

Improving Pedagogical Practices with Undergraduate Nursing Students in High- Fidelity Simulation

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A thesis submitted to Auckland University of
Technology in partial fulfilment of the
requirements for the degree of
Doctor of Health Science

2015

Faculty of Health and Environmental Sciences
School of Clinical Sciences

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed: *Lucretia D. Eklund*

Dated: 10-06-2015

Acknowledgements

My original decision to pursue this doctorate arose out of a variety of impulses and without a clear understanding of the amount of work or potential benefits involved. I have learned that nothing of this magnitude is ever completed in isolation.

As the project unfolded, I found that the journey was both personally transformational and was to have a profound impact on my personal and family life. It is with this in mind that I must acknowledge the presence and support of my husband Charles, who has been tireless in his support. His filming and editing of model simulation clips allowed the unfolding of the third action cycle. His ability to work 'magic' with Microsoft Word™ has both amazed and comforted me in the final editing stages of this project. His support has meant more than words can express. Thank you so very much.

My daughters, Michelle (21 years) and Heather (19 years), were the inspiration for my research question. Their comfort with, and ability to turn on, any electronic device has both amazed and intimidated me for years! This generation truly does consider their phone a 'body part' and cannot understand why I (a Baby Boomer) struggle to turn on the television. I continue to be put in my place with my technical inability and am inspired with their continual direction and instruction as I journey this road. Technology can be a good thing.

I would like to acknowledge my supervisors. My primary supervisor, Professor Liz Smythe, entered a journey of her own during the final stages of this project. Her ability to support and inspire while struggling with her own health issues has moved me beyond the words written here. I am grateful for her patient persistence as I have struggled to form my thoughts and make some meaning of all I have learned. Her face-to-face supervision (coupled with endless cups of tea and encouragement) inspired me to believe in myself; and trust the transformational process of action research.

My secondary supervisor, Associate Professor Valerie Wright–St Clair, provided both a watchful eye with APA formatting and valuable insights into the linking of ideas in order to maximise my thinking. Her ability to work with the intricacies of Endnote™ and Microsoft Word™ has made me wonder if she is not a 'Millennial in disguise.'

Professor Anita Bamford-Wade acted in a third supervisory role subsequent to her move to Australia at the beginning of 2014. Her presence and 'possibility thinking' inspired me to begin this doctorate. I will always be thankful for her positive 'can do' attitude. These three amazing women have truly invested in my life and thinking, and are part of the 'gift' of this enduring journey. I would like to thank all of them for taking the time to invest in me.

I would also like to acknowledge Nick Garrett for his help with the design and implementation of the quantitative section of the third action cycle. His advice on processing the data, including the selection and use of particular statistical techniques, was invaluable. His patience and assistance with interpreting the results of the statistical analysis, and his assistance in the production and use of graphics, helped to give an objective viewpoint to this thesis.

Finally, I would like to thank the students who participated with me in this research. They often came to both simulations and focus groups despite workload pressures, clinical commitments, and sheer terror at the prospect of simulation. They were keen to learn, upbeat, and helpful in framing my understanding of how Millennials make meaning. Their patience and eagerness to ensure I 'got it right' were humbling as these efforts showed how much they desired to contribute to both educational advances and professional practice in nursing. You are all a credit to the profession. Thank you for being co-researchers with me in this doctorate.

Ethics Approval

Ethics approval for this project was granted by Auckland University of Technology Ethics Committee on October 1, 2012; Ethics Application Number 12/208 (Appendix A1) -- Maximising the potential of simulation for millennial health care students.

Abstract

Nurse educators are required to consider how to best prepare students in order to avoid injury to patients presenting with complex conditions. This study examined one nurse educator's question: "How can I improve my pedagogical practices working with undergraduate students in the high-fidelity simulation environment?" The aims were to (1) develop a personal living theory on how to design and implement high-fidelity simulation; (2) involve nursing students as co-researchers; and (3) inform the University's design and implementation of high-fidelity simulation.

A total convenience sample of 146 final-year, undergraduate nursing students, aged 18-35, with previous exposure to the high-fidelity simulation environment, were recruited from a New Zealand university. An action research 'living theory' methodology was used to guide three investigation cycles. The **first action cycle** began with observing current educational practice using high-fidelity simulation with one student cohort; from which 15 students were purposively recruited for a focus group discussion on how learning experiences might be redesigned. Data were analysed using NVivo™ to develop a descriptive thematic analysis. The main themes emerging from this cycle included students' need for, (1) friendly and concise feedback from educators, (2) educators available in the room to assist students during the simulation and, (3) roles within the simulation which allowed students to focus on one or two things instead of the entire complex patient situation.

These themes were operationalised and evaluated in the **second action cycle** with a convenience sample of 125 students. Participants completed pre- and post-simulation questionnaires rating their most and least valued aspects of the revised high-fidelity simulation using a 5 point Likert scale. The students most valued academic staff modelling how to perform each role in the simulation, having an opportunity to repeat each scenario, and receiving clear friendly feedback. Students least valued not having more high-fidelity simulation earlier in the programme, not being shown how to use the ISBAR communication tool earlier in the programme, and the lack of a coordinated simulation plan in the undergraduate nursing curriculum. Subsequently, 35 purposively recruited nurse educators completed a questionnaire to gather their opinions on what resources were required to assist student learning using high-fidelity simulation.

Twenty-one students from the final semester of the nursing degree volunteered to participate in the **third action cycle** which integrated pre-briefing modules, pre-and post-simulation tests, modelling clips performed by educators and debriefing, into a simulation suite of three scenarios that were video recorded. Participants completed pre- and post-simulation tests measuring content knowledge around each simulation topic. Students' mean post-test scores improved by an average of 2 points over their pre-simulation tests for each scenario. This result suggests that involvement in the high-fidelity simulation and associated activities improved content knowledge. Student performance was also evaluated by educators using the *Lasater Clinical Judgment Rubric* to measure students' performance in noticing, interpreting, responding, and reflecting skills. The students' observer-rated scores improved by an average of 2.5 points from the first to the third simulation, showing improved clinical assessment, clinical judgment and reasoning, and reflection skills. To complete the third cycle, eight students from the same cohort were

purposively recruited for one of two focus group interviews. The data were analysed using NVivo™. The results showed student learning as maximised when the high-fidelity simulation was designed to include modular learning, repetition, and skills training in the simulation environment, as well as having nurse educators model expected behaviours, give specific feedback and engage students in post-simulation debriefing. These findings suggest student learning is best when educators are actively involved in the design and running of high-fidelity simulation, giving students access to their thinking and reasoning during, and in the debriefing, of high-fidelity simulation.

The contribution of knowledge offered by this thesis is a theory of practice, personal yet transferable to others, of how to design and implement simulation in order to provide an integrated simulation programme for undergraduate nurses.

Chapter 1 - Introduction

This thesis presents the story and insights of an action research project (as informed by McNiff and Whitehead, (2011, p. 1271)) that addresses the question “How can I improve my pedagogical practices working with undergraduate students in the high-fidelity simulation environment?”

I chose the route of a professional doctorate to support my quest to take research insights ‘from’ practice and invest them back ‘into’ practice as part of what it means to be doing research (Rolfe & Davies, 2009). Action research, was chosen as an approach which contributes to the generation of principles and theories and is, at the same time, action-oriented (Little, 2012). In this process the ‘I’, the researcher, enters a real-world situation and aims both to improve it and to acquire knowledge. Action research asks questions which are inside the mind of the ‘I’ and which are phrased in first person (McNiff & Whitehead, 2011). The purpose is to develop what McNiff and Whitehead (2011) called a *living theory of practice*. In developing this living theory, the ‘I’ states that “I know what I am doing and why I am doing it” (p. 23). I am showing that I am acting in a systematic way, not ad hoc, and that I am developing a praxis which is morally committed. In action research the object of the enquiry is the ‘I’; knowledge is uncertain, and the knowledge that is gained is done via a collaborative process (McNiff & Whitehead, 2011).

Rolfe and Davies (2009) argue that the knowledge-production of a professional doctorate:

should be measured according to its contribution to tangible improvements to practice rather than whether it generates ‘pure’ decontextualised theoretical knowledge. The focus of the judgement therefore shifts from the research process to the change process, and the arbiter of quality likewise shifts from the academic to the professional practitioner (p. 1271).

I offer this thesis in a manner that demonstrates why and how the process of change was generated within three action research cycles. I demonstrate the impact of the insights gained on my own professional practice as an educator as well as the ways in which I shared my *living theory of practice* with colleagues at my University and with other practitioners. I have done this in a manner that allows other practitioners to take these understandings and invest them into their own process of change.

I came to this study as an educator of under graduate nursing students in a New Zealand University. I was perplexed by my struggles, and those of my peers and the students, around what seemed to be an exciting addition to our teaching/learning environment: High-fidelity simulation. At the same time there was a growing shortage of quality clinical placements for undergraduate nursing students’ clinical experiences. New Zealand schools of nursing education were motivated to consider alternatives to traditional clinical placements. As I began to read the literature, I came to understand afresh that simulation as a learning tool involves more than knowing how to turn on a manikin (McNeill, Parker, Nadeau, Pelayo, & Cook, 2012; Seropian, Brown, & Driggers, 2004b). Furthermore, simulation is not a pedagogy, but a tool which can be

used to implement various pedagogical theories (Parker & Myrick, 2009). High-fidelity, scenario-based simulation utilisation is currently one of the predominant technology tools incorporated into undergraduate nursing curricula. However, it seemed to me that its complexity, and the lack of cognisance to the research in my own setting, called for research that would “find ways of taking action to improve learning with social intent” (McNiff & Whitehead, 2011, p. 26). In a context where productivity is in high demand and time is limited, other educators focused on achieving their own academic qualifications. I came to realise that the starting point towards achieving transformational change was ‘me’.

It is essential that educators continue to develop in their ability to create teaching/learning environments in a way that involves professional learning. One such type of professional development focuses on classroom interactions (Edwards-Groves, 2008) as a centre point for transforming pedagogy and understanding *praxis*. *Praxis* implies a commitment to acting for the good of humankind, and involves practical reasoning as to what is right to do in a particular situation (Kemmis & Smith, 2008a). It is a special kind of action undertaken in occupations like education, where the educator takes into account not only his or her interests, but the interests of the students, society, and the world at large (Kemmis & Smith, 2008b). When faced with perplexities or puzzles as to what one should do in any particular circumstance, for example my disquiet with how simulation was being used in teaching, *praxis* involves looking at what I am doing, and then deliberating as to how action could be moderated to improve existing outcomes. This process involving developing “educationally right practice” (Edwards-Groves & Gray, 2008, p. 85) or *praxis*, involves preparing students to act with both technical skill and moral and ethical integrity. It is this type of professional development which was envisaged in this study.

Therefore, this action research study addresses the question:

How can I improve my pedagogical practices working with undergraduate students in the high-fidelity simulation environment?

The process of such action research leads to the development of a *living theory* of pedagogical practice for me (McNiff & Whitehead, 2011). This thesis is written in the first person as it is my reading, my thinking, my planning, and my insights that are at the heart of this study. It comes with my personal biases which will be evidenced throughout the study. While, in the first instance, this research has improved my own practice, and the practice of those whom I work with, the thesis moves beyond that to demonstrate my contribution to a scholarship of educational inquiry. This is done by showing, through action research cycles, how my practice has evolved “through a process of rigorous theorising” (McNiff & Whitehead, p. 77). As such, my thesis offers new theories that others may find useful in transferring to their own practice contexts.

The study was conducted with students from an undergraduate Bachelor of Health Science (Nursing) programme in a New Zealand University. It consisted of three action cycles, with a supplementary cycle with technicians involved in high-fidelity simulation in the time frame of cycle one.

It is important to note that the nursing school in which this research was situated was undergoing significant upheaval in the initial stages of this project due to restructuring, coupled

with a new Head of nursing and a protracted curriculum revision. Therefore, this project took on a consultative rather than a collaborative approach. This was due to the fact that there were no available nursing educators who could commit to collaboration over the action cycle phases of this research. I therefore decided to take a 'consultative approach' which involved gaining my primary insights from the students, who were very available and willing to participate but in short bursts rather than becoming collaborative partners through the entire study. While the educators and technicians were consulted in supplementary cycles within this project, primary data were not gathered from these sources. This method fits with the McNiff and Whitehead (2011) approach to action research.

Aim of cycle one: To engage with a group of students who have experienced learning in the high-fidelity simulation environment for the purpose of:

- listening to student opinions as to how their learning could be more effectively supported;
- adapting pedagogical practices accordingly;
- involving students in a trial run employing recommended pedagogical practices; and
- seeking feedback as to the effectiveness of implemented changes.

Cycle one was a reconnaissance exercise employed to understand current student opinions and experiences as they encountered simulation at my university. The simulation experiences that were being investigated employed what is termed 'high-fidelity simulation.' High-fidelity simulation employs a computerised human patient simulator (or manikin) which responds in a physiologically appropriate manner to clinical interventions (e.g., medication administration, oxygen therapy) in a realistic way (Parker & Myrick, 2009). The aim in this action cycle was to explore the impact of current teaching practice at the university within this setting, and to glean student (n = 15) responses to this teaching/learning environment through working with them in a simulation scenario. Student recommendations were sought with a goal of tailoring an improved high-fidelity simulated setting which would then be trialled. In alignment with the action research methodology (McNiff & Whitehead, 2010, 2011; Mills, 2014; Reason & Bradbury, 2006), student-recommended changes were implemented in cycle two of this research.

The aim of the group technician interview was to gain the perspectives of those involved in running the equipment and manikins in the high-fidelity simulation labs in the undergraduate programme at our university. The goal was to understand the advantages and challenges occurring in the current high-fidelity simulation programme.

Link to cycle two: A variety of pedagogical changes were ready to be put into practice with a wider group of students.

Aim of cycle two: To trial insights from cycle one as part of regular teaching with all students in semester 5 of the undergraduate nursing programme.

Actions:

- enact pedagogical changes to seek feedback from a wider group of students; and
- conduct pre- and post-simulation surveys for semester 5 students in the final year of the undergraduate nursing programme.

Cycle two involved the implementation of pedagogical changes discovered in cycle one on a larger scale with the same cohort of nursing students (n = 125). The aim was to understand whether changes implemented in cycle one enhanced student learning; and to discover which aspects of the revised simulation experience were most valuable, along with detail as to why these changes did or did not contribute to student learning. Students were given a pre- and post-simulation questionnaire in order to determine which aspects were most valued. They were then asked, "If the world was perfect, what would you desire as part of simulation at this institution?" These suggestions were implemented in cycle three as part of the action research process.

Link to cycle three: Students recommended they have an opportunity to immerse themselves in a variety of simulated scenarios in the final semester of their programme.

In reviewing the literature it became clear that educators often feel under prepared to work in the high-fidelity learning environment (Blazek, 2011). This led to a small purposive spin off cycle.

Aim of supplementary cycle: To explore educators' opinions of being involved in teaching in high-fidelity simulation environments.

Actions:

- Survey of educators attending training sessions and a conference involving simulation.

Within the time frame of cycle two there was an opportunity to survey educators involved in teaching in high-fidelity simulation environments. While it was outside the specific aim of the study, it provided useful background insights.

Aim of cycle three: To provide and evaluate a suite of clinical scenarios for students in the final semester of their nursing programme.

Actions:

- student content-knowledge assessed before and after participating in the simulated scenario using pre- and post-tests;
- student focus groups conducted after participation in the scenario suite; and
- video clips of student performance were assessed by two educators using Lasater Clinical Simulation Rubric.

Cycle three involved the creation of a simulation suite involving three unique simulated patient scenarios. Students (n = 21) proceeded through each scenario (pre-test, pre-briefing, two attempts at scenario, and debriefing), in one hour. The students were filmed, and their

performances evaluated by two educators using the Lasater Clinical Simulation Rubric (Lasater, 2007).

Link to recommendations:

After concluding the third action cycle of this thesis, recommendations were made to the Head of School of Clinical Sciences in order to suggest justifiable changes as to how simulation as a tool could be developed and integrated into the various health disciplines at the institution. These recommendations are discussed in Chapter 10 of this thesis. Further, the insights that emerged from this *living theory* approach are offered to the scholarly community as pointers that may be transferable to their own situations.

Terminology used in this Thesis

- *Anatomical models*: Two or three dimensional models (pictures, slides, or anatomical parts made to mimic human form) used to show students visual likenesses of anatomical parts (Nehring & Lashley, 2009).
- *Behaviourism*: An approach to psychology that combines elements of philosophy, methodology, and theory. Primarily expressed in the writings of John B. Watson and B. F. Skinner. Behaviourism focuses on observable behaviour from an objective point of view. Behaviourism maintains that behaviours can be described scientifically without recourse either to internal physiological events or to hypothetical constructs such as thoughts and beliefs (Ledoux, 2012; Skinner, 1985).
- *Clinical judgment*: An interpretation or conclusion about a patient's needs, concerns, or health problems, and/or the decision to take action (or not), use or modify standard approaches, or improvise new ones as deemed appropriate by the patient's response (Tanner, 2006).
- *Clinical reasoning*: Processes by which nurses and other clinicians make judgments. This includes a process of generating alternatives, weighing the alternatives against each other, and choosing the most appropriate for the particular situation involved (Tanner, 2006).
- *Constructivism*: A theory of knowledge describing how people learn. It is based on observation and scientific study, and says that people construct their own understanding and knowledge of the world through experiencing things, and reflecting on those experiences. Jean Piaget suggested that through processes of *accommodation* and *assimilation*, individuals construct new knowledge from their experiences. Writers who influenced constructivism include Jean Piaget, John Dewey, Lev Vygotsky, and Maria Montessori (Bradshaw, 2014; Kala, Isaramalai, & Pohthong, 2010).
- *Constructionism*: A pedagogy inspired by the constructivist theory, where individual learners construct mental models to understand the world around them (Haw, 2006). Constructivism advocates student-centred, discovery learning where students use information held previously to acquire new knowledge. This is done through problem-

based learning where students are able to make connections between different ideas and areas of knowledge that the educator helps them form. The educator's role is to function as a facilitator who coaches; learning involves reconstruction rather than transmission of knowledge. Its primary proponent is Seymour Papert (Crotty, 1998).

- *Cognitive load theory*: This theory suggests that learning happens best under conditions that are aligned with human cognitive architecture. Short term memory, as part of this architecture, is limited in the number of elements it can contain simultaneously. It is therefore best to encourage schemas, or combinations of elements, to be loaded into long-term memory in order to free up short-term memory capacity. Instructional design must take into consideration the load on human cognitive architecture of various activities/problems. Primary proponent is John Sweller (Artino, 2008; Merriënboer & Sweller, 2005; Sweller, 2004).
- *Elaborative rehearsal*: Particularly useful for creating more lasting memories. Metacognitive elaborative rehearsal involves the individual learner's purposeful manipulation of information as a means of deepening processing. It requires reflecting on the meaning of incoming information, connecting it with existing knowledge, and revising accordingly (G. Roberts et al., 2014).
- *Fidelity (realism)*: Fidelity is an intrinsic property of simulation and can be defined as the degree of accuracy to which a simulation, whether it is physical, mental, or both, represents a given frame of reality in terms of cues and stimuli, and permissible interactions (Tun, Alinier, Tang, & Kneebone, 2015). Fidelity refers to an accurate representation of real-world cues and stimuli. Simulation fidelity is dependant not only on user perception, but also accuracy of representation in relation to the real world, such as in terms of the laws of physiology.
- *High-fidelity*: Refers to the highest degree of accuracy in relation to real-world as is possible to provide the learner (Tun et al., 2015). Another term used is *absolute fidelity* which the simulation cannot be differentiated from reality (Tun et al., 2015). It is important to note that the ability to differentiate from reality is key in fidelity, not the sophistication of technology or computerised manikins employed.
- *High-fidelity simulation*: A learning environment which has the highest degree of accuracy in relation to the physical and mental reality as is possible through the production of real-world cues and stimuli (Tun et al., 2015).
- *Human patient simulation*: A computer-controlled manikin that mimics human interaction with students in a controlled simulated clinical setting. The human patient simulator is a computerised full-body manikin that is able to provide real-time physiological and pharmacological parameters of persons of both genders, varying ages, and with different health conditions (Kardong-Edgren, Adamson, & Fitzgerald, 2010).
- *Immersive learning environments*: Place the learner in a state of being deeply engaged or involved; absorbed. Learning environments which are immersive are distinguished

from other learning environments by their ability to simulate realistic scenarios that give learners the opportunity to practice skills and interact with other learners. Immersive environments allow learners to be totally 'immersed' in a self-contained artificial or simulated environment while experiencing it as real (Bergero, Hargreaves, & Nichols, 2012).

