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Design-based research in designing the model for educating simulation facilitators

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ABSTRACT

The purpose of this article is to introduce the concept of design-based research, its appropriateness in creating education-based models, and to describe the process of developing such a model. The model was designed as part of the Nurse Educator Simulation based learning project, funded by the EU's Lifelong Learning program (2013-1-DK1-LEO05-07053). The project partners were VIA University College, Denmark, the University of Huddersfield, UK and Metropolia University of Applied Sciences, Finland. As an outcome of the development process, "the NESTLED model for educating simulation facilitators" (NESTLED model) was generated. This article also illustrates five design principles that could be applied to other pedagogies.

1. Introduction

The use of simulation-based learning (SBL) in the education of nurses and allied health professionals has increased rapidly over the last decade. Simulation pedagogy is considered a good solution to overcoming the many problems related to nursing education today (Adamson, 2009). Simulation improves nursing students' knowledge, confidence, competence and self-efficacy (Cant and Cooper, 2017). The literature, however, reveals no consensus on what is needed to effectively deliver a simulation or how to train nursing educators to use (SBL). It has been recognized that there is a need to clarify the existing terminology that is associated with simulation-based learning (Bland et al., 2014) and to improve understanding of simulation pedagogy and the learning theories to which it is linked (Clapper, 2010; Roberts and Greene, 2011; Walsh, 2011). Additional enquiry is necessary to illuminate further the conceptual framework of simulation (LaFond and Van Hulle, 2012) and the attributes that underpin the foundations of SBL (Bland et al., 2011).

Simulation pedagogy is widely used in nursing education but each teacher's knowledge and skills relating to its use may vary substantially. Effective use of SBL is complex, and educator preparation is recognized as being vital (Anderson et al., 2012; Cant and Cooper, 2009; Jeffries, 2008; Kaakinen and Arwood, 2009). Crucially, educators need more preparation to deliver SBL than simply learning how to use a high-fidelity manikin. Importantly, it should be recognized that SBL does not necessarily involve the use of high-fidelity manikins.

There is a recognized need to improve simulation practice. As a consequence the International Nursing Association for Clinical Simulation and Learning (INACSL) has developed the INACSL Standards of Best Practice for simulation. These standards were designed for advancing the science of simulation, sharing best practices, and to providing guidelines for implementation and training INACSL (2016).

As a whole, there is limited research on how health professionals and teachers should be educated or trained to use simulation pedagogy. Some studies identify that simulation is best learned by practical training with feedback from simulation experts (Anderson et al., 2012; Bentley and Seaback, 2011). Fisher (2007) describes an online simulation tool created to teach educators how to use simulation and to help them to create the content for their SBL event. However, this kind of training does not teach the theoretical background of simulation pedagogy. Moreover, it does not include debriefing and evaluation skills considered as important attributes of SBL (Topping et al., 2015).

Competence-based approaches and models of education, as well as human resource management (in a broader sense), have gained popularity in the last thirty years (Boyatzis, 1982; Mulder, 2012, 2014; Mulder et al., 2007; Spencer and Spencer, 1993; Vathanophas & Thaingam, 2007; Zemke, 1982). The notion of competency pertains to the

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integral capability of persons to perform adequately in a given context (Muller and Gulikers, 2011). According to Boyatzis (1982) a competency characterizes ability. Spencer and Spencer (1993) identified five characteristics of competency: motives, traits, self-concept, knowledge and skills. Motives, traits and self-concept competencies are hidden, deeper and central to personality, whereas knowledge and skill competencies tend to be visible and relatively obvious characteristics. Thus, knowledge and skill competencies are rather easy to develop through training (Spencer and Spencer, 1993).

The need to develop educator competency to facilitate simulation-based learning in nurse education was a starting point for the Nurse Educator Simulation based learning (NESTLED) project. The common goal of the project partners at VIA University College in Denmark, the University of Huddersfield in the UK and Metropolia University of Applied Sciences in Finland was to improve the education of nurse educators who use simulation-based learning. As a result, the NESTLED project team developed a model for preparing nurse educators to effectively use simulation-based learning. The development process began with a systemized rapid review and synthesis (Topping et al., 2015) which identified a list of competencies required of nurse educators. The competences were categorized under the headings knowledge, skills, behaviours, and comportment. Following the identification of these competencies, design-based research (DBR) was considered as an appropriate methodological framework (discussed within section 2) to guide the development and testing of the NESTLED model.

