamped, facilitator-annotated, digital video recordings of simulation performances that are transmitted from the control to the debriefing room so that recordings are immediately available for facilitator and participant reflection, discussion, and feedback. Each simulation session consists of three parts. Briefing provides background clinical and human factors information related to the simulation. Prior to our project briefing was done on site in a lecture type face-to-face manner. Our project introduced an interactive, online briefing to replace the face-to-face lectures, thus creating a B-SBME socio-technical assemblage. The simulation session provides a near real-life scenario in which facilitators and participants collaboratively experience clinical and non-clinical practices. Debriefing sessions support the development of reflective practice.

Methodology and Methods

This study is an ANT-informed ethnographic investigation explores human and non-human actors involved in B-SBME and the ‘translations’ that happen to shape ‘alliances’ between actors (Bleakley, 2012). Actor network theory (ANT) emerged from the 1980s onward as a disparate range of research practices, “tools, sensibilities, and methods of analysis” (Law, 2007, p. 595), through which social and material phenomena can be examined for relations (agencies and influences) and network effects (outcomes). ANT-informed studies foreground relations (connections and interactions) among social, physical, material, cultural, and technological phenomena (Fenwick & Edwards, 2010). As ANT was specifically “developed to analyse situations in which it is difficult to separate [the network effects of interactions among] humans and non-humans, and in which the actors and actants have variable forms and competencies” (Callon, 1998, p.2), ANT provides a useful framework for tracing the assemblage of B-SBME in the SC. This study explores how actors involved in a B-SBME network are assembled and the extent to which the networked assemblage supports learning and innovation.

The research team spent time over two years within the context of SC and broader Trust, gradually developing understandings of the technological and practical aspects of SBME, and introducing blended learning into briefing practices. Data has been collected through observations of the practices, formal/informal conversations with staff within the SC and LTHTR as wider context of this research. We took field notes and photographs, made video recordings, and conducted semi-structured interviews with third-year medical students and SC facilitators. Drawing on Mol’s conceptualization of multiple ontologies—multiple ways of experiencing (Bleakley, 2012) and translating (Callon, 1998) the same phenomenon—we traced our socio-material assemblage of blended learning into facilitators’ and students’ experiences of SBME. We examined mediators’ and intermediaries’ capacities for influencing the stability and durability of our B-SBME networked assemblage. Working with Bleakley’s (2012) conceptual framework, we define intermediating actors as those who “transport meanings without transformation, where mediators transform, translate and innovate” (p.464).

Preliminary findings

The data has been analysed in reference to three essential components of B-SBME: online briefing, simulation sessions, and debriefing with a view of finding answers to the research questions. By providing descriptions this study aims to explore actor networks in B-SBME.

How are the actors involved in B-SBME assembled?

In LTHTR SC linkages are made among three components of B-SBME. Online briefings provide learners with background information and practice implications for clinical and human factors elements of performance related to the simulation session. If “briefing is done well, productive practice follows” (Bleakley, 2012, p.465) in the simulation lab. Reflective debriefings following on the simulation sessions and are designed to create opportunities for constructing new knowledge and/or enhancing future decisions, actions, and practices.

Briefing: By introducing on-line learning into what had been a same-time, same place assemblage more actors became involved in the network, and new translations and coordination performances had to be created between existing and new networks. Three modules were developed on the Trust Learning Management System (LMS) supported by Moodle. The LMS as an actor was initially linked with wider organisational networks of actors such as Trust IT systems, local and national organisational policies which allow only on-site access to patient information and medical educational artefacts in NHS databases. However, the idea behind introducing B-SBME was to provide learners with an opportunity to prepare flexibly for the simulation, which required external access to just the LMS. After extended negotiations with actors outside SC network (e.g., the Trust e-