- *Manikin*: A jointed model of the human body used for teaching anatomy or as an artist's lay figure. A styled and three-dimensional representation of the human form. Dutch origin combining 'man' + 'kin' (2015).
- *Mannequin*: A life-size dummy of the human body used to fit or display clothes. Has origins in both French and Dutch languages (2015).
- *Millennials*: Also known as Gen Y, Net Gen, Echo boomers. The newest of the four generations alive today. Demographic cohort following Generation X. There are no precise dates when the generation starts and ends. Researchers and commentators use birth years ranging from the early 1980s to the early 2000s (Howe & Strauss, 2000; Koeller, 2012).
- *Mrs Chase*: The most notable task-trainer employed in nursing education. Mrs Chase was a full-bodied mannequin introduced in 1910 for training of nurses (Nehring & Lashley, 2009).
- *Pedagogy*: The philosophy that underpins teaching and learning. It is the method and practice of teaching, especially as an academic subject or theoretical concept. The art and science of professional teaching. A comprehensive definition of pedagogy includes considerations around the nature of knowledge; what is taught; how it is taught; what comprises learning; and how students and educators learn (Horsfall, Cleary, & Hunt, 2012). Noun form implies the function or work of an educator; teaching (Horsfall et al., 2012; Pedagogy, 2015).
- *Praxis*: Implies a commitment to acting for the good of humankind, and involves practical reasoning as to what is right to do in a particular situation. Aristotle described the end goal of praxis as action (Edwards-Groves, 2008).
- *Schema (plural schemata)*: A schema is a structure that organises large amounts of information into a meaningful system. A standard pattern or sequence of steps associated with a particular concept, skill, or event (Schunk, 2014). Schema, once formed, become automated and are stored in long-term memory (Merriënboer & Sweller, 2005; Sweller, van Merriënboer, & Paas, 1998).
- *Simulator*: The medium that allows users to conduct simulations (Tun et al., 2015). Examples include part-task trainers, mannequins or patient simulators, simulated or standardised patients (SP), screen-based environments, and simulated equipment and healthcare environments.
- *Simulation*: Simulation as a teaching strategy is a replication of essential aspects of reality so that reality can be better understood (Jeffries, 2007; Nehring & Lashley, 2010).

It is an *interactive* teaching strategy designed for augmenting the teaching/learning process (S. Miller, 2010) which employs the use of computerised human patient manikins, models, and scenarios in place of live patients (Bearnson & Wiker, 2005). These manikins are capable of responding in a physiologically appropriate and realistic manner to clinical interventions (e.g., medication administration, oxygen therapy). Furthermore, they can be programmed to respond to both actions and omissions on the part of the student (Leigh & Hurst, 2008), thus immersing the student in a learning environment which mimics the reality of clinical complexity without posing danger to actual patients.

Pre-understandings of the Researcher

I am a nurse, educated in the United States, who has lived in New Zealand for 19 years. I have been involved in undergraduate nursing education in three different nursing schools in New Zealand for the past 15 years. In my day to day life, my pre-understandings include the following:

- I have always been fascinated by technology, and it does not scare me.
- I am mindful that the opportunities afforded by technology are ever-growing and hold rich potential to transform educational possibilities.
- The interface of technology and healthcare has always fascinated me. In my clinical working years in the United States, I can remember loving to be assigned patients on balloon pumps and ventilators.
- I am an early adopter of technology. I was one of the first to put my hand up to be involved with high-fidelity simulation.
- I am exposed to technological advancements and their influence on learning on a daily basis. I am the mother of two millennial daughters who throw me even further into the world of technology, their seemingly innate skills far out-reaching my own.

In my day-to-day work as a university lecturer, I have noted the following:

- I am dissatisfied with how high-fidelity simulation is being implemented at my university. Neither the educators nor the students seem to be enjoying the experience.
- I note that my university is not experiencing the same success with simulation as other nursing schools are reporting. As an educator of nursing students, it is important to explore what can be done to discover which practices were not working, and how the current simulation experiences could be changed into a more effective learning environment. The journey I am on is a personal one – to develop a more effective use of high-fidelity simulation which would build confidence and competence; and to instil a desire to pursue further learning on the part of my students. I am also committed to sharing the insights I glean from this action research process to inform the practice knowledge of other nurse educators.

Background Context to the Problem

In response to the above considerations, I set out to discover how to improve the use of high-fidelity simulation as a teaching/learning tool, as well as to create a simulation environment, which

would be effective, inspirational, and prepare students in environments more effectively than current transmission models of content delivery.

The healthcare environments, for which current students are destined, require training in the use of high-tech equipment, ability to problem solve, and the tenacity to make decisions out of a strong knowledge base which can be applied to crisis situations (Williams & Chong, 2010). Graduates entering practice are being required to 'hit the ground running', often refining their skills in actual clinical environments, practicing on live patients, perhaps posing unnecessary risk to those most vulnerable. One research project suggested that only 35% of new graduates were deemed able to meet entry expectations for clinical judgment when evaluated by the *Problem Based Development System* (Sportsman et al., 2009). This incongruity between healthcare demands, public expectations, and readiness for practice of undergraduate nurses, produces tensions as educators seek optimal ways to prepare undergraduate nurses.

In response to the above challenges, I began exploring different teaching/learning platforms which might improve my professional practice as an educator within the context of high-fidelity simulation. High-fidelity simulation often involves advanced technologies, which necessitate training as to their use and integration into undergraduate curricula (McNeill et al., 2012). These challenges are occurring against a backdrop of a growing shortage of nurse educators (S. Miller, 2010), diminished financial resources and, in some cases, a resistance to the use of emerging technologies by an aging educational workforce (Halstead et al., 2011). However, these challenges operated in the backdrop of a need for my own development.

Improving *praxis* was my motivator for exploring innovative ways to increase students' clinical reasoning and ability to make sound clinical judgments within the complex clinical settings for which they are destined. Simulation has been defined as a replication of the essential aspects of reality so that reality can be better understood. Simulation is currently being used to enhance or supplement classroom, laboratory, and clinical setting experiences within the nursing school I am working. It is evidenced in the literature as potentially providing an effective means of remediation of selected clinical skills (Fero et al., 2010; Rutherford-Hemming, 2012), assessment of students' clinical competencies and decision-making (Fero et al., 2010), and orientation of students to new or challenging clinical situations such as bioterrorism, which they may not encounter in routine clinical placements (McCaughey & Traynor, 2010; Richardson & Claman, 2014). However, there is a need for professional educator development which will inform the actions (*praxis*) taken by educators within these environments, with a mind to maximise levels of preparation for students emerging from these learning environments.

Context of this research

This research occurred within the largest undergraduate nursing school in New Zealand. The nursing programme consists of six semesters of learning which culminates in a Bachelor of Health Science in Nursing. Before I began this research project, simulation was being used sporadically and primarily in semesters three, five, and six. Each semester had a teaching team, and each team managed their own high-fidelity simulation. There was no overarching coordination of simulation across the curriculum; nor alignment of simulation outcomes with the learning

outcomes for the particular course in which it was situated. Many educators were not interested or openly refused to incorporate simulation into their semesters for a variety of reasons. As an educator, and course coordinator, I was not required to use simulation if I did not want to. The focus was on the number of clinical hours the students completed (with a cumulative requirement of 1100 hours at the end of three years). Simulation was considered an option which did not have to be integrated into courses or into the curriculum.

At the time of the research there were 930 students across the three undergraduate years, with 628 of these between 18 and 30 years of age. It is noted, therefore, that 67% of the students at this university fell into what has been termed the millennial generational cohort (18-30 years old). While not all of these students can be characterised as having exactly the same tendencies, some preferences have been identified with this generational cohort which are part of the educational context of this research (Cahill & Sedrak, 2012; Hartman & McCambridge, 2011; Howe & Nadler, 2008). Some research (Aviles & Eastman, 2012; Dominiak, 2007) is showing that Millennials build relationships, operate online, and learn in ways unique to their generation. This tie to technology, with a focus on connectivity to other people, needs to be considered when creating learning environments for these students (Earle & Myrick, 2009).

The university has several sites where simulation and clinical skills training occur. These sites include several high-fidelity adult, child, and paediatric training manikins, along with simulation suites and associated equipment. Several technical staff assist with the administration and support of the simulation and skills training at the university. These resources serve several clinical (healthcare) schools including physiotherapy, podiatry, oral health, occupational therapy, nursing, paramedicine and midwifery.

It must be acknowledged that the nursing programme in which this research was nested was not working from any clearly explicated pedagogy. This has implications for both the context and manner in which the study unfolded. These implications included a lack of educator understanding around how to apply various pedagogical underpinnings to maximise the use of high-fidelity simulation as a teaching tool.

Defining Pedagogy and Education

Pedagogy and education have been inter-twined since antiquity. Education has been defined as learning for its own sake, while pedagogy can be defined as learning with a focus on social goals (Hinchliffe, 2001). The tradition of pedagogy can be traced back to Socrates who taught rhetoric and other arts to young Greek aristocrats in order to equip them for a career in public life. The tradition of education can be traced back to Plato, who advocated that learning be untarnished by the pursuit of worldly affairs. Thus the notion of pedagogy seems to have emerged from the goal of creating a well-formed person who can be of service to society – for ultimately political, social, and economic ends. Pedagogy addresses the skills society needs. These distinctions have a reverberation today in that attempts to improve educational standards quickly revert to an exercise in pedagogy with the goal of changing particular targets (Hinchliffe, 2001). It is pedagogy, therefore, which is being addressed as a process which influences how nurses

are prepared for a career serving the public in healthcare environments which is being addressed in this thesis.

The first known use of the term *pedagogy* was in the 14th century. It derives from the Greek *paidagōgia* which was the office of a child's tutor (Pedagogy, 2015). The Merriam-Webster online dictionary (2015) defines pedagogy as the art, science, or profession of teaching. The current term pedagogy derives from the Middle English *pedagoge*, from the Latin *paedagogus*, and from Greek *paidagōgos*. The Greek term described a slave who escorted children to school, from *paid-* ped- + *agōgos* leader, from *agein* to lead. Pedagogy involves the knowledge and skill that a person needs to develop in order to become a successful educator (Pedagogy, 2015). It is an educator's pedagogical knowledge which most profoundly influences the teaching/learning environments he or she creates (Bradshaw, 2014). In today's tertiary settings, a clear understanding of pedagogy and its impact on teaching and learning processes is considered essential.

Increasingly, there is conviction that educators require a carefully formulated philosophy for teaching and learning which should be constructively aligned to their work setting as well as learner-centred (Horsfall et al., 2012). Pedagogy embodies both the art and science of teaching. A comprehensive definition of pedagogy includes considerations around the nature of knowledge; what is taught; how it is taught; what comprises learning; and, how students and educators learn (Horsfall et al., 2012). Additionally, there is a "sharp divide between the pedagogies of the classroom and the effective pedagogies of the situated teaching in the clinical setting" (Benner, Sutphen, Leonard, & Day, 2010, p. 14). Jeffries (2008) noted that traditional models of teaching and learning in didactic courses, and the expectancy to transfer knowledge and skills to clinical experiences, fail to provide opportunities for safe and effective practice. Simulation is one learning environment which bridges the gap between theoretical content and its application in real-world settings (Berragan, 2011).

Defining Simulation

The definition of simulation continues to expand as its usage and application to practical settings grows. Simulation as a teaching strategy is a replication of essential aspects of reality so that reality can be better understood (Jeffries, 2007; Nehring & Lashley, 2010). Simulation is an activity that represents real or potentially real world activities, including hypothetical situations such as major disasters (Tun et al., 2015). When used educationally, it is an *interactive* teaching strategy designed for augmenting the teaching/learning process (S. Miller, 2010) which *may* employ computerised human patient manikins, models, and scenarios in place of live patients (Richardson & Claman, 2014). Students involved in simulation are *immersed* in a learning environment which mimics the reality of clinical complexity without posing danger to actual patients.

High-fidelity simulators have been used in nursing education for roughly 15 years (Nehring & Lashley, 2010). The term fidelity refers to an accurate representation of real-world cues and stimuli (Tun et al., 2015). Fidelity is an intrinsic property of simulation and can be defined as the degree of accuracy to which a simulation, whether it is physical, mental, or both, represents a

given frame of reality in terms of cues and stimuli, and permissible interactions (Tun et al., 2015). All aspects of fidelity significantly hinge on the learners' perceived realism of the context of the learning episode as opposed to any one particular element such as the technology used. Fidelity is an important aspect of immersive environments, as it assists learners to identify exactly what a similar situation might look like in the real world (Nehring & Lashley, 2010). The use of as close an approximation to reality as possible should be attempted when designing scenarios in order to promote better learning outcomes.

Traditionally, nursing concepts have been taught via transmission models of educational practice in the form of large-room lectures and tutorials. However, these techniques are being challenged as more immersive learning opportunities emerge (Bergero et al., 2012; Kumar, 2011). A major cause of this widening gap between knowledge and application to the clinical setting is the current emphasis on more content in nursing programmes, rather than focusing on the application of knowledge (Sportsman et al., 2009). A learning experience involving simulation, due to its immersive qualities, forces learners to apply what they know and then reflect on the effectiveness of that application (Kneebone et al., 2010). It is therefore considered an effective way to address the problem of applying knowledge to the practice setting (Stewart, Williams, Smith-Gratto, Black, & Kane, 2011).

However, one of the challenges high-fidelity simulation facilitators must face is that without critical reflection on its impact in terms of resourcing, alignment of learning outcomes, and training of those implementing its use, it can become a confounding factor (Parker & Myrick, 2009). There is the very real possibility that educator focus can shift from real patients and the evolving identities of student nurses, towards the endless possibilities of technology (McNeill et al., 2012; Parker & Myrick, 2009).

Brief Outline of Methodology

Methodology refers to the theoretical rationale or philosophical principles that justify the research methods appropriate to a field of study (Carr, 2006). This thesis is a form of practical philosophy – an example of researching my own practice and aligning it with my own values (Foreman-Peck & Murray, 2008). In its initial formulation, action research was defined as a method that enabled theories produced by the social sciences to be applied in practice and tested on the basis of their practical effectiveness.

After falling into decline in the 1950s, due to its inability to meet the methodological requirements of positivism, action research experienced a resurgence due to the growing conviction of the irrelevance of conventional educational research to answer the practical concerns of educators and schools (Kemmis, 1988). There were some who claimed that educator professionalism could best be enhanced by giving educators a research role which would enable them to improve in their own practice (Carr & Kemmis, 1986). This viewpoint was coupled with the belief that a reformulated version of Lewin's (1947) action research method would, by enabling educators to test curriculum policies and proposals in their own classrooms, lead to improvements in pedagogical practice and stimulate innovative curriculum change (Carr, 2006).

With this shift in focus on improving professionalism, the object of educational action research became educational practices. These practices informed committed action (Kemmis, 1988). Action research was no longer seen as a method for assessing the practical utility of social scientific theories but as a means whereby practitioners could test the educational theories implicit in their own practice by treating them as experimental hypotheses to be systematically assessed in specific educational contexts (Carr, 2006). At this point, Lewin's (1947) action research cycle was transformed from a method by which practitioners applied social scientific theories to their practice, into a method which allowed practitioners to assess the practical adequacy of their own tacit theories 'in action'(Elliott, 1991).

Action research combines research which relies on 'action' with morally informed practice. It has woven this understanding with 'research' in accordance with post-positivist research methodologies. Action research has been able to liberate itself from the errors and confusions of its historical predecessor and develop a more intellectually sophisticated understanding of its task (Carr, 2006).

Organisation of this Dissertation

The chapters of this thesis give an introduction to the impetus of this research followed by a description of the background in New Zealand in undergraduate nursing education. I begin with a description of the context and current challenges and progress through the chosen methodology and design. My *living theory* as it unfolds is described by three action cycles of study which conclude with how this research impacted our school, and offers the living theory that emerged to the body of knowledge around high-fidelity simulation.

Chapter 1: Introduction.

This chapter, Chapter 1, outlines the impetus for the study along with the background context which has influenced undergraduate nursing education in New Zealand for decades. The impetus of preparing undergraduate nurses for complex clinical environments is outlined, followed by the research question which will be a focus in this study. A discussion around the potential differences between pedagogy and education is offered. This is followed by a discussion about some of the pedagogies which underpin high-fidelity simulation. The research method (action cycles) and methodology are also introduced.

Chapter 2: Background context.

Chapter 2 discusses the background contexts influencing the research question. The historical development of undergraduate nursing education in New Zealand is outlined, followed by the development of maintenance of mandated clinical hours. Tensions influencing undergraduate nursing around the globe are outlined along with how different countries are using and managing simulation in their undergraduate curricula. This chapter concludes with the educational preferences of millennial students who are 18-30 years of age at the time of this writing and form 67% of this undergraduate nursing school.

Chapter 3: Literature Review.

Chapter 3 outlines the literature which, upon my reviewing, helped me to more clearly understand the work which must be done around high-fidelity simulation as a means of educating undergraduate nurses. As I interacted with the literature, I came to a clearer understanding of the pedagogical theories which underpin this teaching strategy, along with how high-fidelity simulation could be used as a tool to enhance students' clinical reasoning and judgment. I came to see more clearly how high-fidelity simulation could be used to assess student competence, with the ultimate purpose of replacing some clinical hours. High-fidelity simulation as a teaching strategy requires vision and a plan in order to integrate into nursing curricula; along with a strong and transformational leadership which needs to include specific training for simulation facilitators.

Chapter 4: Pedagogies underpinning high-fidelity simulation.

Chapter 4 begins by tracing the pedagogies that inform nursing education and particularly high-fidelity simulation. Some authors refer to simulation as a pedagogy, while others refer to it as a teaching strategy. This chapter clarifies the difference between the two, and continues to outline the various educational theories and how these form underpinning pedagogical principles within high-fidelity simulation.

Chapter 5: Methodology.

Chapter 5 outlines the historical roots of action research beginning with Kurt Lewin. Lewin's change model is described, along with the various types of action research (critical, practical, and technical). My *living theory* and study of my own practice represents a particular style of action research used to address the research question. This is outlined along with the action research circle of enquiry and the philosophical underpinnings of John Dewey.

Chapter 6: Methods.

Chapter 6 outlines the process of gaining ethics approval and ensuring the study was conducted ethically. The methods employed for recruiting participants, gathering data (focus groups, group interviews, video recording of simulation performances, pre- and post-test results, and Lasater simulation rubric scores) and analysing data using thematic descriptive methods, are described. Strategies for managing researcher bias and trustworthiness in this study are discussed.

Chapter 7: Action Cycle One.

Chapter 7 outlines how action cycle one unfolded starting with two focus groups, the student response to revised high-fidelity simulations, followed by the technician group interview. Themes emerging from the data analysis are discussed along with how these integrate with Dewey's pragmatism and other pedagogical theories.

Chapter 8: Action Cycle Two.

Chapter 8 describes how action cycle two picks up threads of learning from action cycle one and implements these with a larger cohort of students. This cycle follows 125 students through a high-fidelity simulation which employs the suggestions gleaned from cycle one. This cycle sees me attempting to manage pre-simulation anxiety, allowing repetition on the part of students, and providing modelling of expected performance. Students are taught to use the ISBAR tool to recruit assistance in managing a deteriorating situation within the high-fidelity simulation environment. Evaluation of themes gleaned from data analysis provides a rich tapestry from which to move in new directions in cycle three.

Chapter 9: Action Cycle Three.

Chapter 9 describes the unfolding of action cycle three which sees the design and implementation of a simulation suite of three scenarios (hypovolaemic shock, paediatric croup, and acute coronary syndrome). This suite of scenarios was implemented with students in their final semester of an undergraduate programme in nursing. Results showed that involvement in the simulations improved students' post-test scores, and that students improved in clinical judgment and reflection as evidenced in the Lasater clinical simulation rubric. This cycle inspired further development of high-fidelity simulation within our school.

Chapter 10: Conclusion and Recommendations.

This final chapter includes a summary of the three action cycles along with recommendations gleaned from each cycle. A living theory is developed from lessons gleaned from each cycle. This living theory involves seven key steps to move the school forward in high-fidelity simulation development and integration. The chapter concludes with the impact of this research along with recommendations for further research in the area of high-fidelity simulation.