The definitions of the terminology used in this article are:

- NESTLED model: the overall outcome of the NESTLED project, i.e. the program and the results of the systematic review, including the identified competencies.
- NESTLED program: the eight sessions (including those elements considered compulsory and where there is some flexibility in delivery and content).
- NESTLED project team: researchers and simulation educators from VIA University College, Denmark; University of Huddersfield, UK; and Metropolia University of Applied Sciences, Finland.
- Simulation educator: person delivering the NESTLED program.
- Simulation facilitator: participant undertaking the NESTLED program.
- Student: those for whom the delivery of simulation-based learning is intended.

2. Framework

In the development of the NESTLED model, a design-based research methodology was adopted due to its systematic and flexible method of improving teaching practices (Amiel and Reeves, 2008; Wang and Hannafin, 2005). The design-based research methodology is well-suited to learning environments and educational research because it draws from multiple disciplines (Koivisto et al., 2018; Sandoval and Bell, 2004) including health and learning sciences. Previously, in the field of nursing, design-based research has been used to generate principles for the design of educational simulation games (Koivisto et al., 2018). Our aim was to advance the theory about the competencies required of educators when delivering SBL and, based on this knowledge, design and develop an educational model for teaching SBL to nurse educators. The scientific community can use this knowledge as it directly influences learning practices in educational organizations.

Design-based research uses iterative cycles to analyse, design, implement and redesign (Amiel and Reeves, 2008; Wang and Hannafin, 2005). Cycles are grounded in development needs analysis, solution construction, solution testing, refining, reflection and reporting. In each cycle, data is collected and analysed for the following planning phase. Research is carried out in real-life settings and situations. In the real-life situations, the learning can be absorbed even better and detected by appropriate research and development topics. This kind of study relies on collaboration between practitioners and researchers (Barab and Squire, 2004; Wang and Hannafin, 2005).

The goal of design-based research is to generate reusable design principles (Reeves, 2006), and the outcomes of design-based research are the design principles that are generated based on the knowledge gained through long-term engagement in iterative cycles (Amiel and Reeves, 2008; Reeves, 2006; Wang and Hannafin, 2005). Designers can make changes to the initial design based on the limitations that appear during the iterative cycles, which in turn improves the final outcomes (Amiel and Reeves, 2008; Reeves, 2006; Wang and Hannafin, 2005). The principles can be used by others when applying the appropriate knowledge to a specific situation in the future (Plomp, 2013).

This project included the following five phases:

1. Systematic literature review
2. Analysis of current education programs
3. Development of a prototype
4. Testing of the prototype
5. Analysis of the test and refining of the prototype

The rapid review and synthesis (Topping et al., 2015) fulfilled the requirements of phase one. This was followed by analysis of education programs as required by the conditions for EU Transfer of Innovation funding (phase 2). Phase 3 involved the development of a program operationalizing the NESTLED model into a deliverable prototype—the NESTLED program. During phase 4 the NESTLED program was tested in three different countries (Denmark, Finland and Estonia). Following this 'pilot testing' and analysis of the data obtained, the program was refined further, and the design of the final NESTLED program confirmed (phase 5).

The iterative phases of this project allowed the international research team to make necessary changes to the design at any stage of the process. In each cycle, data was collected and analysed, and new design principles were applied to the next phase. The NESTLED project included a multi-method approach used by combining qualitative and quantitative data (see Barab and Squire, 2004; Wang and Hannafin, 2005). The data collection methods consisted of focus group interviews and questionnaires (pre- and post-program). Research was carried out in real-life settings in three different countries (Denmark, Estonia and Finland). Collaboration between experienced practitioners and researchers was emphasized (Barab and Squire, 2004; Wang and Hannafin, 2005). In this study, the project team consisted of simulation educators and researchers. The simulation educators in this study were senior lecturers. They were all experienced simulation facilitators who taught nurse educators to become simulation facilitators, and thus their opinions were important in the design process (Amiel and Reeves, 2008). Researchers were responsible for data collection, analysis and reporting the results. The communication between project partners included twenty online meetings. Five face-to-face meetings were organized in Denmark, the UK and Finland between 2013 and 2015. Information was also shared through a NESTLED project website hosted by VIA University College. In addition to these interactions, numerous telephone calls and on-line meetings were arranged, and e-mails exchanged.

2.1. Phases 1 and 2

The design of the NESTLED model was based on the systemized rapid review and synthesis (Topping et al., 2015) and refinement of the existing training programs at the University of Huddersfield, Metropolia University of Applied Sciences and VIA University College. The rapid review and synthesis concluded that a simulation facilitator's knowledge base should consist of learning theories and strategies, an understanding of curriculum development and integration, group dynamics, and real-world examples for scenario development. The skills and behaviours needed to facilitate simulation based learning are the ability to