learning co-ordinator, IT managers, Trust managers) a gateway was developed to provide external access to LMS through having two sets of usernames and passwords. However, a lack of coordination between the SC network and wider Trust networks caused challenges during the implementation process. NHS and Trust policies and processes for initially setting, distributing, and periodically re-setting passwords frequently disrupted access, breaking the link between learners and online resources. Lacking sufficient IT and helpdesk allies to resolve access problems in a timely fashion, the SC blended learning assemblage became fragile and eventually required Trust managers to act as institutional mediators and the SC network to enrol, for the term of the project, an e-learning co-ordinator to mediate among technological systems and institutional divisions. This challenge was also highlighted by interviewed learner-participants. The interviews with the students who were able to access online briefings provided evidence that online briefings were meaningfully related to the simulation scenarios. Some of the students stated that the online modules acted as a 'recap' of their existing knowledge and increased confidence to perform in the simulations. Others expressed that without the online briefings they could be lost in the simulation session, not knowing what to do, or how to approach the situation. For facilitators the value of the online modules was not having to spend scarce time on lecturing, thus their enrolment in the network provided value through increased time to facilitate hands-on learning practices.

Simulation: High fidelity manikins, although a focal part of a simulation, are only actors in a wider simulated environment. Although their presence is necessary to construct the network, without well-designed briefings and scenarios, careful technical and clinical facilitation, supporting technologies, clinical equipment, medical supplies, and multiple functioning communication channels the network would fail. In this particular setting manikins are linked to computers and authentically respond to students' clinical interventions by changes that happen in the vital signs (e.g. blood pressure, respiration rate, etc). The computers are managed by a technical facilitator who makes changes in clinical parameters according to the learners' performances. The technical facilitator can see the learners' performances through one way windows, hear the conversations through high tech microphones, and is connected to clinical facilitator through a head set, which enables communication between facilitators possible. Learners interact with the manikin in a meaningful manner, ask questions, and receive responses by a voice coming through a microphone attached to speakers behind the manikin. Therefore the technical facilitator, role players, and clinical facilitator are all actors who step in to fill in the gaps (some technical limitations that even high fidelity manikins have) to create a mediatory link between manikin and learners to help the "translations between actors develop and grow" (Bleakly, 2012) in order to make the SBME network effective and stable.

Debriefing: "The post scenario debriefing is important to maximize learning and facilitating change on an individual and systematic level" (Diekmann, 2009, e287). Creating the meaningful link between simulation and debrief is very important. Debriefing in this simulation centre is practiced in a reflective manner, allowing learners to watch the video clips time-stamped by the clinical facilitator for feedback purposes. Time-stamps can indicate either a good practice or a mistake or a missed clue that would support treatment of the patient and control of a particular condition. The clips can refer to both clinical and human factor elements. In debriefing sessions the students who were observing the session have the opportunity to provide feedback to their peers, ask questions to clarify ambiguous moments, and reflect how they would perform in the same situation. Facilitators provide clinical and human factors feedback to fill in gaps and support learners to relate SBME experiences to real-life practices. Where influence an on clinical performances can be related SBME, SBME practices may expand and form alliances with wider Trust networks, such as hospitals and health care centres.

To what extent does the network of actors in the LTHTR SC support learning and innovation?

Learning and innovations are indicated by an expanding network of actors (Bleakley, 2012). The simulation network at LTHTR has broadened SBME interestment and enrolment (Callon, 1986) from a base clientele of 3rd year medical students from one university medical programme to serve internal (Trust) and external, medical, nursing, and inter-professional continuing education. This broader mobilisation has placed increasing demand on SC capacity. Introducing B-SBME was directed toward enhancing capacity.

Learning: Students and learners have varied perspectives on B-SBME. Some expressed they have learned skills such as managing acute situations, effective communication, team work, and prioritising tasks that they would not easily learn in a real context since junior doctors never directly get involved in acute situations in hospital settings. However learning those skills as early as possible may support improvement of practices in hospitals and patient safety. As one of the students has expressed, "I wouldn't change anything because I think that way is the best way to learn and it doesn't miss anything. And I think people learn in different ways so I think that covers every student's learning style so I think

that's the best way to do it (S10, 3rd year medical student). Other learners identified emotional factors hindering their performance such as discomfort resulted by being observed by peers and other facilitators, perceiving a lack of fidelity in simulations sessions, and dealing with the fear of being criticised. As a result, no matter how well the B-SBME actor network is designed affective factors might act as intermediaries and hinder the stability of the network.