Chapter 2 – Background Context

There are advantages and challenges to the use of simulation in nursing undergraduate curricula. A rising demand for nurses able to manage increasingly complex patients (Cooper et al., 2012; Ministry of Health, 2006) means that the emerging generation of nurses will have to incorporate both clinical reasoning skills and an ability to recognise patterns of deteriorating patients (Cooper et al., 2013; Fuhrmann, Østergaard, Lippert, & Perner, 2009). In recent years the acuity of patients managed in acute clinical settings has increased, while access to critical care beds has decreased (Cooper et al., 2011). This shift has resulted in increased demands on nursing staff, many of whom may not have appropriate skills or clinical reasoning to be able to notice or manage rapid deterioration in acutely ill patients. This mix of elements has resulted in a decreased ability to manage deteriorating patients with a resultant increase in sentinel events involving management of care (Ministry of Health, 2012).

This chapter will set the context for use of high-fidelity simulation in undergraduate nursing education. First, the history of nursing education in New Zealand is discussed. Next, the part that mandated clinical hours has played in current undergraduate nursing education is discussed, followed by some of the difficulties and inconsistencies surrounding mandated clinical hours. A brief description of the characterised preferences of the predominant age cohort enrolled in the nursing programme, where the current study is situated, will then be detailed, including how high-fidelity simulation fits into millennial preferences for educational learning environments. A history of simulation development will be briefly outlined, followed by the progression of simulation development in New Zealand, and in similar contexts around the globe.

History of Nursing Education in New Zealand

With the introduction of hospital-trained nurses and the instigation of legislation influencing registration for practice from the New Zealand Department of Health (1901), the educational status and social position of nurses became elevated in New Zealand. The number of nurses increased dramatically from 259 in 1874 to 2830 in 1911; with Ellen Dougherty qualifying as the first registered nurse at Wellington Hospital in 1889 (Gage & Hornblow, 2007). With nursing registration came new standards of training. Reform was shaped by members of the medical profession who asserted themselves as social and political leaders — which in hind sight was considered an unfortunate alliance by some. Nursing was shaped significantly by the medical profession on the assumption that whatever the nurse may think, ‘Her’ duty was to obey the physician without expression of opinion as the patient was, after all, the doctor’s charge. It was the nurse’s responsibility to carry out the doctor’s instructions faithfully (Maude, 1908). Knowledge was imparted to nurses from doctors who exerted control over practice, particularly through their influence on legislation (Gage & Hornblow, 2007).

During the 1930s education of nurses embraced a live-in apprenticeship model in secondary care hospitals with concurrent acculturation to their hierarchical structures, dress codes, protocols, and decision-making processes (French, 2001). The post-Depression Labour government promised a free and comprehensive health system and established a broad

framework for the New Zealand health sector that would predominate for the next half century. This system would influence nursing practice through the funding of hospitals, development of psychiatric institutions, introduction of sickness and invalid benefits, and the introduction of a maternity benefit with full payment to the doctor. The work of the hospital-based nurse was typically that of rostered, state-supported, state-controlled employment under the medical oversight of an increasingly complex secondary care environment. In primary care, the role of the nurse became the support of a fee-for-service general practitioner (Gage & Hornblow, 2007).

In the decades following World War II, the health sector grew to become one of the major areas of employment and government expenditure in New Zealand (Gage & Hornblow, 2007). Advanced medical specialisation and biotechnology created an increasingly complex scientific, diagnostic and administrative infrastructure which led to greater specialisation and the need for advanced expertise amongst the growing and increasingly diverse nursing workforce. By the 1970s the need for fundamental restructuring of nursing education was widely, though not universally, accepted. In 1971 the Nursing Council was established and the Nurses' Association launched 'Operation Nursing Education.'

The landmark Carpenter Report (1971) recommended the transfer of basic nursing training from hospital schools to tertiary training facilities. With government support, a long-term transition process was commenced to phase out hospital-based programmes and make way for a comprehensive, national nursing educational framework to be instigated in polytechnics across the country. While nurses supported the change, some hospital boards did not due to the loss of a cheap, passive work force. While a possible university role in nursing education had been considered in 1928, the centrally-controlled University of New Zealand, with its Otago Medical Faculty, dominated all of tertiary nursing education discussions until 1961 (Gage & Hornblow, 2007). Therefore, the prospect of university-based nursing education proved short lived in New Zealand despite its prevalence overseas — particularly in the United States. However, this was not the only hurdle to be overcome. Preparation for undergraduate nurses was to undergo further transformation.

The recommendations made by the then Department of Education included making the preparation for registered nurses comprehensive in nature, transferring the delivery and control to the Department of Education (i.e. away from hospital boards and into the hands of technical institutes), and pitching the level to 6th form school leavers ("Education Amendment Act," 1991). It was generally accepted that programmes offered by polytechnics would provide the basis for beginning practice, and that the university programmes would provide for the development of the discipline and advancement of nursing knowledge. The Education Amendment Act (1991) provided a new environment with regard to the regulation of the number, type, and enrolments of health professional courses (e.g. individual tertiary institutions now have responsibility for setting intake numbers for nurses). However, there was poor concordance between educators and regulators as to how much and what kind of clinical (actual workplace) hours should be included in nursing preparation. In the current climate, this issue has become a hotly debated topic, compounded by the decreasing availability of clinical placements across the country (Betony &

Yarwood, 2013). Unfortunately, mandated clinical hours are required through legislation and not under the control of tertiary providers.

History of Mandated Clinical Hours

Under current legislation, ("Health Practitioners Competence Assurance Act," 2003) the Nursing Council's purpose is to protect the health and safety of members of the public by providing mechanisms to ensure that health practitioners are competent and fit to practise their professions. Currently the Education Programme Standards(2010) set by the Nursing Council state that nursing curricula in New Zealand must provide, "a minimum of 1100 hours of clinical experience for all students, with all students being entitled to 1500 clinical hours in which to demonstrate competence" (Nursing Council of New Zealand, 2010, p. 8). However, simulation hours *cannot* be included in required clinical hours. This stance is not supported by research on simulation in undergraduate nursing curricula in other countries (Hayden, 2010; Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014; Kardong-Edgren, Willhaus, Bennett, & Hayden, 2012).

The National Council of State Boards of Nursing (NCSBN) recently concluded a National Simulation Study (Hayden, Smiley, et al., 2014) in the United States. This was a large-scale, randomised, controlled study that encompassed the entire nursing curriculum. Ten nursing programmes consented students who were beginning their studies in the second semester 2011, with an expected graduation date of semester one 2013. These students were randomised into one of three groups: the control group, whose curriculum included traditional clinical experiences with no more than 10% of clinical hours spent in simulation; a group in which 25% of clinical hours were replaced with simulation; and a group in which 50% of clinical hours were replaced with simulation (Hayden, Smiley, et al., 2014). Results from this study showed that up to 50% of clinical hours can be replaced with simulation with no statistically significant differences in clinical competency as assessed by preceptors and instructors ($p = 0.688$), no statistically significant differences in comprehensive nursing knowledge assessments ($p = 0.478$), and no statistically significant differences in NCLEX® pass rates ($p = 0.737$) among the three study groups (Hayden, Smiley, et al., 2014). These results show that simulation can be used as an effective learning platform in place of some clinical hours with no deleterious effects on student content knowledge or exam results.

Furthermore, the above study contributes to the body of knowledge addressing the transfer of learning from simulation to clinical practice (Alinier, Hunt, Gordon, & Harwood, 2006; S. Miller, 2010). Final clinical preceptor evaluations showed no differences in critical thinking, clinical competency, and overall readiness for practice between the three study groups (Hayden, Smiley, et al., 2014). Taken with the findings of previous studies (Kirkman, 2013; Rutherford-Hemming, 2012), it is evident that skills learned in simulation do transfer to the clinical setting. This research should influence the New Zealand Nursing Council to reconsider its current stance on substitution of some simulation for mandated clinical hours.

At the time of this writing, simulation is not allowed to replace any mandated clinical hours in New Zealand. Other countries have lost or greatly reduced mandated clinical hours due to the unavailability of clinical placements and lack of research around the effectiveness of this mandate

(National Council of State Boards of Nursing, 2009; Nursing Midwifery Council, 2010b). New Zealand is tying itself to clinical hours mandates, a bygone era of trade training that workforce educators may need to re-evaluate.

International standards for nursing workforce preparation in New Zealand, the United States, Australia, and the United Kingdom are all transitioning. Many have either lost or greatly reduced the number of clinical hours required for undergraduate nursing registration due to the unavailability of clinical placements (McNelis, Fonacier, McDonald, & Ironside, 2011), the lack of standardised experiences for all students within these placements (Garrett, MacPhee, & Jackson, 2011), and a sheer desire to become more relevant to the Millennial generation (Earle & Myrick, 2009).

Clinical hours do not ensure patient safety.

As hospital boards and nurses attempted to ride the waves of change, patient safety emerged as another area of concern. With the complexity of conditions patients present with, educators are required to consider how to best prepare students in order to avoid injury to patients (i.e. sentinel events). While there has been no evidence that mandating clinical hours positively influences patient safety, there has been much evidence outlining how simulation improves patient safety (Durham & Alden, 2008; Sears, Goldsworthy, & Goodman, 2010; Steven, Magnusson, Smith, & Pearson, 2014). In the area of sentinel events for 2011-2012 in New Zealand, clinical management issues (e.g. errors in diagnosis, treatment, monitoring of a patient after treatment, safe discharge, and management of complications from treatment) make up the second largest category of adverse patient events (31%) (Ministry of Health, 2012). Furthermore, clinical management has reportedly been compromised when health workers 'fail to rescue' their clients in situations of clinical deterioration (Fuhrmann et al., 2009). Simulation has been shown effective in teaching nursing students how to recognise and manage deterioration in clinical settings (Fisher & King, 2013). If clinical management of deterioration is the weak link in the provision of healthcare in New Zealand, educational institutions and clinical boards must focus on ways of preparing health professionals for the complex clinical management required in today's transitioning healthcare environments.

Clinical hours do not ensure development of clinical judgment.

Clinical judgment is the art of making a series of decisions in situations, based on various types of knowledge in a way that allows individuals to recognise salient aspects of, or changes in, a clinical situation, interpret their meaning, respond appropriately, and reflect on the effectiveness of the intervention (The INACSL Board of Directors, 2011). When clinical judgment is not in place, the professional can perform in a way which 'fails to rescue' the deteriorating situation (Cooper et al., 2012).

Failure-to-rescue is one of several nurse-sensitive outcomes that are gaining importance in evaluating the quality of care provided (Schmid, Hoffman, Happ, Wolf, & DeVita, 2007). Recognition of the existence of unexpected, but preventable, events that influence mortality has

led to the conceptualisation of the 'failure-to-rescue' phenomenon. 'Failure-to-rescue' refers to the inability to save a patient's life after the development of a complication. It involves not recognising deterioration in patient status and taking steps designed to reverse this trend (Schmid et al., 2007). The skills needed to appropriately intervene before the onset of life-threatening health problems requires complex assessment, highly intensive therapies, targeted interventions, critical evaluation, and immediate adjustment dependent on patient response. 'Failure-to-rescue,' when considered in the context of more acute ward populations, can lead to poorer patient outcomes due to mismanaged patient deterioration (Cooper et al., 2011).

In many cases, performance decrements appear to be related to high anxiety levels on the part of nurses, along with an inability to clinically reason a correct course of action (Lapkin, Levett-Jones, Bellchambers, & Fernandez, 2010). High fidelity simulation provides a means of assisting students to link theoretical concepts of deterioration with what is seen in actual practice settings (Cooper et al., 2013). In fact, high fidelity simulation may contribute significantly to the preparation of nurses in the final stages of their undergraduate training when consolidation of skills, clinical judgment, and clinical reasoning are imperative for safe practice (Lapkin et al., 2010; Levett-Jones, Lapkin, Hoffman, Arthur, & Roche, 2011).

With increasing morbidity and mortality rates in hospitals (Ministry of Health, 2012), competency levels of health care professionals, including nurses, are under scrutiny. The use of patient simulators in baccalaureate and graduate nursing education provides an excellent, objective tool by which to measure competency in the application of knowledge and technical skills (Nehring & Lashley, 2010). Simulation has the potential to provide a near seamless bridge between theoretical tenants of educational institutions and management of care in clinical settings (Cooper et al., 2012).

Clinical hours do not ensure equal opportunity for all students.

With mandated clinical hours of 1100-1500 required to gain undergraduate nursing qualifications in New Zealand ("Health Practitioners Competence Assurance Act," 2003), all training institutions are required to secure these hours from the District Health Boards. This process has evolved into a competitive vying for placements amongst the various training institutions, both in Auckland and around the country. Due to the current Nursing Council mandate refusing the use of simulated hours in place of these clinical hours (Nursing Council of New Zealand, 2010), there is no 'give' in the system. This has forced tertiary institutions to find placements in an environment void of opportunity. The outcome has been that some students are placed in less than opportune areas which do not allow them the experiences required to gain a salient understanding of that particular practice area. This can have a powerful impact on student confidence immediately before qualification (K. Brown, 2013). A third-year learning opportunity immediately before qualification can make a difference as to whether a student feels confident in applying for a professional position.

Simulation informed by sound pedagogy can be an effective tool for filling the gap in these less than opportune situations (McCaughey & Traynor, 2010). Simulation has also been shown

to increase student confidence; thus fostering improved ability to secure employment (D. Brown & Chronister, 2009). Simulators are valuable as a means of assisting linkage of theory to practice and developing clinical judgment (Ashcraft et al., 2013). Whilst there are limitations to the realism of high fidelity simulators, the majority of students consider simulation an authentic learning experience (McCaughey & Traynor, 2010). High fidelity simulation may contribute significantly to the preparation for nursing students' final assessment prior to entry into practice (Harder & Nicole, 2010).

Simulation, for all of the above reasons, is a means of achieving equitable and relevant experiences for all nursing students seeking entry to professional practice. However, there are concerns that high-fidelity simulation technology is being adopted in place of sound educational practice (Berragan, 2011; Parker & Myrick, 2009). Additionally, more research needs to be done in how to maximise this teaching tool for the next generation to enter the tertiary setting — the Millennials (Earle & Myrick, 2009; Howe & Nadler, 2008). Millennial use of technology, which high-fidelity simulation does integrate, is very different from that of previous generational cohorts (McGlynn, 2010). This must be considered when developing learning environments from which to teach this newest generation.

Educational Preferences of Millennials

Millennials are one of four living generations (aged 20-32 in 2014) currently on the planet (McGlynn, 2010). The other three are the Gen Xrs (aged 30-45), the Baby Boomers (aged 46-64), and the generation known as the Silents or Matures (aged 65 and older). In critique of generational preferences, it must be noted that all individuals do not necessarily possess the characteristics of their particular generational cohort. However there are tendencies present, within each generation, in relation to how individuals integrate and use technology. As educators, it is essential to become aware of what these generational tendencies are in order to design learning environments which will maximise learning in these emerging classrooms.

Because of the use and interface with technology, preferred learning environments for each generational cohort may differ (Earle & Myrick, 2009). The effects of intergenerational diversity on pedagogical practice in nursing education highlights the need for nurse educators to engage in a critical discourse regarding the adequacy of current pedagogy in fostering an ethos that can enhance the teaching-learning process and promote ongoing learning for the future. Further research is needed to promote awareness and understanding of the expectations of today's students and to reform nursing pedagogy to accommodate the current generation of learners in tertiary education.

Millennials are second only to the Baby Boomers in size (Howe & Strauss, 2000), and are projected to increase worldwide tertiary enrolments 20% by 2015 (Gerald & Hussar, 2002). They are said to be the best educated, most affluent, and most ethnically diverse (36% non-Caucasian) of the four generations currently alive (Howe & Strauss, 2000; Wieck, 2008). They bring certain traits to the educational setting which must be considered when designing educational environments in which they are prepared (Aviles & Eastman, 2012; Howe & Nadler, 2008; McGlynn, 2010). As educators, it is our job to prepare curricula that meet their needs and to

provide experiences that help with their entrance into the workforce (Koeller, 2012; Parker & Myrick, 2009).

Connection to technology is imperative.

It has been suggested that generations, like people, have personalities (Howe & Strauss, 2000). If this is true, the biggest distinguishing feature of the Millennials is their relationship to technology and social media. They have been referred to as the ‘always connected generation’ (McGlynn, 2010, p. 3). Some have observed that Millennials see connections to technology as a major component of their generational identity. In fact, the argument has been made that their preference to be steeped in digital technology has progressed to the point where they treat their multi-tasking, hand-held gadgets almost like a body part (McGlynn, 2010). It is interesting to note that more than eight-in-ten acknowledged that they sleep with their cell phone by their pillow — poised to answer texts and emails, listen to songs, play games, and be awakened by their favourite jingle (McGlynn, 2010). Some have argued that Millennials see the computer in the same way Baby Boomers see the pencil — as a tool (Aviles & Eastman, 2012; McGlynn, 2010). The suggestion has been made that their approach to technology permeates even their thinking as to how it is used. While Boomers look at a computer and ask, “What can it do?” Millennials ask, “What needs to be done?” (Wieck, 2008). With this type of technological immersion and demand for flexibility permeating their daily lives, it is interesting to note that some academic institutions continue to force face-to-face attendance in half-filled theatres at 0800 hours. Some have noted that classroom lecturing is actually the most ineffective delivery model to use with Millennials due to its passive-learning, teacher-driven qualities (Nicoletti & Merriman, 2007). Most students expect educators to incorporate technology into their teaching and be proficient in its use (Wilson, 2004). The argument is made that this generation is truly wired differently than preceding cohorts and that simulation not only speaks their language, it ‘resonates’ with how they learn (Parker & Myrick, 2009).

Connection to parents/guardians is strong.

Millennials are most often the children of the Baby Boomers with some of the younger cohorts claiming Gen X parents. Baby Boomer parents are very attentive to their children — allowing them to have the voice they were never allowed. As most Millennials grew up in a time of unprecedented Western economic prosperity, they are the most protected and indulged generation to date (McGlynn, 2010). When Millennials did not excel, Boomer parents provided them with tutors and coaches to help meet their goals. Millennials were sheltered and provided for in ways that previous generations have not experienced (Nicoletti & Merriman, 2007). Millennials are used to being consulted on family decisions which some say has contributed to their confidence, sense of entitlement, and preference for teams (Tucker, 2006). Others have noted that they make close connections with their parents and share parental values to a level not seen in previous cohorts (McGlynn, 2010). Baby Boomer parents have, however, been termed ‘helicopter parents’ more than once due to their over-attentiveness (Gardner, 2006). With excessive parental involvement, comes a resultant delay in the development of autonomy in

millennial students. These tendencies make Millennials unique learners requiring a new kind of classroom (Howe & Nadler, 2008; Koeller, 2012).

Connection to support is required.

Some have argued that the above indulgences by Boomers on their Millennial children has created an expectation that they receive individual attention, extra help and other institutional resources to guide them through any difficulties they may encounter (McGlynn, 2010). Understanding their history and the culture in which they grew up may ease the frustration academics feel with what we might perceive as the millennial sense of entitlement. Millennials are accustomed to receiving all the help they need, and many have never had to ask for it. Some assert that it is therefore prudent to encourage Millennials to verbalise this need instead of expecting the teacher to 'read their minds' (Wieck, 2008). In this way expectations might be met for both the educator and the student. Millennial expectations for technology use in classrooms are similar to expectations for assistance — it needs to be there and integrated flawlessly.

Connections with each other are expected.

Millennial learners have grown accustomed to cutting edge technology seamlessly integrated into educational programmes (Bassendowski, 2007). They are highly adaptable and adept at multi-tasking, yet may suffer from short attention spans which require active engagement in place of transmission models of delivery (Hutchinson, Brown, & Longworth, 2012). They learn most effectively when a large variety of instructional strategies are used (Koeller, 2012). The argument has been made that their preferred pedagogy is one based on *collaboration* coupled with increased *participation* in the context of realistic *immersion* (Skiba, 2007). Additionally, it seems that their preference for teamwork and their fondness for collaboration may actually enhance their ability to engage in increasingly complicated healthcare environments (Bassendowski, 2007).

Millennials prefer not to take a spectator role, but a participatory one (Parker & Myrick, 2009). They prefer working in teams to working alone as they have a collective approach to learning (Hutchinson et al., 2012; Tucker, 2006). They display an increased proficiency for multi-tasking (Tucker, 2006) which makes simulation, where they are required to juggle multiple roles and tasks, particularly appropriate for both developing and accessing this skill. In fact, simulation may prove a more effective teaching tool while appealing to these technologically savvy students, who view passive information gathering and linear thinking as lacking in immersive qualities (Earle & Myrick, 2009; Starkweather & Kardong-Edgren, 2008). Simulation allows for these preferences while fostering learning environments that are technologically equivalent to Millennial abilities (Hutchinson et al., 2012).

Connection to multiple concepts and images is effective.

Simulation fosters student engagement by encouraging them to use their own resources creatively to develop strategies which will improve the condition of their patient (McCaughy & Traynor, 2010). Active engagement promotes deeper levels of processing and learning due to the creation of stronger connections (McGlynn, 2005; Passmore, 2014). The active learning involved in simulation facilitates long-term memory development through the process of

elaborative rehearsal (a memory process that involves the use of meaning rather than rote learning) (G. Roberts et al., 2014). Simulation allows for the formation of multiple connections to concepts, thus increasing the retrieval cues a student can make from long-term memory (Artino, 2008). The more connections made to a particular concept, the easier the retrieval of that concept from long-term memory (Sweller, Ayres, & Kalyuga, 2011). Multiple connections allow students to draw on previously learned concepts with greater efficiency (McGlynn, 2005), thus improving their ability to make sound clinical judgments (Decker, 2007). Additionally, as simulation is visual, it provides a preferred 'classroom' for Millennials students who show a preference for an image-rich learning environment versus the text-rich environment of previous cohorts (Nicoletti & Merriman, 2007). Individuals retain only 10% of what they read versus 30% of what they see. Simulation provides a visual connection to long-term memory in a manner which classroom lectures do not (Paas, Renkl, & Sweller, 2003).

Recent years have seen the development of a process for the implementation and integration of simulation into undergraduate nursing curricula (Jeffries, 2006; Jeffries, 2008; Seropian, Brown, & Driggers, 2004a). A similar journey will form the background in which this research will develop. The focus is within a nursing school at an academic institution in Auckland, New Zealand. The pragmatic philosophy of John Dewey, which guides the planning and analysis of this research from one cycle to the next, explores how practice can move beyond 'habits' and recognises the inter-connectedness between means and ends (Dewey, 1922).

In this research the initial observation was that there was a gap in understanding how effective pedagogical practice could be achieved in a teaching/learning situation that includes simulation. The medical profession has been instrumental in developing simulation frameworks and manikins for use in training and maintaining the competency of physicians (Gaba, 2004). While research continues to develop around simulation in training for physicians, simulation as a tool has been quickly adopted for education of other healthcare professionals (e.g. nurses, midwives, paramedics, physiotherapists, etc.) despite a lack of research into an evidence-based pedagogy or educational philosophy appropriate to guide this technology-based learning tool (Parker & Myrick, 2009). There are legitimate concerns that technology, rather than sound, philosophically-based pedagogy, is informing health-professional education in simulation. Some believe that the dominance of this technology, coupled with passive acceptance as educators, has led to limiting the full potential of simulation and its restrictive application in nursing education (Schiavenato, 2009).

History of High-fidelity Simulation Development

Simulation as a means of developing professional competence is not a new phenomenon. The history of simulation stretches back over many centuries and emerges in many industries such as the military and aviation. High-fidelity simulation includes a computer-controlled manikin that mimics the interaction with students in a controlled, simulated clinical setting (Bearnson & Wiker, 2005). It was developed through the cooperation of health care professionals and computer technology. Normal and abnormal heart and lung sounds are present, pulses can be felt, the eyes blink, pupils constrict and dilate, and the tongue can swell (Nehring, Ellis, & Lashley,

2001). The monitors attached to the system are able to provide waveforms for electrocardiography, cardiac output, heart rate, respiratory rate, wedge pressure, and real-time read-outs for blood pressure, blood gases, vital signs and other physiological parameters needed for patient scenarios. There are currently various models available which can be made to simulate an adult between 12 and 100 years of age, a child between 2 and 11 years, and a new-born infant (Sim NewB™). The software includes a repertoire of patients and pre-programmed scenarios. A cordless microphone can be used to simulate the patient's voice (and the manikin can also speak). One-way glass often separates the operators from those involved in the simulation in order to help isolate the scenario and focus student attention on the patient.

The modern era of health care simulation has its origins in the second half of the 20th century with the occurrence of three distinct movements which have spurred the development of simulation in clinical healthcare environments (Bradley, 2006). The first movement occurred in association with the work of a Norwegian publisher and toy manufacturer named Åsmund Laerdal. He developed the 'Resusci-Anne,' a part-task trainer that would revolutionise resuscitation training by providing to the wider community a low-cost, effective training model. Since the production of this novel task trainer, simulation has evolved steadily with an increasing sophistication, as evidenced by a wide range of manikins and models used to support resuscitation and basic skills training (Bradley, 2006; Clapper & Kardong-Edgren, 2012).

The second movement in clinical simulation concerns the development of sophisticated simulators dedicated to the reproduction of aspects of the human patient. The earliest of these was the 'Sim One,' developed by Abrahamson (1969) in the late 1960s. The Sim One manikin had a number of sophisticated features such as breathing, palpable pulse (carotid, temporal) and blood pressure, and it even opened and closed its mouth and blinked. However, the Sim One failed to achieve acceptance due to a variety of factors — an undefined market, predominance of apprenticeship-based training, and excessive cost to produce (Bradley, 2006). Thus, Sim One was in essence overlooked until the 1980s when a new market, timing, and vision catapulted simulation into the forefront of clinical education (Bradley, 2006).

The development of high-fidelity simulators was resurrected in the 1980s by two groups. The first was at Stanford University and the other at the University of Florida (Bradley, 2006). The former group was led by David Gaba who focused on the development of *comprehensive anaesthesia simulation environment* (CASE) (Gaba & DeAnda, 1988). The latter, led by Michael Good and J.S. Gravenstein, developed the 'Gainesville anaesthesia simulator' or GAS (Good & Gravenstein, 1989). CASE later became commercialised as 'Medsim,' and GAS eventually developed into the Medical Education Technologies, Inc. (METI) (Bradley, 2006). These simulators have formed the basis for today's high-fidelity simulators.

The third major movement has been that of educational reform in the latter part of the previous century. The reform has been driven by a worldwide recognition of the need for students to be prepared as novices in their field while undergoing undergraduate education. Information overload in undergraduate curricula at the expense of the learning of clinical and communication skills has spearheaded the widespread adoption of programmes aimed to maximise training in these areas (Bambini, Perkins, & Washburn, 2009; Bradley, 2006). Increasing attention is being

paid to high-fidelity simulation as a means of providing safe, protected, educationally sound experiences to undergraduate students which can form a platform on which to develop an expertise in their fields (Valdez, de Guzman, & Escolar-Chua, 2013). It has been argued that these changes are long overdue and represent an essential element in ethically cognisant health workforce education (Benner et al., 2010).

Nursing education strives to promote the development of psychomotor skills, critical thinking, self-confidence and the ability to integrate theory into practice (Guhde, 2011). Unfortunately, graduates are also repeatedly demonstrating deficits in psychomotor and technical skills; along with deficits in their competence and confidence in clinical decision making (S. Miller, 2010). While clinical skills laboratories are instituted to try and assist students in the practice of psychomotor skills (Medley & Horne, 2005), their success in the transfer of skills into an actual clinical setting, where decision-making may be required, is less certain (Clapper & Kardong-Edgren, 2012; Fero et al., 2010). Simulation can be used throughout nursing curriculum, beginning with basic assessment skills and progressing to the integration of different competencies in complex patient care situations (Howard, Englert, Kameg, & Perozzi, 2011; Nehring & Lashley, 2010). Simulation has the potential to foster the development of critical thinking, decision making, delegation, and teamwork (Gates, Parr, & Huguen, 2012) — all essential qualities for a competent nurse in today's complex health care environment. However, it does not come without its challenges.

There are advantages and challenges to using simulation in nursing undergraduate curricula. While simulation has been used to develop teamwork, delegation, organisational skills, and prioritisation; the integration of other competency components such as professional judgment can be more difficult. This is due, in part, to the difficulty of assessing non-technical skills (Garrett, MacPhee, & Jackson, 2010). A rising demand for nurses able to manage increasingly complex patients (Krichbaum et al., 2007; Ministry of Health, 2006) means that the emerging generation of nurses will have to incorporate both clinical reasoning skills and an ability to recognise patterns of deteriorating patients (Cooper et al., 2013; Fuhrmann et al., 2009). High-fidelity simulation has the potential to boost confidence in students (D. Brown & Chronister, 2009; Lewis & Ciak, 2011) along with having a positive influence on critical thinking (Fero et al., 2010; Tanner, 2006).

Challenges of integrating simulation into a curricula include a high demand on educator time and resources (Akhtar-Danesh, Baxter, Valaitis, Stanyon, & Sproul, 2009; McKeon, Norris, Cardell, & Britt, 2009), the need for a valid and reliable tool for assessment of the simulation (Adamson, Kardong-Edgren, & Willhaus, 2013; Todd, Manz, Hawkins, Parsons, & Hercinger, 2008), time required to develop simulation scenarios (Alinier, 2010; McNeill et al., 2012), high cost of simulation products (McKeon et al., 2009; Rauen, 2001), and a variance in responses within groups of students participating in simulation (P. Jeffries & K. Rogers, 2007). These advantages and challenges must be managed in combination with the current acceptance of simulation as an adjunct to mandated clinical hours in New Zealand.

Advancement of Simulation in New Zealand

At the time of this writing, there is a growing realisation that reliance on traditional clinical apprenticeship models for health workforce education is no longer appropriate (Coyle, 2007). As previously highlighted, there is no allowance for replacement of any clinical hours with simulation (Nursing Council of New Zealand, 2010). New Zealand does not allow simulation in any form to be counted as part of the required clinical hours, thus tying it to what many consider a bygone era of apprenticeship training (Coyle, 2007). Demands for clinical hours are being extended into the educational institutions through legislation (Nursing Council of New Zealand, 2012), which requires boards and councils to monitor every educational institution where accreditation is granted. The argument might be made that holding on to clinical hours requirements may no longer support student learning in a reliable manner; that is, every student is not guaranteed the same experiences in clinical placements. The problem is compounded when there are not enough clinical placements for all students thus creating a bottleneck in enrolments, which is not viewed favourably by academic institutions (Betony & Yarwood, 2013).

To compound these issues, there is also some evidence in New Zealand of 'fudging' actual clinical hours available to students (Coyle, 2007). With competency for nursing graduates increasing, and no real evidence that clinical hours actually do prepare students for current complex healthcare environments, the clinical hours mandate seems at best uninformed. In partial response to this information, clinical skills and simulation centres are being established around New Zealand. These centres are being established in an ad hoc manner to address local needs, without particular consideration of national needs or future funding. Duplication of services in one area, with lack in another, increasing sentinel events within the District Health Boards (Ministry of Health, 2012), lack of equity in health workforce education, and lack of educator training in simulation, are all driving nursing educators to begin to collaborate. National collaboration has been elusive for a variety of reasons, one of which is the competition amongst schools for students which inhibits collaboration. A strategy is necessary to consolidate and standardise simulation use throughout New Zealand and provide an equitable solution to the current patchwork approach.

High-fidelity simulation as a teaching/learning modality has the potential to provide a platform for developing interprofessional collaboration and role flexibility while aiding in the transition from undergraduate education to clinical practice (Metcalf, Hall, & Carpenter, 2007). Simulation is capable of addressing the ever increasing gaps (McKeon et al., 2009) in traditional healthcare education while providing scaffolding to support critical thinking (D. Brown & Chronister, 2009), knowledge transfer (Trangenstein, 2008), and management of deteriorating patients (Cooper et al., 2013; Fuhrmann et al., 2009). Health Workforce New Zealand (2011) has initiated the development of a national skills and simulation-based education strategy with the aim of driving up the quality and improving the learning experiences of trainees in medicine, nursing, and allied health professions. However, this initiative is still evolving at the time of this writing.

An integral part of the Health Workforce New Zealand initiative was to consolidate training activity to ensure that workforce training aligns with national service delivery needs and regional clinical service plans. Health Workforce New Zealand intends to develop a comprehensive

national skills and simulation strategy aligned to the four regional training hubs (Northern, Midland, Central and Southern). The regional training hubs were to become operational during 2011 with the intention of improving the quality and depth of learning experiences for trainees in medicine, nursing, and allied health professions (Health Workforce New Zealand, 2011). However, this process is still emerging at this writing in 2015 and use of these training hubs is not fully integrated into stakeholder settings. It is envisaged that with this initiative, New Zealand will be able to progress in the consolidation and implementation of a national simulation strategy.

A further initiative includes a nurse education collaborative simulation project run by the *National Centre for Tertiary Teaching Excellence* (also known as AKO Aotearoa) and lead by Christchurch Polytechnic Institute of Technology which aims to:

- carry out a literature review of undergraduate clinical simulation in New Zealand;
- hold a two-day workshop for all undergraduate nurse educators involved in simulation in New Zealand;
- design teaching and learning guidelines for clinical simulation in undergraduate sector;
- create a collaborative community of practice in simulation via web community; and
- develop a research plan by the beginning of 2013.

(Edgecombe, 2011)

The AKO Aotearoa project has been completed, as of this writing, and this university had the privilege of hosting the two-day workshop. I had the pleasure of participating in this team and thoroughly enjoyed the interactions and effort shown by this dynamic group of women. However, workload issues for all involved meant that efforts were at times thwarted and participants struggled to meet and work through further development in depth. Further work in simulation continues by AKO Aotearoa.

Simulation as a teaching tool is currently being integrated into various District Health Boards around New Zealand. Simulation skill units in hospitals are increasingly using high-fidelity simulation to turn real clinical incidents into learning scenarios and to test and highlight gaps in processes and protocols (Health Workforce New Zealand, 2011). All of these developments are part of the national strategy for simulation development in simulation.

Advancement of Simulation in Comparable Contexts

Overall, changing societal needs, the professionalisation of nursing, and reform of healthcare systems around the world, have necessitated degree programmes ensure graduates meet international competency benchmarks. However, it is not simply the requirement of a baccalaureate degree encompassing the change, but the actual content of said undergraduate degrees which are now under scrutiny.

In Australia (Department of Education, 2002), transfer of pre-registration nursing education from hospitals to the higher education sector was completed by 1993. Changes are being initiated to ensure there is a coordinated effort to integrate simulation across 12 professions (Health Workforce Australia, 2010d). The Australian project aims to contribute to the increased capacity of the health system to provide clinical training via the use of simulation modalities. This initiative

was motivated by the problem of insufficient clinical placements coupled with the need to train healthcare professionals more efficiently and effectively through the adoption of new and innovative training techniques (Health Workforce Australia, 2010d). While no simulation replaces clinical hours in Australia, clinical hours are slightly more than half of those required in New Zealand (around 800 hours). This comparatively reduced number of clinical hours frees up resources for the development of other teaching/learning modalities such as simulation within undergraduate nursing programmes.

Canada is making similar changes with Canadian provinces (Canadian Nurses Association, 1998) introducing a baccalaureate degree in nursing around 1998. Canada began an inventory of the use of simulation and evaluation of its effectiveness in 2007 (Garrett, Tench, van der Wal, & Fretier, 2007). The use of simulation in nursing education has increased as educators are seeking ways to replace some elements of the high risk components of the physical experience of a clinical placement. Canadian educators are seeking new learning strategies that will support the ability of the student to learn complex skills in a safe environment. Canadian schools are working to establish the evidence base and best practices for the use of simulation for health care professionals (Garrett et al., 2011).

The United States is moving forward in its use of simulation as an integral part of undergraduate nursing (Kardong-Edgren et al., 2012; National Council of State Boards of Nursing, 2011). Beginning in the Fall of 2011, the National Council of State Boards of Nursing embarked on a research initiative exploring the role and outcomes of simulation in pre-licensure clinical nursing education (National Council of State Boards of Nursing, 2011). The purpose is to evaluate the use of simulation with a longitudinal, multi-site study investigating replacing 10%, 25%, and 50% of clinical hours with simulation (National Council of State Boards of Nursing, 2011). The results of this study have revealed that up to 50% of clinical hours in undergraduate programmes can be replaced with simulation (Hayden, Keegan, Kardong-Edgren, & Smiley, 2014). In fact, the evidence suggests that the amount of simulation used in a programme is not a factor in that programme's success, so long as a culture of institutional support, feed-back, and ongoing faculty training is cultivated by administrators.

Many schools of nursing in the United States are now including simulation days, simulated clinical experiences, and mandatory competency skill check-offs in a simulated environment within their curricula (Gates et al., 2012). Regulatory bodies are showing interest in simulation as a delivery method for undergraduate nursing preparation. Some states have set mandates on the percentage of clinical hours that can be obtained through simulation, while others are in the process of making changes to allow for such substitution (Cornelius, 2012). Sixteen American states currently give approval for simulation substitution, and seventeen states may consider changes to allow simulation in the future (Kardong-Edgren et al., 2012).

The United Kingdom is inviting simulation use for up to 300 hours of the 2300 clinical hours required for registration (Nursing Midwifery Council, 2007). The substitution of clinical hours with simulation is subject to prior and on-going auditing of the simulation environment. Providers are in the process of making internal modifications to the approved programme with the goal amending the *Standards for Pre-registration Nursing Education* (Nursing Midwifery Council,

2010c) accordingly. This process has situated the United Kingdom most definitely along the path of simulation integration in undergraduate nursing curricula.

In the end, many countries are integrating simulation into undergraduate preparation in an effective manner. Some countries do not make clinical hours a requirement for registration, while others retain this distinction. New Zealand, a country which does retain clinical hours requirements, retains the largest number of mandated clinical hours outside of the UK as seen in Figure 1.1. If New Zealand's clinical hours requirements were reduced, resources used to pay for and support clinical placements could be used to develop simulation and other immersive teaching/learning platforms, thus keeping pace with international progress in simulation development.

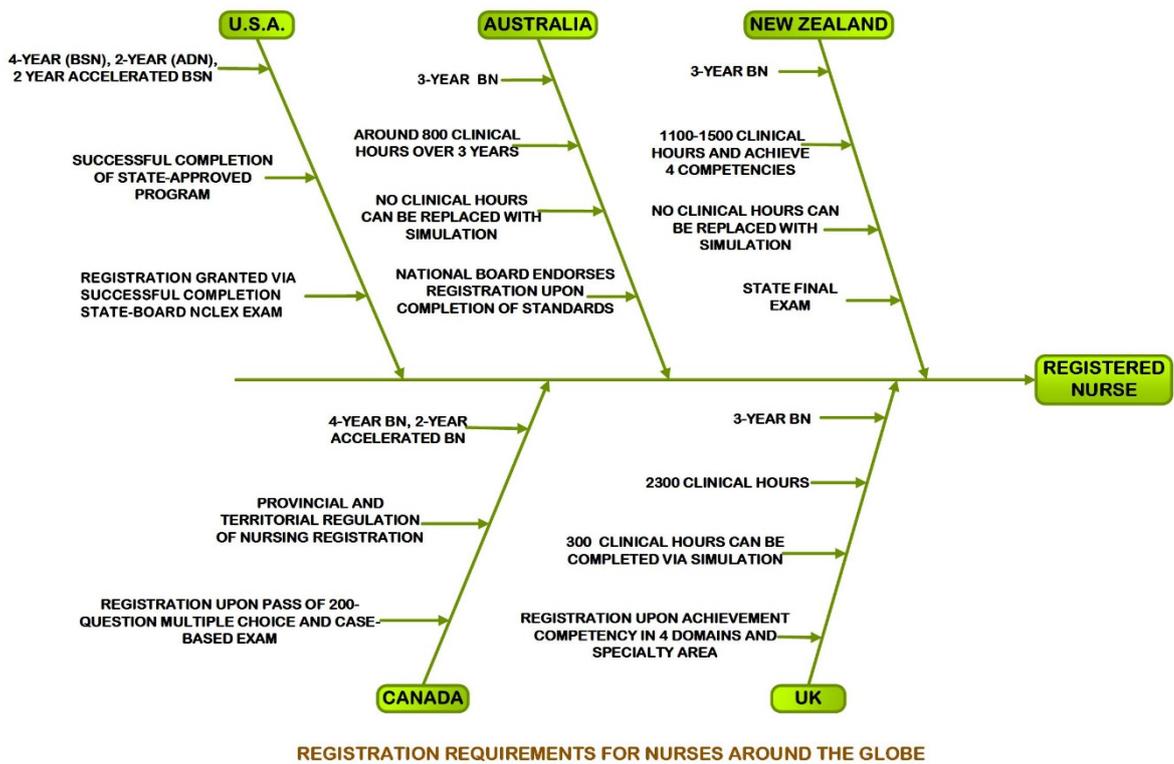


Figure 1.1 Current international undergraduate nursing requirements.
Note. Drawn and researched by Gwen Erlam

Conclusion

While the United States, the United Kingdom, Australia and Canada are involved in research integrating simulation into undergraduate nursing preparation, New Zealand's stance of not allowing simulation to replace clinical hours continues the tradition of apprenticeship training (Nursing Council of New Zealand, 2010). While Australia's stance does not include simulation as part of clinical hours, the approximately 800 clinical hours employed in undergraduate nursing programmes is significantly less than the 1100-1500 hours mandated in New Zealand. Therefore, the issue of including simulation in place of some clinical hours is not as significant as it is in New Zealand.