Innovation: The LTHTR SC allowed innovative and high-fidelity technologies, new educational approaches, and new human actors to join existing actors and assemblages “through associations, translations, mediations, and the forming of alliances” (Bleakley, 2012, p. 464). The MMS, a design model and three modules for B-SBME, as well as the use of a videocam to capture patients' perspectives are all innovative ideas that originated in this centre. Some, such as the MMS, integrated successfully into the SC and broader Trust networks, forming durable alliances. Where blended learning worked in harmony with SC SBME practices, B-SBME failed to enrol itself in broader Trust networks, and thus the B-SBME actor network failed to attract sufficient long-term resourcing for mobilisation beyond the scope of the project. In other innovations, e.g., constructing the patient's perspective, socio-material actors are still in processes of interestment and enrolment (Parchoma, et al., 2012).

Implications

Seeing SBME, B-SBME, and broader Trust networks as a set of interacting assemblages made more or less durable as a result of network effects provides insight into challenges involved in implementing B-SBME practices in a NHS Trust setting. Where our early findings suggest that introducing B-SBME into a SC supported learning and innovation over the duration of our project and formed a stable alliance with SC teaching and learning practices, failure to form sufficiently durable alliances with broader Trust networks seems to have contributed to B-SBME abandonment. Future research in the area of SBME may benefit from identifying and problematising interruptions and obstacles in processes of forming alliances between B-SBME actor networks and broader Trust socio-technical assemblages. Actors involved in assembling B-SBME networks in Trust settings may need to explore opportunities to act as ‘mediators,’ mediating network effects of ‘intermediaries.’

References

- Bleakley, A. (2012). The proof is in the pudding: Putting actor-network-theory to work in medical education. *Medical Teacher*, 34(6), 462-467.
- Callon, M. (1986). Some elements of a sociology of translation: domestication of the scallops and the fishermen of St Brieuc Bay. In J. Law (Ed.), *Power, action and belief: a new sociology of knowledge?* London: Routledge.
- Callon, M. (1998). Keynote speech: 'Actor-network theory - The market test'. Retrieved from: <http://www.lancs.ac.uk/fass/sociology/papers/callon-market-test.pdf>.
- Dieckmann, P., Gaba, D., & Rall, M. (2007). Deepening the theoretical foundations of patient simulation as social practice. *Simulation in Health Care*, 2, 183-193.
- Dieckmann, P., Molin Friis, S., Lippert, A., & Østergaard, D. (2009). The art and science of debriefing in simulation: Ideal and practice. *Medical Teacher*, 31(7), e287-e294.
- Fenwick, T. & Edwards, R. (2010). *Actor-network theory in education*. London: Routledge.
- Kneebone, R. (2005). Evaluating clinical simulations for learning procedural skills: A theory-based approach. *Academic Medicine*, 80, 549-553.
- Law, J. (2007). Making a mess with method. In W. Outhwaite & S.P. Turner (Eds.), *The new Blackwell companion to social theory* (pp. 595-606). London: Sage.
- McGaghie, W.C., Issenberg, S. B., Petrusa, E.R., & Scalese, R.J. (2010). A critical review of simulation-based medical education research: 2003-2009. *Medical Education*, 44, 50-63.
- NESC. (2008). E-learning scoping exercise for NHS South Central: Results and recommendations: Part One: Trusts and PCTs. Retrieved from: [http://www.nesc.nhs.uk/Docs/06052008%20-%20Final%20report%20\(Public%20copy\)%20-%20v8%20AGW.doc](http://www.nesc.nhs.uk/Docs/06052008%20-%20Final%20report%20(Public%20copy)%20-%20v8%20AGW.doc)
- Parchoma, G., Pimblett, M., Dickinson, M., & Hanson, J. (2012, October). Simulation based medical education: Constructing the patient's perspective. In the *Proceedings of the World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*, 1875-1880.

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