The future calls for more rigorous testing of high-fidelity simulation practices in undergraduate healthcare education with an eye to determining how best to educate the future nursing workforce. Other areas of inquiry might include asking what cannot be simulated or taught using simulation. Does simulation ultimately make a difference to patient safety by helping to prepare graduates to face the unexpected? How does the newest generation (the Millennials) view this immersive type of learning environment? What assessment instruments are available for use in simulation? Whatever the answers to these and other questions, the landscape of nursing education is already evolving in ways that will continue as nursing embraces advanced technologies, innovative educational design, and a variety of simulation platforms. Reviewing the context that backgrounds my study ensures the living theory that develops, recognises the constraints and possibilities afforded by the current environment.

Chapter 3 will present an overview of research done on simulation. The literature review will focus on various topics in order to provide the reader with an understanding of the various issues relevant to simulation in undergraduate nursing education.

Chapter 3 - Literature Review

Current Research in High-fidelity Simulation

McNiff and Whitehead (2011) stated in their book on how to do action research, “You do not have to write a literature review but you must show you have reviewed and engaged with the literature... your review runs right through the text” (p. 117). In keeping with this spirit of engagement they argued that the most important thing to do is to “write in the first person” (McNiff & Whitehead, 2011, p. 118). This signals that it is ‘I’, the researcher, who has taken the literature and used it as a reflective tool in understanding, thinking, planning and reflecting; from the proposal stage of this research through into the action research cycles. In presenting this chapter within my doctoral thesis I have both kept to the more traditional writing style of stepping back and reporting on the research, and at the end of each section described how the thinking has impacted ‘me’ the researcher. As part of my reading strategy, I devised a series of questions to ask of each article. I have presented the findings from this process in table form within each section. This is evidence of ‘me’ the researcher directly engaging in the thinking process. The aim was always to help grow my own understandings, both as researcher and educator, while at the same time to offer a synthesis of insights to inform the growing body of knowledge related to high-fidelity simulation.

Nursing researchers only began examining the use of high-fidelity patient simulation in nursing education and practice at the turn of the century (Nehring & Lashley, 2010). The research is growing year by year, as more and more institutions start using high-fidelity simulation; and, in doing so, come to recognise both the strengths and challenges it offers. In tracking this literature the following databases were searched: CINAHL, ProQuest, Medline, Pub Med, Science Direct, OVID, EBSCO, Cochran, ERIC, and Summon. Key words used for the above searches included the following: simulat*, “millennial students,” educat*, competence, nursing, clinical hours, “vision and plan,” training, action research, interprofessional, “healthcare, education,” “evaluation, rubric,” assessment, and pedagogy. Using mind maps to group common ideas, two overarching themes emerged. The first pointed to the possibilities offered by high-fidelity simulation:

1. There are multiple applications of high-fidelity simulation in undergraduate nursing education

Within this theme are the categories of:

- 1.1 High-fidelity simulation as an adjunct to transmission models of education
- 1.2 High-fidelity simulation as a means for enhancing clinical reasoning and judgment
- 1.3 Simulation as a means of assessing competence
- 1.4 High-fidelity simulation as an accepted substitute for clinical hours

The second overarching theme moves on from articulating the possibilities offered by high-fidelity simulation to consider how such possibilities may be enacted:

2. High-fidelity simulation requires vision, planning, and specific training of facilitators

Within this theme are the categories of:

- 2.1 The training must be frequent and specific for educator needs
- 2.2 High-fidelity simulation requires training to reduce facilitator anxiety
- 2.3 High-fidelity simulation design requires alignment and sequencing of learning objects
- 2.4 High-fidelity simulation requires a plan
- 2.5 High fidelity simulation encapsulates Millennial classroom preferences

Reviewing this literature was an important part of the reconnaissance and reflective phases of this study, giving pointers which informed the planning of each action cycle. Thus this research was able to build on what was known, explore possibilities where the research had gaps, and bring another voice to the ongoing debates and discussions of possibilities.

1.0 Applications of High-fidelity Simulation in Undergraduate Nursing Education

1.1 High-fidelity simulation as an adjunct to transmission models of education.

Historically, simulation with undergraduate nurses started out with a skills focus using anatomical models and task trainers (Nehring & Lashley, 2009). However, high-fidelity simulation soon became used for more than just skills training. It was able to provide a learning platform which exceeded that of traditional lectures, and immersed students in a manner which allowed students to learn about safety breaches, communication, the ability to make decisions, and interpersonal interactions (Guimond, Sole, & Salas, 2011). High-fidelity simulation is said to also increase students' confidence and promote self-discovery and peer-teaching opportunities (Burke & Mancuso, 2012). Its applicability as an adjunct to traditional classroom lectures has been borne out in the literature (Cant & Cooper, 2010).

Simulation as a teaching tool has shown the ability to influence teamwork in crisis management situations (Cheng, Donoghue, Gilfoyle, & Eppich, 2012), improve critical thinking (Lewis & Ciak, 2011), and augment clinical learning experiences (Garrett et al., 2010). It allows for the embedding of different ways of knowing using metacognitive skills, and reflection (Stayt, 2012). The pedagogical underpinnings of behaviourism and constructivism encourage students to both perfect skill development, and construct meaning based on their experiences in the high-fidelity simulation environment (Parker & Myrick, 2009). The use of metacognitive prompts during the facilitation of high-fidelity simulation has been shown to enhance comprehension and long-term retention (Nicholsen, Fiore, Vogel-Walcutt, & Schatz, 2009).

Research as to how to optimise the use of simulation by specifically designing the individual steps students proceed through in their simulation experience has been helpful to optimise the use of simulation as a teaching tool (Guimond et al., 2011). In this way, simulation has been used to teach facts, principles, and concepts, and then to subsequently assess students' competency in the application of this knowledge (Jeffries, 2006). All of these types of learning are not so visible in face-to-face delivery of content where one-way communication of knowledge dominates. Furthermore, other advantages have been documented in the use of high-fidelity simulation.

There is statistically significant evidence that students participating in high-fidelity simulation experiences are more confident than students participating in traditional delivery paradigms in undergraduate nursing programmes (Alfes, 2011; Pike & O'Donnell, 2010). High-fidelity simulation has shown an ability to enhance scores on knowledge and skills exams (Yuan, Williams, Fang, & Ye, 2012), and to improve the way students work in teams (Cheng et al., 2012). Studies have also shown that simulation has implications for four key facets of undergraduate nursing education: (1) developing technical proficiency through practice of psychomotor skills and repetition; (2) assistance of experts which is tailored to student needs; (3) situated learning within context; and (4) incorporation of the affective component of learning (Cant & Cooper, 2010, p. 4). With 70% of graduate nurses in the United States scoring at an 'unsafe' level in their clinical reasoning abilities (Lapkin et al., 2010), there is a compelling argument for educators to employ alternative methods to those traditionally used to ensure novice professionals embark on professional careers with the correct set of skills, knowledge, and ability to manage deteriorating patient situations (Pike & O'Donnell, 2010; D. Roberts & Greene, 2011).

In order to maximise effectiveness, a judicious selection of scenarios seems to be essential. Some argue that the development of student metacognition, progress in self-regulation, and promotion of self-efficacy on the part of students, requires a planned approach to the integration of simulation into nursing curricula (Burke & Mancuso, 2012; Nichol森 et al., 2009). However, the combination of learning how to design simulation while maintaining a dialogue around which simulations to integrate in a curriculum can be overwhelming to nursing educators (Starkweather & Kardong-Edgren, 2008).

In reviewing this literature I came to see that more work ought to be done around training educators in both use and integration of this teaching tool so that the load can be disseminated among many, instead of just a few voices. More particularly, I recognised the need to start with 'me'. I was already committed to using high-fidelity simulation in my teaching but was mindful there was so much I had yet to 'get right'. The literature revealed the breadth of issues that need attention for such teaching and learning to be effective. The research from which this discussion is drawn from is found in Table 3.1.

Table 3.1 Literature Summary for High-fidelity Simulation as Adjunct to Teaching

Category 1.1: High-fidelity simulation as an adjunct to transmission models of education	
Akhtar-Danesh et al. 2009	
Purpose	The purpose of this study was to explore nursing faculty perceptions of the implementation of simulation in schools of nursing across Ontario. Outcome was revelation of four major viewpoints held by faculty.
Issue underpinning study	Sub-study of a larger study that sought to explore how schools of nursing across Ontario, Canada, integrated simulation into their undergraduate nursing curriculum and the influence that this teaching modality had on teaching and students' learning.
Participant information	A few (nursing educators) were not receptive because they were fearful of the technology, hesitant to change their teaching methodology.

Method	Qualitative. Following Q-methodology guidelines, 104 statements were collected from faculty and students. 43 final statements for the Q-sample.
Location of study	Canada
Findings	<p>Results revealed four major viewpoints held by faculty including:</p> <ol style="list-style-type: none"> 1. Positive Enthusiasts, 2. Traditionalists, 3. Help Seekers, 4. Supporters. <p>Few negative voices were heard. It was evident that with correct support and training, many faculty members would embrace clinical simulation because it could support and enhance nursing education.</p>
Critique	The strength of this study was it showed the progression of educators as to their responses to simulation as a teaching tool. The weakness was that Q-sort analysis is not considered rigorous by many researchers.
How findings relate to this research	<p>Simulation is an important element in nursing education. It requires:</p> <ol style="list-style-type: none"> a) <i>additional support</i> in terms of the time required to engage in teaching using this modality b) additional human resources to support its use c) other types of support such as a repository of clinical simulations

Alfes et al. 2011

Purpose	Evaluate and compare the effectiveness of simulation versus traditional teaching.
Issue underpinning study	Technological advances in health care are revolutionising the design, delivery, and evaluation of nursing education. Technology-driven learning strategies are often embraced by digital natives, students born between 1980 and 2000, for whom technology is a way of life.
Participant information	<p>63 first-semester (convenience sample) baccalaureate nursing students were recruited to compare the two teaching methods.</p> <p>52 female (82.5%) and 11 male (17.5%) participants.</p> <p>Participants ranged in age from 18 to 27, with 58.7% of participants being age 18; 36.5%, age 19; 3.2%, age 20; and 1.6%, age 27.</p>
Method	<p>National League for Nursing's (2005) <i>Student Satisfaction and Self-Confidence in learning questionnaire</i> was used to evaluate self-confidence and satisfaction.</p> <p>Quasi-experimental study was to evaluate and compare the effectiveness of simulation versus a traditional skills laboratory method in promoting self-confidence and satisfaction with learning among beginning nursing students.</p>
Location of study	United States
Findings	<p>Students participating in the simulation experience were statistically more confident than students participating in the traditional group.</p> <p>There was a slight, non-significant difference in satisfaction with learning between the two groups.</p> <p>Bivariate analysis revealed a significant positive relationship between self-confidence and satisfaction.</p>
Critique	<p>The strength of this study was its ability to show that simulation could enhance student confidence, and a positive relationship between self-confidence and satisfaction. There is also clear evidence that simulation works well with digital natives (Millennials).</p> <p>As digital natives fill New Zealand undergraduate nursing programmes, faculties no longer have the luxury of pleading digital naiveté.</p> <p>A weakness to the study is the use of self-evaluation which is not always a reliable indicator.</p>

How findings relate to this research	Positive relationship between self-confidence, satisfaction and learning using simulation.
Burke et al. 2012	
Purpose	The purpose of this research was to investigate how social cognitive theory can be used within simulation environments. Outcome was the recognition that theory-based facilitation of simulation optimizes efficacy of this learning method to foster maturation of cognitive processes of SCT, metacognition, and self-directedness.
Issue underpinning study	Simulation promotes student anticipatory control over similar future clinical situations in support of <i>metacognition</i> . Effective <i>debriefing</i> is the most important step to promote student learning because it promotes self-regulation and self-direction to apply forethought.
Participant information	An alternative approach pairs two freshmen and two seniors in a 'hybrid' situation where the freshmen assume the role of nursing student and the seniors represent the role of the RN, clinical leader, or preceptor.
Method	SCT: describes learning that is affected by cognitive, behavioural, and environmental factors, to bring about the conscious desire to <i>self-regulate future behaviour</i> . The four components of observational learning are: <ol style="list-style-type: none"> 1. attentiveness 2. symbolic coding operations 3. motor retention processes 4. motivation
Location of study	United States
Findings	Intrinsic motivation and external incentives affect attentiveness to the learning environment. Retention of learning occurs through symbolic coding operations. Pre-simulation activities, laboratory preparation, and scenarios that parallel lecture content will support motor retention processes. Allowing students to lead the debriefing promotes self-discovery and maintains "a student-centric focus."
Critique	Positive aspects of this research are the integration of SCT with self-regulated learning. Retention through symbolic coding helps support developing 'steps' or means (Dewey, 1922) as part of simulation design. Linking simulation learning to classroom content promotes mastery of didactic content, heightens attentiveness, and may improve test performance.
How findings relate to this research	Peer teaching fosters leadership development and promotes a more relaxed learning environment.

Cant et al. 2010

Purpose	The purpose of this article is to explore the key benefits of simulation
Issue underpinning study	Simulation implicates four key facets of education in nursing: <ol style="list-style-type: none">1. developing technical proficiency through practice of psychomotor skills and repetition2. assistance of experts which is tailored to students' needs3. situated learning within context4. incorporation of the affective (emotional) component of learning
Systematic review	Key benefits of simulation: Can repeat simulation Technical skill development Expert help Affective element development Develop clinical reasoning Clinical judgment development Endorsed by professional bodies Endorsed by students
Method	A systematic review of quantitative studies published between 1999 and January 2009 was undertaken using the following databases: CINAHL Plus, ERIC, Embase, Medline, SCOPUS, ProQuest and ProQuest Dissertation and Theses Database. The primary search terms were "simulation" and "human simulation". No qualitative studies evaluated.
Location of study	11 North American and 1 Australian Study
Findings	Twelve studies were included in the review. These used experimental or quasi-experimental designs. All 12 reported improvement in knowledge, critical thinking, and confidence. 4/9 showed increase in <i>knowledge</i> over control group. 5/11 showed gains in <i>critical thinking</i> over control group. All reported simulation as a valid teaching and learning strategy. Six of the studies showed additional gains in knowledge, critical thinking, satisfaction or confidence compared with a control group (range 7–11%).
Critique	Medium and/or high-fidelity simulation using manikins is an effective teaching and learning method when best practice guidelines are adhered to. Simulation may have some advantage over other teaching methods, depending on the context, topic and method. Further exploration is needed to determine the effect of team size on learning and to develop a universal method of outcome measurement. The validity and reliability of the studies varied due to differences in design and assessment methods.
How findings relate to this research	Helps to clarify way simulation impacts learning, with key benefits clearly delineated.

Cheng et al. 2012

Purpose	To explore the overarching key principles of crisis resource management as applied to situational awareness
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Issue underpinning study	“To Err Is Human: Building a safer healthcare system,” concluded that the majority of medical errors were not the result of individual actions, but rather a failure on the level of teams, systems, or processes that led to preventable mistakes.
Participant information	<i>Not applicable</i>
Method	Literature review.
Location of study	United States
Findings	Investigations of major airline accidents identified human errors such as failures of <i>communication, leadership, and decision making</i> as the major contributors to these accidents. A growing body of evidence supports the effectiveness of CRM training in improving team functioning and dynamics.
Critique	Highlights the impact of interpersonal interactions and behaviours on collaboration and teamwork. Challenge was lack of use of effective communication tool in managing crisis (e.g. ISBAR).
How findings relate to this research	In simulation it is important that healthcare teams manage simulated cases aimed at highlighting <i>leadership, communication, and teamwork issues</i> that arise during patient care.

Garrett et al. 2011

Purpose	Explores experiences in implementing HFS over the last three years, in the context of the results of the Canadian Association of Schools of Nursing (CASN) health 2006 simulation survey. The major benefits of simulation were reported as being improved client safety and better prepared practitioners.
Issue underpinning study	The rapid increase in the uptake of simulation-based education in Canada is due in large part to the belief that these techniques offer a safe environment for learners to improve competence. Educators are seeking ways to replace some of the higher risk components of the experience of a clinical placement.
Participant information	64 schools in Canada.
Method	In 2006 a web-based survey on simulation use across Canada was commissioned by the Canadian Association of Schools of Nursing (CASN).
Location of study	Canada
Findings	The majority of respondents (70%) indicated they used simulation (including HFS) as an augmentation to clinical learning experience, rather than as an alternative to clinical experience, and 17 out of the 64 programs reporting used simulations as a formal requirement in their curriculum. No respondents reported that they completely replaced any practical experiences with simulation, and the hours replaced being reported ran from 8-40 per programme. Of the few (9%) that did replace practice with simulation, most reported using simulation to replace <i>less than two days of actual practical experience</i> .
Critique	There are a large number of schools reporting simulation use within curricula. However, there could be more information as to what types of simulation were used, and how this simulation was implemented in actuality in each setting (e.g. HFS? Hearing voices? Standardised patients?).
How findings relate to this research	There are many programmes in Canada using simulation as an augmentation to clinical learning, but not as much an alternative.

Guimond et al. 2011

Purpose	To explore how learners improve meta-cognition and recognise patterns which will enhance decision making in new and unfamiliar environments
Issue underpinning study	Embed desired knowledge, skills, and attitudes, learning objectives, instructional strategy, evaluation of learning, and transfer of knowledge to the clinical setting.
Participant information	Not applicable
Method	Literature review
Location of study	United States
Findings	The identification of what to include in training is critical. Aviation training was historically skills-based; however, when a thorough analysis was applied, the following elements were identified as the major factors in <u>safety breaches</u> : communication ability to make decisions interpersonal interactions
Critique	There is evidence that communication affects safety, and that is highlighted in this article. However, a tool which could assist in clearer communication could be suggested.
How findings relate to this research	Design for simulation needs to focus on safety breaches, communication, ability to make decisions and interpersonal interactions.

Hawkins et al. 2008

Purpose	Two evaluate pathways used to get students through simulation with a view to using these pathways as a model to orient educators to this new tool.
Issue underpinning study	This article is the presentation of a model for implementing simulation. No data were presented. This article is a case study.
Description of simulation use in two pathways	This method of teaching comprises five essential components: <ol style="list-style-type: none">1. Case introduction2. Simulation3. Care plan development4. Documentation5. Reflection Students divided into two groups that follow one of two paths (no actual numbers given): Care plan development and simulation Simulation and documentation
Method	Case study where students placed in one of two alternative teaching/learning pathways as above.
Location of study	Australia

Findings	<ul style="list-style-type: none"> • Thorough planning by faculty was essential to a successful experience. Thorough planning involved structuring the simulation, anticipating questions and caveats, and orienting new or contracted faculty to the simulation. Time invested in initial planning resulted in a richer learning experience, and subsequent experiences were less time intensive for faculty. • Buy-in by both students and faculty was a critical component to make the experience more meaningful. Strategies for faculty to increase student buy-in included comprehensive and thorough planning, role modelling, and inclusion of the student's performance into their clinical evaluation. • Strategies to improve faculty buy-in included orientation to this teaching-learning strategy and hands-on experience with the simulator. • There was a level of comfort that had to be established to use high-fidelity simulation. As faculty became more familiar with this teaching method, comfort levels increased. Similarly, as students had repeated experience with the simulator throughout their nursing education, they also established a higher level of comfort. • The importance of an assistant who could prepare the simulation room and run the simulation from a technological standpoint could not be understated. This allowed faculty the freedom to truly evaluate and teach students.
Critique	<p>Strengths: With student-centred learning, more traditional methods of teaching, such as lecturing and presentations, are less desirable. Also, the use of ISBAR tool to assist in communication skills is a strength, along with fact that no moment was idle. Student learning was dynamic and continuous. Recommendations made in the findings are very applicable to this institution.</p> <p>Weakness: No evaluation of actual student performance quantitatively with rubric.</p>
How findings relate to this research	This study highlights the need for faculty training and buy-in before a simulation plan is put into place. Investing time in initial planning will help simulation's journey to successful integration in undergraduate nursing education.
Jeffries, 2006	
Purpose	<p>The purpose of this article was to outline the use of simulation in the following areas:</p> <ul style="list-style-type: none"> • Teach facts, principles, and concepts; • Assess the student's progress or competency with a certain skill or nursing intervention; • Integrate the use of technology in the learning experience; and • Develop problem-solving and diagnostic reasoning skills in a safe, nonthreatening environment before caring for a real client.
Issue underpinning study	The use of new technologies in simulations gives rise to issues such as the need for a <i>framework to guide the simulation</i> development, best practice for implementing this technology, and the need for rigorous research designs to evaluate learning outcomes.
Participant information	This is a review article around the implementation of simulation in undergraduate nursing curricula
Method	Review article
Location of study	United States
Findings	<p>Jeffries et al. (2004) have developed an instrument, called the Education Practices in Simulation Scale (EPSS) to measure the educational practices embedded within a simulation. This is a 16-item scale.</p> <p>Johnson et al. (1999) found that a <i>faculty development workshop</i> allowed teachers to experience feelings similar to those of students, enabling them to understand students' anxiety and discomfort in participating in the new simulated experience.</p> <p><i>Simulation Design Scale (SDS)</i> (Jeffries et al., 2004), developed to measure the five major design features needed when developing and implementing simulations.</p>

Critique	<p>Strength is that article situates simulation in nursing education stating strengths and weaknesses. In-depth discussion around some of the effects of simulation on student learning helps clarify strengths around this tool.</p> <p>Weakness is that there is no evaluation using quantitative evidence or evaluation rubric, and a clearer description of what is not working would be helpful.</p>
How findings relate to this research	<p>More research is needed to identify the hallmarks of a good simulation:</p> <ul style="list-style-type: none"> • The teacher role in the development and implementation of simulations • The effect of simulations on student learning • What constitutes good educational practice in Simulation • Improvement in learning outcomes • Use of simulation to partially replace practice hours • Contribution of simulation to safer patient care environments
Lewis et al. 2011	
Purpose	The purpose of the study was to investigate the impact simulation lab experiences have on student satisfaction, self-confidence, cognitive learning, and critical thinking.
Issue underpinning study	<p>Eight scenarios for high-fidelity simulators were chosen:</p> <ul style="list-style-type: none"> • paediatric bleeding (tonsil) • asthma exacerbation • airway distress-croup • pyloric stenosis • obstetric (post-epidural maternal hypotension) • preeclampsia, • depressed neonate • postpartum haemorrhage <p>For each scenario, the students were to use the nursing process, make an assessment and provide interventions.</p>
Participant information	<p>Convenience sample (63) pre-licensure students, over four semesters.</p> <p>A comparable group of students, who took the course during a summer semester and did not have the simulation experience, served as a control.</p> <p>Primarily Caucasian women, average age of 28.</p>
Method	<p>A quasi-experimental (pre-post-test) design to investigate the effectiveness of a simulation lab experience.</p> <p>Upon arrival at the simulation lab, students were asked to complete an online, 20-question, multiple-choice pre-test to assess baseline cognitive knowledge.</p> <p>After completion of the test, the students completed eight scenarios, four based on paediatric care and four based on maternal-new-born care.</p> <p>After conclusion of the scenarios, students completed the post-test, which was identical to the pre-test.</p>
Location of study	United States
Findings	With 63 students participating over four semesters. A Positive response was found in satisfaction and self-confidence in learning. There was a significant increase in cognitive knowledge. No definitive conclusion regarding critical thinking was established. A discovery was made regarding the importance of process during the simulation.

Critique	<p>This study provides strong evidence of the positive contributions simulation can make. Quantitative and qualitative evidence is gathered. Additionally, a large number of cases were used.</p> <p>Weakness: A one-time event may not be enough to significantly impact critical thinking patterns overall.</p> <p>Weakness: A sample size of 63 may not be large enough to draw broad conclusions, especially in an area as challenging to assess as critical thinking.</p>
How findings relate to this research	<p>Simulation can be effective for development of self-confidence, cognitive knowledge.</p> <p>More work needs to be done around how simulation develops critical thinking—especially with Millennial learners.</p>

Nicholsen et al. 2009

Purpose	This paper explores how a specific instructional strategy, contrasting cases, can be incorporated into scenario-based training to enhance the acquisition of advanced skills.
Issue underpinning study	This paper discusses how simulation can facilitate the learning of trainees across the novice-expert continuum.
Participant information	Simulation-based training, when supported by an appropriate framework such as simulation, can effectively support the training of higher-order cognitive skills, yet requires the input of <i>highly trained tutors</i> .
Method	<p>Case study employing various strategies to advance learning in simulation based training: <i>Metacognitive prompts during training</i> are one strategy as they may further support the acquisition of these higher-order cognitive skills.</p> <p>Metacognition is a multidimensional construct generally involving two primary components—<i>knowledge of cognition</i> and <i>regulation of cognition</i>.</p> <p>Metacognition is an effective technique for enhancing comprehension and <i>long-term retention</i>.</p> <p><i>Compare and contrast</i> is another strategy employed.</p>
Location of study	United States
Findings	To meet these aims, we discuss complementary pedagogical approaches (such as compare-and contrast scenarios and metacognitive training) to use within scenario-based simulations.
Critique	<p>Strength is in ability to employ different strategies to influence outcomes in simulation</p> <p>Weakness is that the characteristics required of those facilitating remains relatively undefined with necessary training of these individuals unclear.</p>
How findings relate to this research	Need for highly trained tutors in simulation-based learning. Challenges in developing proper objectives include determining which performance variables to measure, determining causal relationships between measurable variables and other attributes, personalising the measurement process, and then gaining stakeholder acceptance of the assessment decisions.

Parker et al. 2009

Purpose	The purpose of this paper is to consider the predominant educational philosophies of behaviourism and constructivism that guide modern nursing pedagogy and explore how each philosophical perspective impacts high-fidelity simulation's integration into nursing curricula.
Issue underpinning study	The use of high-fidelity human patient simulators (HPS) have been embraced by nursing education programmes in the development of immersive clinical simulations despite the lack of research into a pedagogy or educational philosophy appropriate to guide this technology-based learning tool.
Participant information	Simulation as a type of exploratory or inquiry-based learning is closely aligned with behaviourist and constructivist principles.
Method	Critical examination of high-fidelity simulation revealing that: <i>A constructivist approach</i> to teaching and learning is based on the concept that learners create their own meaning through interaction with the environment. Compared to behaviourism, <i>constructivist pedagogy</i> argues that knowledge transmission is not inertly passed from teacher to learner but, rather, is created by individual learners, or in some cases groups of learners. <i>Automaticity of skills' theory</i> stipulates that some vital skills are better learned with little conscious effort. Effectiveness of <i>behaviourist pedagogy</i> in psychomotor skill acquisition is important to keep in mind with simulation. The goal is to achieve <i>automaticity of skills</i> .
Location of study	Canada
Findings	Philosophical underpinning for simulation includes both constructivist and behaviourist principles. Further research must be done to develop a guiding philosophy to underpin simulation. Behaviourism applies to development of psychomotor skills and rote learning needed in preparation for simulation. Constructivism is deemed more valuable in development of clinical-judgment skills, problem solving, collaboration, and group process.
Critique	Strength is in identifying exactly which pedagogical approaches are influencing high-fidelity simulation and underpin this teaching tool. Weakness is lack of information as to how to use these underpinnings to maximise simulation as a teaching tool. What can the educator do to influence simulation design with these pedagogical influences in mind?
How findings relate to this research	Consideration must be given to: <ul style="list-style-type: none">• Societal trends such as the digital revolution;• The incoming millennial generation who expect immersive experiences woven seamlessly with technology;• The resultant effect on the student–teacher relationship;• The way information is disseminated; and• The way the millennial generation experiences this impact in the process of knowledge construction.

Pike et al. 2010

Purpose	Goal of this research was to instil a sense of confidence in pre-registration nurses, a concept known as <i>self-efficacy</i> . Simulation is becoming increasingly popular within pre-registration nursing education, particularly as a result of "The Fitness for Practice Report" which highlighted problems with nurses' levels of competence at the point of registration.
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Issue underpinning study	<p>Concerns over <i>competency levels</i> have been partially attributed to the <i>variable</i> nature of <i>practice placements</i> resulting in different student experiences.</p> <p>A multi-site pilot study demonstrated simulation was effective in addressing this issue.</p> <p>Simulation offers students a chance to achieve practice outcomes which are <i>not possible in the clinical setting</i>.</p> <p>It is asserted that high self-efficacy beliefs will lead to improved performance.</p>
Participant information	<p>Participants were recruited from a larger convenience sample (n=22) of pre-registration nurses.</p> <p>From this sample, 9 students agreed to participate in a focus group.</p>
Method	<p>A <i>qualitative approach</i> to the study was chosen to gain understanding from the perspective of the individual going through the experience.</p> <p>This approach orientates towards the <i>interpretivist tradition</i> which contends ideas are constructed within different contexts.</p> <p>A <i>focus group method</i> was selected to encourage participants to explore their experiences using group interaction in a non-threatening environment.</p>
Location of study	United Kingdom
Findings	<p>Student anxieties around levels of communicative competence did not arise only in relation to sensitive situations such as bereavement, but also general aspects of communication such as simple telephone enquiries.</p> <p>This study recommended 300 of the required practice placement hours may be included within the clinical simulation laboratory.</p>
Critique	<p>Strength was in use of qualitative descriptive interpretation of data focusing on communication competence. More research needs to be done in the area of communication and its effect on teams and management of deteriorating patients.</p> <p>This research addresses the variability of experience in clinical placements which is one of the drivers for this research, and a very real problem in nursing education currently.</p> <p>Weakness: only one focus group of nine possibly limiting depth of data.</p>
How findings relate to this research	<p>This is one of only a few pieces of <i>qualitative research</i> in simulation.</p> <p>Poor communication skills and lack of self-efficacy in <i>communication</i> is similar to research outcomes found in this thesis.</p> <p>For certain clinical skills in nursing the psychomotor aspect must be mastered first—this backs up emphasis on not losing skills training.</p>

Roberts et al. 2011

Purpose	<p>This paper presents a new method of introducing human patient simulation to students and educators, whilst seeking to demystify the roles, responsibilities and underpinning pedagogy. The analogy of simulation as theatre outlines the concepts of the theatre and stage (simulation laboratory); the play itself (Simulated Clinical Experience, SCE); the actors (nursing students); audience (peer review panel); director (session facilitator); and the production team (technical coordinators). Outcome was a more 'user-friendly' way of integrating simulation into undergraduate nursing curricula.</p>
Issue underpinning study	<p>It is important that pedagogy leads the use of high-fidelity simulation, rather than the technology. This paper seeks to demystify the roles, responsibilities and underpinning pedagogy of high-fidelity simulation by making the analogy of simulation as theatre.</p>
Participant information	This is a review article
Method	<p>Not a research article, but a case presentation using simulation as a 'theatre.'</p> <p>Seeing high-fidelity simulation as theatre may potentially help to allay fears and ensure that the pedagogy leads rather than the technology. This new method encourages technically savvy people to relate to simulation as it takes on a familiar non-threatening guise.</p>

Location of study	United Kingdom
Findings	The facilitator takes on a similar role to the director of a production. Their role is to facilitate and assist the student's learning. The technical teams are similar to a theatre's back-stage crew or production team.
Critique	Strength in this article is the casting of facilitator as a director of a performance, as this is an accurate description. This notion of a theatre inspired the 'Oscar presentations' in this study. Weakness: limited detail as to scenario design means that study difficult to replicate.
How findings relate to this research	Tech savvy students would benefit from being involved in making up the scenarios and in peer assessment in order to get the maximum benefit from the simulation encounter.

Starkweather et al. 2008

Purpose	The purpose of this article is to provide details on the efforts to embed simulation into an undergraduate programme.
Issue underpinning study	Details one large nursing programme's initial work toward infusing simulation in an undergraduate nursing programme. <i>Diffusion of Innovations Theory</i> (Rogers, 2003) provided guidance for implementation. The anticipated barriers to simulation adoption included: time to learn to use simulation lack of faculty compensation for learning
Participant information	The largest undergraduate nursing program in the northwest, spanning three diverse campuses, admitting 144 students per semester.
Method	Case study outlining how one nursing programme worked towards integrating simulation Lead researcher produced some short video clips and created a course to <i>educate educators</i> in the use of simulation. Opportunity for members interested in participating in a <i>two-day simulation retreat</i> . Creation of a <i>core set</i> , using the same patient but with increasingly complex issues. Simulation <i>aligned to course content</i> and expectations of increasingly complex clinical skills.
Location of study	United States
Findings	Simulation appeals to technology savvy students, to whom lecture, passive information gathering, and linear thinking may not provide full engagement. Multiple studies in a variety of disciplines suggest that students immersed in technology from an early age, learn very differently. Students overwhelming satisfaction with simulation use. Increase in SIM from 20-50% use.
Critique	Strength: Specific strategies were given to create a 'safe' path for integration of simulation in an undergraduate school of nursing. Diffusion of innovation theory was useful tool in this process. Allowing students to repeat scenarios was used in design of third action cycle in this study. Weakness: Limited description therefore difficult to replicate.
How findings relate to this research	The best outcomes with simulation occur when it is integrated across a curriculum, not added to an already overcrowded curriculum. High-fidelity simulation is even more important for <i>novice nursing students</i> , to develop essential skills involved in patient safety, communication and patient/family interactions. Each scenario would be run a second time, to solidify the content and experience.

Stayt, 2012

Purpose	The aim of this article is to examine the learning theory that underpins clinical simulation by utilising Carper's patterns of knowing (1978) as a theoretical framework.
Issue underpinning study	<p>It would appear that due to a paucity of the current evidence base that the cost benefits of clinical simulation are largely unknown.</p> <p>Traditionally, nurse educators have relied on clinical placements to provide experiential learning of clinical skills.</p> <p>The use of simulation as an education tool to support competency development is becoming increasingly prevalent.</p>
Participant information	This is a review article.
Method	<p>A review of current use of simulation as an educational tool which includes following concerns:</p> <p>Behavioural approach, empirical knowledge acquisition, constructivist approach, and the reflective approach are not all simultaneously compatible.</p> <p>The effectiveness of many identified learning approaches relies upon students having metacognitive and reflective skills.</p> <p>Educators developing the curriculum need to consider where simulations are placed within the curriculum, ensuring that meta-cognition and reflective skill development are supported by other curriculum activities.</p>
Location of study	United Kingdom
Findings	<p>Four patterns of knowing in nursing: empirical, aesthetic, ethical and personal.</p> <p><i>Empirical pattern of knowing:</i> Ontology is realism. Positivist and relies on objective truth; behaviourist learning theory. Role of teacher—knowledge transfer, and learner is passive.</p> <p><i>Aesthetic pattern of knowing:</i> knowing is an expressive form of knowledge which bridges the gap between recognition and perception.</p> <p><i>Ethical pattern of knowing:</i> ethical knowledge represents that which the individual values highly due to their belief that it is good or right. This type of knowing involves making decisions for which there are no prescriptive answers. Reflection is essential to the development of an ethical pattern of knowing.</p> <p><i>Personal pattern of knowing:</i> personal knowledge involves the inner experience of being self-aware and is essential for the therapeutic use of self in nursing. Personal knowledge derives from reflection upon personal experience. Ontology in this pattern sees reality as a human construct in which individuals construct their understanding of the world. Simulation is an experiential paradigm consistent with constructivism.</p>
Critique	<p>Strength: This article combines various pedagogical and ontological underpinnings of simulation and shows how they work together, and how they conflict. The role of the teacher is discussed within each.</p> <p>Weakness: Limited detail around how to manage conflictual underpinnings within the simulation design.</p> <p>The premise that learning resulting from clinical simulation is transferred to clinical practice is only tentatively supported as robust empirical evidence supporting this claim is sparse.</p>
How findings relate to this research	<p>Simulation must reflect the contextual realities of everyday practice if it is an effective adjunct to clinical experience.</p> <p>When considering learning theory of motor skill development the simulated contextual realities may inhibit learning.</p>

Yuan et al. 2012

Purpose	A systematic review of the evidence published between 2000 and 2010 was undertaken using the following databases: CINAHL, ProQuest, MEDLINE, Science Direct, OVID and Chinese Academic Journal. <i>Empirical studies</i> determining the effects of high-fidelity simulation on knowledge and skills in nursing or medical education were considered.
Issue underpinning study	There is a question about whether high-fidelity simulation actually demonstrates more effects on improving students' knowledge and skills than traditional techniques.
Participant information	The following were reviewed: 16 randomised controlled trials 1 nonrandomized-controlled trial 9 quasi-experimental studies
Method	Systematic review. Studies were excluded if they employed a review or case methodology, described interventions without evidence of evaluation or used role-playing, standardised patients or low/mid-fidelity simulation as the comparison group. Quality of controlled trials was evaluated with the Jadad scale focusing on the methods for random allocation, double-blinding, and withdrawals and drop-outs.
Location of study	Canada, China
Critique	Strength: inclusion of 16 robust RCTs. Based on the systematic review question, qualitative research is not relevant to include.
Findings	More research with rigorous design needed. High-fidelity simulation did enhance scores on knowledge and skill exams, but its contribution to OSCE performance was mixed. The majority of reviewed Randomised controlled trials are of low methodological quality. Enhanced knowledge and skills after simulation training using. HFS effectively enhanced nursing students' ability to transform learned knowledge into clinical practice.
How findings relate to this research	HFS does enhance scores on knowledge and skills exams, but contribution to OSCEs is mixed.

1.2 High-fidelity simulation for enhancing clinical reasoning and judgment.

Clinical judgment has been defined as:

The art of making a series of decisions in situations, based on various types of knowledge, in a way that allows the individual to recognise salient aspects of or changes in a clinical situation, interpret their meaning, respond appropriately, and reflect on the effectiveness of the intervention. (The INACSL Board of Directors, 2011, pp. S3-S4)

An interpretation or conclusion about a patient's needs, concerns, or health problems, and/or the decision to take action (or not), use or modify standard approaches, or improvise new ones as deemed appropriate by the patient's response. (Tanner, 2006)

Clinical judgement describes the thinking processes nurses use when faced with complex, ambiguous, and conflicting situations (Dillard et al., 2009). Tanner (2006) has identified four dimensions of clinical judgment: noticing, interpreting, responding, and reflecting. The level of

ability a nurse uses to engage in effective noticing (recognising salient features, interpreting their meaning, and responding appropriately) varies with the context, the nurse's background, and the nurse's relationship with the patient. An active and growing clinical judgement is a kind of pinnacle to which nurses and nurse educators aspire in order to ensure competence in nursing practice (Lasater, 2007). Simulation as a pedagogy has been shown effective in the development of clinical judgment in nursing (Bambini et al., 2009; Benner, 2004; Benner et al., 2010; Burke & Mancuso, 2012).

Lasater (2007) developed a rubric that describes levels of performance in clinical judgment, and piloted this rubric in scoring students' performance. It was a piece of exploratory research using a qualitative — quantitative — qualitative design (Creswell, 2003). She based her work on Tanner's (2006) model for clinical judgment. Lasater found that Tanner's Clinical Judgment Model provided the basis for identifying students' gaps in understanding, a kind of formative assessment, and offered important feedback for simulation facilitation. Such gaps in thinking could involve a student administering a narcotic for pain management while forgetting to assess the effect of said narcotic on the respiratory and cardiovascular systems, thus missing the patient's respiratory and cardiac compromise. This poor clinical judgment can be picked up in high-fidelity simulation with no harm done to 'real' patients. A well-constructed rubric provides a mechanism to evaluate student performance and give meaningful feedback addressing knowledge deficits (Ashcraft et al., 2013). This deficit in knowledge may not show itself in multiple-choice exams, case studies or essays.

In the clinical setting there arises a risk that knowledge deficits go unnoticed for a longer time, or that they might not be noticed at all. After all, clinical educators are present for only a fraction of the entire shift. Additionally, clinical placements do not guarantee a standard experience for every student. This is one of the key arguments for integrating simulation into undergraduate nursing curricula (Adamson, 2010; Health Workforce Australia, 2010a; Starkweather & Kardong-Edgren, 2008). When a gap in understanding is uncovered, the simulation facilitator can address the issue with the entire group during a short teaching session and in the debriefing. This situates simulation as a significant tool in the development of undergraduate nurses.

Managing deterioration in clinical situations has been identified as a key influence on positive patient outcomes (Tait, 2010). The ability of nurses to respond to clinical situations which are changing involves the development of a 'professional gaze' (Tait, 2010, p. 6) which necessitates that the nurse survey his or her clinical arena while monitoring the patient for visual signs of change. Nurses are best able to manage deterioration when their professional gaze is informed by a sound knowledge and experience base, and in association with clear communication lines with other professional groups. If clinical deterioration is detected and managed early, complications associated with delayed diagnosis will be reduced, and affected patients could avoid the need for an extended hospital stay (Williams & Chong, 2010). As signs of deterioration are often missed by individual clinicians (Endacott et al., 2010), emphasis on the importance and functionality of teams has become an integral part of managing deterioration. Simulation has proved effective in embedding strategies to support professional management of deterioration, and improve individual and team performance (Cooper et al., 2012; Cooper et al., 2013).

While the management of deterioration remains an important skill for managing acute clinical situations, the question of how to assess competence in this area then arises. My own experience as a nurse educator has taught me the difficulties and challenges of ‘seeing’ the student whose practice is of concern in actual clinical settings. Currently, assessments are made by means of examination questions, writing reflective assignments, reports of others, and sometimes a controlled practice room assessment. We have not yet incorporated high-fidelity simulation into our assessment repertoire. Reviewing this literature has opened me to the challenges and advantages of exploring how we might assess students through a high-fidelity simulation scenario. I am keen to incorporate this within an action cycle. The research from which this discussion is drawn can be viewed in Table 3.2.

Table 3.2 Literature Summary for Enhancing Clinical Reasoning and Judgment

Category 1.2: High-fidelity simulation as a means for enhancing clinical reasoning and judgment	
Ashcraft et al. 2013	
Purpose	The purpose of this study was to describe the process of evaluating senior nursing students in the simulation laboratory using a modified Lasater Clinical Judgment Rubric (LCJR).
Issue underpinning study	Simulation, using high-fidelity simulators and well-planned scenarios with reflection, can be used to evaluate clinical judgment, reflective thinking, and development of psychomotor skills.
Participant information	The study was conducted over two years with students enrolled in their final bachelor of science in nursing semester. (Phase 1, $n=86$; Phase 2, $n=102$) using high-fidelity simulation.
Method	Descriptive longitudinal study to evaluate simulation performance with modified LCJR.
Location	United States
Findings	<p>The modified rubric measured student performance more holistically than a procedural checklist and provided objective criteria for evaluation.</p> <p>Paired samples t-test showed significant differences in nine dimensions) and in total points between the formative and summative evaluations ($t = -5.83$, $df = 85$, $p = 0.000$), indicating improved summative performance.</p> <p>Phase 1 and Phase 2 scores representing the clinical judgment profiles on the modified LCJR increased between the formative and summative scenarios, indicating improved performance on the summative evaluation.</p>
Critique	<p>Strength: Highlights that a well-constructed rubric provides a mechanism to evaluate student performance in simulation by focusing on clinical reasoning essential for patient safety and allowing numeric evaluation of performance.</p> <p>Weakness: Students informing other students about the scenario and the simulation experience may increase rubric scoring.</p> <p>Weakness: Differences in faculty training on the use of simulation and on specific equipment (e.g., manikin, software) may affect grades because of the tendency to focus on unfamiliar equipment versus student performance.</p> <p>Weakness: Scoring of dimensions on the rubric is dependent upon instructor interpretation of the descriptors.</p>

How findings relate to this research	This rubric is what was implemented in action cycle three of this research with the simulation suite.
Cooper, 2012 & McKenna, 2014 (results)	
Purpose	The purpose of this article was to report the results from the Australian programme of translational research which aims to produce an evidence based education package that will improve nursing student management of deteriorating patients.
Issue underpinning study	Since 2008 in pilot work with individual nursing and midwifery students, and registered nurses to examine patient management in simulated settings using an interventional program known as <i>FIRST2ACT</i> (Feedback Incorporating Review and Simulation Techniques to Act on Clinical Trends).
Participant information	All final-year nursing students studying on a Bachelor of Nursing or combined degree at Monash University, (n=120); Deakin University, Melbourne Burwood Campus (n=350); and the University of Queensland, (n=100) will be eligible. Total population n=570.
Method	A mixed methods approach used to capture quantitative and qualitative data from three sources in a pre- post quasi-experimental design: <ol style="list-style-type: none"> 1. Multiple choice structured knowledge questionnaire (MCQ). 2. Three video recorded team based simulation exercises (OSCEs) to identify performance skills. 3. Video review of the simulation exercises to facilitate reflective review of performance.
Location of study	Australia
Findings	Participants had good knowledge but failed to respond appropriately. Educational experience had significant impact on participant learning. Overall, situation awareness was low (41%). Of the four domains, physiological perceptions scored the lowest (26%) and projection the highest (59%). Final year nursing students may not have well developed <i>situation awareness</i> skills, especially when dealing with these types of scenarios.
Critique	Strength: This research showed that rote memory is not always applied to clinical setting Design shows good triangulation, and simulation as an experience positively impacted participant learning. Also, collaboration involved multiple schools and large group of participants. Weakness: The study design and methods not particularly robust. Study did not set out to explore how students develop situational awareness.
How findings relate to this research	This study has implications for doing similar research across sites in New Zealand. New Zealand needs to start looking at research involving multiple schools.
Endacott et al. 2010	
Purpose	The purpose of this article is to report results of a study investigating processes used by final-year nursing students to recognise and act on clinical cues of deterioration in a simulated environment.
Issue underpinning study	Emphasis on the use of teams in simulation. Signs of deterioration are often missed by individual clinicians. Nursing curricula should focus on enhancing the ability to piece information together, including linking pathophysiology with patient assessment, and identify <i>trends</i> , rather than seeing observations as parallel to each other.
Participant information	51 students. 102 videoed scenarios 51 interviews

Method	<p>Thematic analysis of video data and reflective interviews identified considerable differences in processes used by students to identify cues.</p> <p>Observational and reflective interview data were analysed using dimensional analysis – an inductive, interpretivist analytical method.</p> <p>The analytical procedure can be described as a midpoint between Straussian and Glaserian grounded theory techniques.</p>
Location of study	Australia
Findings	<p>Four aspects of cue recognition were evident:</p> <p>Initial response</p> <ol style="list-style-type: none"> 1. Differential recognition of cues 2. Accumulation of signs 3. Diversionary activity <p>Skills training should address:</p> <ol style="list-style-type: none"> 1. The importance of trends in identifying deterioration 2. The need for systematic assessment in stressful situations 3. The realistic replication of clinical signs that are difficult to assess, for example peripheral shutdown
Critique	<p>Strength: Good evaluation of aspects of cue recognition required when evaluating student performance in simulation. Thematic analysis of video data and reflective interviews identified considerable differences in processes used by students to identify cues.</p> <p>Weakness: While recognition of cues is given, there is no mention of how students called for assistance in managing the situation (Was ISBAR used, and did team members collaborate?) Cognitive load on working memory is not managed within the overall scenario design.</p>
How findings relate to this research	<p>Situational awareness through being able to note signs of deterioration is more critical.</p> <p>Nursing skills training should emphasise the importance of trends in identifying and acting on deterioration and the need for systematic assessment in stressful situations.</p>
Gantt, 2010	
Purpose	The purpose of this article is to report on the use and effectiveness of the Clark Simulation Evaluation Rubric with Associate degree and Baccalaureate nursing Students.
Issue underpinning study	Very few rubrics for evaluating nursing student performance exist, and even fewer have been evaluated with different groups of students.
Participant information	69 associate degree and; 109 baccalaureate degree students were evaluated and scored in simulation performance using the rubric.
Method	The article describes a pilot study using the Clark Simulation Evaluation Rubric with undergraduate nursing students of different levels from two types of programmes.
Location of study	United States
Findings	<p>Scores ranged from 10 to 100 (M = 74).</p> <p>45% of students received a score of greater than 80%, with the greatest percentage of students (27%) achieving scores in the 81-90% range.</p> <p>Those same qualities that make a rubric useful for capturing the complexities of performance can make grading difficult in situations where evaluation must be more absolute.</p>

Critique	<p>Strength: Students were able to be evaluated on their clinical judgment and competence in a more objective and visible manner.</p> <p>Weakness: Educators did not always readily assign a score during some sections of the rubric. Training in the use of the rubric needed to happen before the study commenced.</p> <p>Weakness: Individual faculty biases about what constitutes acceptable performance can undermine determination of a performance standard.</p> <p>Weakness: It is easier to use rubrics when judging individual performance. Performance in groups makes this less certain.</p>
How findings relate to this research	The use of a rubric was also required in this research, and the Clark rubric was one which was considered for cycle three.

Lasater, 2007

Purpose	This article describes an exploratory study that originated and pilot tested a rubric in the simulation laboratory to describe the development of clinical judgment, based on Tanner's Clinical Judgment Model. The purpose of this article is to explore the use of the LCJR with the outcome being a determination of the effectiveness of the rubric to evaluate clinical judgment in nursing students.
Issue underpinning study	Development of a rubric to assess clinical judgment of nurses in simulation setting.
Participant information	<p>A 4-year baccalaureate nursing programme.</p> <p>Two groups of 12 students each came to the laboratory, a hospital-like room containing a computerised human patient simulator, on one of two mornings per week, in lieu of their clinical practicum.</p>
Method	<p>The description-observation-revision-review cycle was repeated weekly for 3 weeks until the rubric was developed enough to pilot test the scoring of student performance during Weeks 4 and 5.</p> <p>At the end of the 7 weeks, a focus group of 8 observed student volunteers was convened for 90 minutes to test the concepts of clinical judgment embedded in the rubric.</p>
Location of study	United States
Findings	<p>The LCJR offers performance expectations, as well as language for feedback and assessment of students' clinical judgment development.</p> <p>The rubric has relevance for all clinical contexts, including acute care, long-term care, and community health.</p>
Critique	<p>Strength: Although clinical judgment is clearly related to practical experience, which high-fidelity simulation provides for students in addition to their clinical practicum, students can better learn when they are clear about expectations and receive direct feedback about their performance.</p> <p>Weakness: Raters using the rubric need to be trained to increase reliability between raters.</p> <p>Weakness: Creating a rubric that reports A, B, C, is more difficult than pass or fail. Yet, a grading system would be more valuable to evaluate degrees of student achievement.</p>
How findings relate to this research	<p>The LCJR would be a useful and relevant rubric to research with students at our university.</p> <p>It has potential benefit across a variety of clinical settings and provides language to give students meaningful feedback.</p> <p>Might consider use of this rubric for research in this project.</p>

Tait, 2010

Purpose	The purpose of this article is to represent the suboptimal assessment of patients for signs of clinical deterioration and the subsequent response has led to the development of national guidelines and tools for tracking and responding to these situations. Such tools can provide guidance but ultimately the clinical skill, decision making and collaboration of professional practitioners determine optimal care.
Issue underpinning study	Inadequate or suboptimal care, resulting in the admission of acutely ill patients to critical care units, was identified more than a decade ago as being avoidable in many cases. Organisational, professional and interprofessional issues are often cited as factors that influence the process of responding to clinical deterioration, but there has been limited description of the complexity of recognising and responding to clinical deterioration from the nurse perspective.
Participant information	Review article.
Method	Hermeneutic study of nurses' experience of caring for patients. The researcher analysed the data guided by Gadamer's (1989) hermeneutics of question and answer, and identified a cyclical process of scanning, perception, interpretation and action, which I described as 'the professional gaze and the conditions necessary for optimal practice of engaging in scanning, selective perception, recognition, diagnosis of and response to clinical deterioration'.
Location of study	United Kingdom
Findings	The 'professional gaze' of the nurses appeared to be a cyclic and continuous process of perceiving and responding to clinical deterioration. The process involved the 'professional scan' when nurses would survey their clinical arenas, and to monitor patients for visual signs of change. When nurses have relevant knowledge and experience, they feel in control of clinical situations and demonstrate compassion, competence, confidence and commitment to patients. When nurses are involved in situations where patients have deteriorated, these aspects of their role enable them to assess patients' conditions and communicate effectively with other professional groups to achieve the desired goals.
Critique	Strength: The use of term 'professional gaze' is helpful in supporting students in clinical development from novice to expert. Strength: Teaching students to have a 'professional scan' of their environment with diminish risk and allow better management of deterioration. Weakness: A rubric or more specific detail in the development of 'professional gaze' is not included and would be helpful in progressing students from novice to expert.
How findings relate to this research	This development of a professional gaze has implications for simulation. Teaching students to scan or survey the clinical area along with looking for visual signs of change is part of teaching for a sense of salience. Appropriate knowledge and experience are integral for management of deteriorating situations. Communication with other professional groups is key to managing deterioration.

Tanner, 2006

Purpose	This article reviews the growing body of research on clinical judgment in nursing and presents an alternative model of clinical judgment based on these studies.
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Issue underpinning study	<p>Based on a review of nearly 200 studies, five conclusions can be drawn:</p> <ol style="list-style-type: none"> 1. Clinical judgments are more influenced by what nurses bring to the situation than the objective data about the situation at hand; 2. Sound clinical judgment rests to some degree on knowing the patient and his or her typical pattern of responses, as well as an engagement with the patient and his or her concerns; 3. Clinical judgments are influenced by the context in which the situation occurs and the culture of the nursing care unit; 4. Nurses use a variety of reasoning patterns alone or in combination; and 5. Reflection on practice is often triggered by a breakdown in clinical judgment and is critical for the development of clinical knowledge and improvement in clinical reasoning.
Participant information	This article is a literature review around 'clinical judgment' which resulted in the development of the clinical judgment model.
Method	This article reviews the growing body of research on clinical judgment in nursing and presents an alternative model of clinical judgment based a review of nearly 200 studies.
Location of study	United States
Findings	<p>The development of the Tanner Clinical Judgment Model was the result of this research. The overall process includes four aspects involved in judgment:</p> <ol style="list-style-type: none"> 1. A perceptual grasp of the situation at hand, termed 'noticing.' 2. Developing a sufficient understanding of the situation to respond, termed 'interpreting.' 3. Deciding on a course of action deemed appropriate for the situation, which may include "no immediate action," termed 'responding.' 4. Attending to patients' responses to the nursing action while in the process of acting, termed 'reflecting.' <p>Educational practices must help students engage with patients and act on a responsible vision for excellent care of those patients and with a deep concern for the patients' and families' well-being.</p> <p>Result of this article is a research-based model of clinical judgment.</p>
Critique	<p>Strength: The Tanner Clinical Judgment Model becomes the philosophical underpinning for the LCJRC which is used in simulation evaluation currently</p> <p>Weakness: The analytic process breaks down when the nurse doesn't have the knowledge or experience at a basic level.</p> <p>Weakness: Clinical reasoning can break down when there is a mismatch between what is expected and what actually happens in relation to the client's condition.</p> <p>Weakness: Clinical reasoning and judgment do not always take into account the operation of intuition in clinical settings.</p>
How findings relate to this research	<p>These four aspects of managing deteriorating situations should influence the design of simulation at my institution.</p> <p>Clinical judgment needs to be developed in order to ensure competence in our graduates.</p>

Williams & Chong, 2010

Purpose	The purpose of this article is to encourage discussion around the management of deterioration. If clinical deterioration is detected and managed early, complications associated with delayed diagnosis will be reduced, and affected patients will avoid the need for an extended stay in hospital. Effective identification and management of deterioration also has the potential to prevent ongoing morbidity associated with sequelae of delayed diagnosis such as cardiac or neurologic damage with the associated chronic disease implications.
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Issue underpinning study	<p>In recent years patient deterioration management has focused on teaching resuscitation skills, dealing predominately with patients after a catastrophic event including cardiac arrest or major trauma.</p> <p>Despite this extensive training which forms part of the health systems competence to practice, only 17% of patients who experience cardiac arrest survive to discharge.</p> <p>Key factors that contribute to this failure to recognise and respond to clinical deterioration are complex and overlap.</p> <p>Because medical coverage is reduced after hours and weekends, patients who deteriorate and require higher levels of care are transferred to the local state-run hospital.</p>
Participant information	<p>Calvary Health Care Launceston (CHCL) provides 148 beds.</p> <p>On average 15,000 patients are admitted each year.</p>
Method	<p>A review of Calvary Health Care, Australia processes in 2008 was undertaken and supported by recommendations from the Australian Commission on Healthcare Standards Alignment Survey in November 2007.</p> <p>The survey stated “a system be formalised for the early rescue of patients whose condition is identified as deteriorating.”</p> <p>Introduction of a memorandum of understanding, developed between the University of Tasmania School of Nursing and Midwifery (SNM) and CHCL for the introduction of high fidelity simulated training.</p>
Location of study	Australia
Findings	<p>The CHCL and UTas SNM High Fidelity Simulation Program have provided a range of exciting outcomes in a short period of time.</p> <p>CHCL has continued to experience dramatic improvement including: patient outcomes post critical events, further reductions to patient transfers, an increased ability to manage deterioration.</p> <p>Medical officers increased confidence in the abilities of nursing staff.</p> <p>Nursing staff confidence in managing deterioration and their overwhelming interest in the programme.</p>
Critique	<p>Strength: Using simulation to teach students to manage deteriorating situations provides a safer clinical environment for patients and increased practitioner confidence.</p> <p>Strength: Managing deterioration is a helpful strategy to embed in simulation design</p> <p>Weakness: the ability to improve in managing deterioration depends on variables which might not be controllable (e.g. staffing levels, medical wards, novice practitioners).</p> <p>Weakness: Not all deteriorating situations progress in a predictable manner. Clinical reasoning must also become a part of the training process.</p>
How findings relate to this research	<p>Managing deteriorating situations must become part of any integrated simulation strategy.</p> <p>Using simulation to teach this management has been proven effective by this study.</p> <p>Confidence has improved from medical officers in nursing management of deterioration, and in the nurses’ confidence in themselves.</p>

1.3 Simulation as a means of assessing competence.

Recent reforms of nursing education have led to calls for assessment of clinical performance which contribute to academic qualifications that incorporate professional awards (Davis & Kimble, 2011). Questions often follow concerning the psychometric quality of methods available for assessing competence in critical thinking (Fero et al., 2010). Benner (2010) defined competence in nursing as the ability to operate in the real world whatever the conditions. Once students learn to grasp the major concerns in a situation, they can put some order and priorities to the list of tasks that need to be accomplished. Benner called this “guiding students toward a sense of

salience” (p. 114). Nursing students need to learn how to apply classroom learning in the clinical context and then prioritise tasks when in the clinical setting. Some believe simulation may well be an educational strategy capable of achieving this (Cant & Cooper, 2010). Furthermore, research is showing that simulation has the potential as a pedagogy to develop competence in clinical judgment (Adamson, Gubrud, Sideras, & Lasater, 2012; Lasater, 2007), clinical reasoning (Lapkin et al., 2010), and management of deteriorating patients (Cooper et al., 2013). However, while all of this potential has many educators quite excited, the ultimate question of how and what to assess in students remains unclear.

Some believe that the majority of reviewed randomised controlled trials in simulation are of low methodological quality (Yuan et al., 2012); thus requiring additional randomised controlled trials with larger sample sizes to determine whether performance can be enhanced using high-fidelity simulation. Others wonder if quantitative measures are the only way to justify the teaching tool as a whole (Greene, 2001; Guba & Lincoln, 1994; Loseke, 1989). A thorough literature search on simulation in undergraduate nursing programmes yielded very few pieces of research which used a decisively qualitative methodology for assessing student competency (Pike & O'Donnell, 2010). Many are calling for some form of universal method of outcome measurement for simulation which would address both quantitative and qualitative measures in an effort to research the use of simulation with a broader lens (Cant & Cooper, 2010; Davis & Kimble, 2011).

Various approaches to simulation evident in the literature to this point include Gantt (2010b) who used the Clark Simulation Evaluation Rubric (Clark, 2007) and found that the addition of focused documentation and questions at the end of the rubric led to clarification of student rationale for their behaviour. Gantt (2010b) also found the establishment of inter-rater reliability by faculty assessors before student assessment was crucial for consistent grading and establishing a cut-off score for what constituted a passing grade (Davis & Kimble, 2011). While these may be salient issues, not all human behaviour can be so easily quantified and mapped on a grid.

As stated above, the Lasater Clinical Judgment Rubric (2007) was developed to evaluate single episodes of clinical judgment during a simulated scenario by nursing students. However, in 2007 there was no reported validity or reliability testing for this rubric thus requiring further research to enable its generalisability into current practice. Research has now been done to validate the Lasater rubric (Adamson et al., 2012), but other questions have come to the fore. There has been some concern that there is no assessment of communication skills within the team in the Lasater model (Cooper et al., 2013). The suggestion is that professional competence should involve communication and teamwork, both internal and external to the simulation (Cooper et al., 2013; Finnigan, Marshall, & Flanagan, 2010). Others believe the ability to manage deteriorating client situations while employing effective clinical reasoning and communication is essential for professional competency (Lapkin et al., 2010). Further research needs to include these areas in assessing competence for professional practice.

Ultimately, simulation does appear to have a valuable place in assessing student competence. High-fidelity simulation employing well-designed scenarios, with reflection, can be used to evaluate clinical judgment, reflective thinking, and development of psychomotor skills

(Tanner, 2011). It is appropriate to use high-fidelity simulation to assess student competence (Lapkin et al., 2010), but it is imperative that educators be trained in the use of the chosen evaluation tool so that reliability between raters remains consistent (Parsons et al., 2012).

In reviewing this literature, I came to see that more work must be done around determining specific thinking and actions students must show to be determined competent for professional practice. More specifically I recognised the need to start with ‘me.’ What is required of me as a simulation facilitator in order to be deemed competent in my teaching which incorporates high-fidelity simulation? When this is more clearly defined, I can begin to use high-fidelity simulation to assess students in their competence and readiness for professional practice.

As nursing programmes increasingly integrate simulation throughout curricula and substitute simulation for clinical hours, reliable and valid evaluation instruments designed specifically to measure the learning outcomes and effectiveness of stimulation as a teaching strategy are required (Kardong-Edgren, Adamson, & Fitzgerald, 2010; Yuan et al., 2012). In reviewing this literature, I came to see that high-fidelity simulation may have the potential to be an effective and meaningful assessment tool for my students. However, in order for this to happen I must find and become trained in an assessment rubric which could be used in my own implementation of high-fidelity simulation. This literature revealed the breadth of issues that require attention in order for any assessment rubric to become an effective part of assessment with my undergraduate nursing students. The research which informed this discussion can be found in Table 3.3.

Table 3.3 *Literature Summary for Assessing Competence*

Category 1.3: High-fidelity Simulation as a means of assessing competence	
Adamson et al. 2012	
Purpose	This article describes two frameworks for categorising simulation evaluation strategies and provides a review of recent simulation evaluation instruments.
Issue underpinning study	Simulation should be a core educational strategy because it is “measurable, focused, reproducible, mass producible, and importantly, very memorable.” These qualities make assessing performance within it valuable.
Participant information	This is a review of published simulation evaluation instruments.
Method	A review which includes: An update on four instruments from our original review A review of objective structured clinical examinations (OSCEs), including the development of four OSCE instruments in undergraduate nursing education A report on instruments that are either new or were not included in the original instrument review article
Location of study	United States

Findings	<p>Two articles cited in the table used the Spielberger State-Trait Anxiety Inventory to evaluate participant anxiety related to simulation activities.</p> <p>The National League for Nursing's Simulation design and student satisfaction and self-confidence in learning scales continue to be popular.</p> <p>Within the category of learning, most evaluation instruments focus on cognitive learning. This is disappointing because these low levels of evaluation may not reflect the effects simulation training has on the most important stakeholders in health care education: the patients.</p>
Critique	<p>Strength: Outlines criteria to judge whether a rubric is useful outside of reported high reliability and validity scores.</p> <p>Weakness: Alternatives for rubrics which focus on other areas outside of cognitive learning are not highlighted. This would be useful in terms of providing broader feedback to participants in simulation.</p> <p>Weakness: It is time to step up and focus on what really matters: how simulation affects learning, behaviours, and ultimately patient outcomes. The literature is saturated with reports of low-level participant evaluations, including reaction (Kirkpatrick's Level 1).</p>
How findings relate to this research	<p>It is not enough to select a tool from a list with high marks reported in reliability and validity.</p> <p>It is important to consider whether the instrument is appropriate for the population and the activity to which it is being applied.</p>

Davis & Kimble, 2011

Purpose	This article identifies and assesses six rubrics purported to measure outcomes of human patient simulation and evaluates how these rubrics measure outcomes reflecting the baccalaureate essentials.
Issue underpinning study	A call for curriculum that meets the educational needs of nurses in the 21 st century underpins this article. Faculty shortages and lack of clinical placements have motivated the use of simulation in undergraduate nursing programmes.
Participant information	This article is a review of by the <i>American Associate of Colleges of Nursing</i> in regards the nine essentials for baccalaureate nursing education.
Method	Several rubrics are used and evaluated in terms of ability to measure 9 essentials for baccalaureate nursing education developed by AACN.
Location of study	United States
Findings	<p>Essentials V and VII were not measured by any of the rubrics.</p> <p>Essential V entails the aspects of health care policy, finance, and regulatory environments. An evaluation rubric should be developed that has integrated the evaluation of a working knowledge of this information.</p>
Critique	<p>Strength: The article does identify how six rubrics meet the competencies outlined.</p> <p>Weakness: There is no reference as to how Essentials V and VII can influence outcomes for patient safety or educational preparation. Should educators be worried they are missing? This is unclear.</p>
How findings relate to this research	Evaluation rubrics would be a very good way to give feedback to Millennial learners as they love the instantaneous nature of this kind of communication.

Fero et al. 2010

Purpose	This paper is a report of an examination of the relationship between metrics of critical thinking skills and performance in simulated clinical scenarios. A majority of nursing programmes rely heavily on multiple-choice examinations in the classroom. Acute clinical situations are often managed by staff nurses due to urgency. This limits opportunities to critique practice and increase independent decision-making ability.
Issue underpinning study	Nursing competency plays a vital role in assuring patient safety. Sentinel events commonly occur in acute care settings where new graduate nurses begin professional careers. The ability of new graduates to think critically and intervene effectively is essential. Simulation is being researched as an effective tool in the development of critical thinking.
Participant information	Convenience sample of 36 nursing students.
Method	Students participated in measurement of critical thinking skills and simulation-based performance using videotaped vignettes, high-fidelity human simulation. The California Critical Thinking Disposition Inventory and California Critical Thinking Skills Test were used to evaluate student performance. Simulation-based performance was rated as 'meeting' or 'not meeting' overall expectations. Test scores were categorized as strong, average, or weak.
Location of study	United States
Findings	75% students did not meet overall performance expectations using videotaped vignettes or high-fidelity human simulation. Difficulty related to problem recognition and reporting findings to the physician. 25% had a strong critical thinking disposition, 56% were average, and 19% were considered weak. Simulation-based performance assessment in the nursing population is limited. The literature lacks evidence which encompasses the full use of simulation evaluation, including critical thinking.
Critique	Strength: VTV and HFHS are simulation-based methods that can potentially assist in the evaluation and application of critical thinking skills. Weakness: Variables as to race/gender and age are given but not discussed in relation to how they affected performance.
How findings relate to this research	This research does not consider Millennial preferences. 75% of students did not meet overall performance expectations showing that research is needed to improve these performances.

Kardong-Edgren et al. 2010

Purpose	A review of currently published evaluation instruments. Traditional methods of clinical instruction are not particularly successful in preparing students for complex clinical environments. Clinical education has traditionally consisted of a relatively unsystematic 'apprenticeship process'.
Issue underpinning study	Simulation has generated a need for reliable and valid clinical evaluation tools to measure student learning in the simulation setting. A novel simulation evaluation tool might reflect not only student performance but also patient outcomes. This "gold standard" has not been seen in the literature to date.
Participant information	This is a review of evaluation instruments used in simulation.

Method	<p>Review of currently published evaluation instruments to:</p> <ul style="list-style-type: none"> Discuss the importance of learning domains in evaluation. Review current challenges in designing simulation evaluation tools. Provide a sampling of clinical simulation tools currently found in the literature that show promise for further refinement and development. <p>Tools are required to measure:</p> <ul style="list-style-type: none"> Cognitive learning Psychomotor learning Affective learning Interdisciplinary evaluation tools Tools currently under development <p>Evaluating all these domains is difficult.</p>
Location of study	United States
Findings	<p>Human patient simulation provides the ability to produce clinical experiences encompassing the affective, cognitive, and psychomotor domains.</p> <p>Many going for “low-hanging fruit” of self-reported satisfaction and confidence</p> <p>While easily obtained, these measurements will “not result in a comprehensive and valid assessment of the overall impact of simulation experiences.”</p> <p>Satisfaction and confident measures show little relationship to clinical competence, so we must be wary of these studies.</p>
Critique	<p>Strength: There are 22 evaluation tools reviewed which is a much larger number than other review articles.</p> <p>Weakness: Most of them do not report reliability and validity figures which is an important and useful factor when making a choice.</p> <p>Weakness: Self-report is excluded, and this is an important qualitative reference point.</p>
How findings relate to this research	<p>This article provides information on 22 simulation evaluation tools available for evaluating clinical simulation performances.</p> <p>Further use and development of these published simulation evaluation instruments are of the highest importance.</p> <p>A moratorium on self-report and satisfaction instrumentation development is suggested as the literature does not suggest that these data provide particularly useful information. So we need to start looking for other data than self-report and analysis.</p>
Kardong-Edgren et al. 2011	
Purpose	The purpose of this article is to provide an extended discussion on the International Nursing Association for Clinical Simulation and Learning (INACSL) Listserv around the use of simulation for high-stakes testing. That discussion led to a roundtable at the 2009 INACSL conference in St. Louis. This article comes from notes taken at that roundtable and further-developed thoughts of the lead discussants.
Issue underpinning study	<p>High-stakes testing was defined as tests with the potential to fail students, at the end of a course or programme, on the basis of a simulation experience.</p> <p>Nursing is the only health profession that does not have a practical examination as part of an examination for initial or renewal licensure, thus allowing our current high-stakes test to be a paper-and-pencil exam that allows one to report “proposed actions.”</p>
Participant information	Report of roundtable discussion about use of simulation for high-stakes testing in United States.
Method	Report of discussion.
Location of study	United States

Findings	<p>We have to re-examine the readiness of our nursing students for patient care.</p> <p>We can do better than a 75-question multiple-choice exam.</p> <p>If simulation was used in lieu of clinical hours, and students were familiar with the environment, educators felt comfortable with high-stakes, end-of-course and end-of-programme testing.</p>
Critique	<p>Strength: Identification that nursing is behind other professional healthcare careers in requiring competency assessment on a regular basis.</p> <p>Weakness: Some are concerned the stress level of test preparation will negatively affect the lessons learned in simulation experiences.</p> <p>Weakness: Is the same high-stakes simulation testing standard realistic for large university centres versus small colleges versus community colleges? Also, who determines what is a pass or fail? This must be a decision across institutions?</p>
How findings relate to this research	<p>Every other licensed health care worker, from nursing assistants and respiratory therapists to pharmacists and physicians, is required to pass a practical component to receive licensure.</p> <p>Why is nursing different? New Zealand, along with other countries around the world, needs to consider a practical component registration requirements. Simulation could play some part in this.</p>

Lapkin et al. 2010

Purpose	This article is a systematic review done to identify the best available evidence on the effectiveness of the use of human patient simulation manikins (HPSMs) to teach clinical reasoning skills to undergraduate nursing students.
Issue underpinning study	<p>There is a lack of unequivocal evidence of the effectiveness of using high-fidelity HPSMs in the teaching of clinical reasoning skills to undergraduate nursing students.</p> <p>Further research is required to ascertain the effectiveness of the use of HPSMs as an educational strategy to improve the clinical reasoning skills of undergraduate nursing students.</p>
Participant information	Systematic review of effect of simulation on clinical reasoning, critical thinking, and knowledge acquisition.
Method	This report parallels the results of the Performance Based Development System, a tool employed to assess nurses' clinical reasoning, which showed that 70% of graduate nurses in the United States scored at an "unsafe" level. "Failure to rescue," defined as mortality of patients who experience a hospital-acquired complication, is directly related to the quality of care and clinicians' clinical reasoning skills.
Location of study	Australia
Findings	<p>The results indicate that the use of HPSMs improves knowledge acquisition and critical thinking and enhances students' satisfaction with the learning.</p> <p>The group exposed to the HPSMs had a significant increase in critical-thinking abilities when compared with the interactive case study group.</p> <p>A significant increase in knowledge gain in groups exposed to HPSMs.</p> <p>The results indicated that students who received HPSM instructional methods achieved significantly higher post-test scores than did those who received the traditional lecture.</p>
Critique	<p>Strength: Shows impact of HPSMs on both content knowledge and clinical reasoning.</p> <p>Weakness: Instructional design and facilitator training in the use of this tool is not addressed.</p>
How findings relate to this research	<p>HPSM group scored significantly higher on the post-test.</p> <p>Two studies indicated overwhelming student satisfaction with HPSMs.</p>

Lasater, 2007

Purpose	This article describes an exploratory study that originated and pilot tested a rubric in the simulation laboratory to describe the development of clinical judgment, based on <i>Tanner's Clinical Judgment Model</i> .
Issue underpinning study	Clinical judgment is viewed as an essential skill for every nurse and distinguishes professional nurses from those in a purely technical roles. Nurses care for patients with multifaceted issues; in the best interests of these patients, nurses often must consider a variety of conflicting and complex factors in choosing the best course of action.
Participant information	Two groups of 12 students each came to a hospital-like room containing a computerised human patient simulator, on one of two mornings per week, in lieu of their clinical practicum. Each group of 12 students engaged in the activity for 2½ hours, for a total of 48 students during the 2 days.
Method	This study involved: Describing students' responses to simulated scenarios, within the framework of Tanner's (2006) Clinical Judgment Model Developing a rubric that describes levels of performance in clinical judgment Pilot testing the rubric in scoring students' performance
Location of study	United States
Findings	Five themes emerged from the focus group discussion: <ol style="list-style-type: none">1. The strengths and limitations of high-fidelity simulation.2. The paradoxical nature of simulation (i.e., provoking anxious and stupid feelings, yet increasing awareness).3. An intense desire for more feedback about their performances.4. The importance of students' connection with others.5. Rubric offers language that is understood by both faculty and students and sets standards that students can comprehend and work toward.
Critique	Strength: Although clinical judgment is clearly related to practical experience, which high-fidelity simulation provides for students in addition to their clinical practicum, students can better learn when they are clear about expectations and receive direct feedback about their performance. Weakness: Raters using the rubric need to be trained to increase reliability between raters. Weakness: Creating a rubric that reports A,B,C, is more difficult than pass or fail. Yet, a grading system would be more valuable to evaluate degrees of student achievement.
How findings relate to this research	Rubrics help facilitate communication. Rubrics provide language to assist faculty in giving feedback. Rubrics can provide a more level playing field for increasingly diverse groups of students. Rubrics clarify expectations for students who subsequently receive direct feedback about their performance.

Parsons et al. 2012

Purpose	The purpose of this article is to describe the development and use of the Creighton Simulation Evaluation Instrument (C-SEI), which was developed during a 2-year time frame to assess student performance during a simulated clinical experience (SCE).
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Issue underpinning study	The concerns were trifold: <ol style="list-style-type: none"> 1. There was no formal training process in place to ensure consistent and appropriate use of the C-SEI 2. Lack of education might result in inconsistent reliability results for some items 3. Reliability results for some items indicated variation in percentage agreement among evaluators
Participant information	This article is a review of the instrument and dialogue among faculty to determine expectations of student performance.
Method	Review article.
Location of study	United States
Findings	Improved percentage agreement scores were noted. Education and faculty dialogue improve consistency of student assessment and add richness to the learning experience. Percentage agreement was used to establish reliability and ranged from 62.5% to 100%
Critique	Strength: The rubric provides a way of evaluating performance and giving feedback. Weakness: Extensive training is required in order to ensure reliability amongst raters. This may be difficult for smaller institutions or schools in remote areas.
How findings relate to this research	Educator dialogue needs to be a part of any assessment rubric used at our institution This dialogue has the potential to improve consistency of student assessment and add richness to the learning experience. All educators using simulation must go through training. This article includes worksheet for detail given to evaluators to ensure students pass or fail each component.

Tanner, 2011

Purpose	This article discusses the importance of developing suitable measures for the assessment of learning outcomes in simulation.
Issue underpinning study	Nursing education research lacks common metrics or standardised approaches for the evaluation of learning outcomes that are relevant for a practice discipline and that assess not only students' knowledge gains, but also their ability to use this during the provision of patient care.
Participant information	Review article.
Method	Systematic review.
Location of study	United States
Findings	Three broad categories of learning outcome assessments have been used in nursing education research: <ol style="list-style-type: none"> 1. Student <i>perceptions, attitudes, or opinions</i>: students' ratings of learning, their attitudes toward an instructional activity. 2. Tests of <i>content knowledge or skills</i>: A wide range of tests are used to evaluate student knowledge, then aggregated for use in evaluation of an educational intervention. 3. Tests of <i>performance within a particular clinical context</i>: In a practice discipline, content knowledge is a necessary but insufficient condition for safe practice. <p>In a practice discipline, content knowledge is a necessary but insufficient condition for safe practice.</p> <p>Nurses must also have the ability to recall knowledge that is relevant for a particular clinical situation, an ability referred to as <i>situated cognition</i>.</p> <p>To have high quality evaluation of educational innovations, we must have investment of</p>

	resources — investigator expertise, time, and money — to develop measures that are appropriate for a clinical practice discipline and that will reflect variations in educational approaches.
Critique	<p>Strength: The identification of the concept of situated cognition is an important aspect of clinical judgment identified in this article.</p> <p>Weakness: Little investment has been made in developing suitable measures for the assessment of learning outcomes — all quantitative scales are leaving out the qualitative experience of the learner.</p> <p>Weakness: Nursing education research lacks common metrics or standardised approaches for the evaluation of learning outcomes that are relevant for a practice discipline and that assess not only students' knowledge gains, but also their ability to use it during the provision of patient care.</p>
How findings relate to this research	<p>The ability to build the evidence essential for quality nursing education involves research employing metrics or standardised approaches for the evaluation of learning outcomes.</p> <p>High-fidelity simulation, coupled with rating scales or assessment rubrics holds great promise for testing students' ability to use relevant knowledge in particular contexts.</p> <p>Nurses must also have the ability to recall the knowledge that is relevant for a particular clinical situation, an ability referred to as <i>situated cognition</i>.</p>

1.4 High-fidelity simulation as an accepted substitute for clinical hours.

There has been a significant amount of research regarding simulation use in nursing education; however, there is limited research available regarding the replacement of traditional clinical hours with simulation experiences (Cornelius, 2012). This phenomenon of replacing mandatory clinical hours with simulation is reported in the literature (Harder & Nicole, 2010; Sears et al., 2010). With the development of sophisticated human patient simulators that allow for immediate response to nursing interventions, a widespread acceptance and use of simulation by nursing education programmes is occurring (Dowie & Phillips, 2011; Garrett et al., 2011). An example of this is the acceptance by the California Board of Registered Nursing of replacement of up to 25% of clinical hours with simulation (Totman, Waneka, Bates, & Spetz, 2013). All four nursing programmes in the Northern Sacramento Valley reported using clinical simulation in 2011-2012, and two of these programmes plan to expand its use in the coming year. The importance of clinical simulation is underscored by data showing an increase in out-of-hospital clinical placements. In addition, 75% (n=3) of schools reported that their students had faced restrictions to specific types of clinical practice during the 2011-2012 academic year (Totman et al., 2013); thus ushering in the use of simulation as a viable support to student learning.

Canada is also moving forward in simulation with the opening of multiple simulation learning centres around the country (University of Calgary, 2014). Canada has instigated a study to evaluate the effectiveness of simulation within Canadian professional healthcare education (Garrett et al., 2007). As evidenced above, North America is purposefully moving forward in its thinking around and integration of simulation in health professional preparation.

The National Board in Australia has taken a similar stance with nursing and midwifery in Australia with the *National Registration and Accreditation Scheme* (National Scheme) which came to effect on 1 July 2010 (Australian Health Practitioner Regulation Agency, 2010). Most

accredited undergraduate nursing institutions in Australia require around 800 clinical hours for registration (*Health Practitioner Regulation National Law (Queensland) 2009*, 2014). Simulation is currently being integrated into undergraduate nursing in a proactive manner through the efforts of Health Workforce Australia (Health Workforce Australia, 2010a, 2010b, 2010c, 2010d).

Currently New Zealand is the only country in this group, (United Kingdom, Canada, United States, Australia and New Zealand) where replacement of clinical hours with simulation is not allowed (Nursing Council of New Zealand, 2012, p. 3.1.2). Instead, the mandated 1100-1500 clinical hours is being extended to nursing schools in New Zealand through legislation ("Health Practitioners Competence Assurance Act," 2003). Other countries are proactively pursuing simulation replacement opportunities (Garrett et al., 2011; Kardong-Edgren, 2010; McCaughey & Traynor, 2010; National Council of State Boards of Nursing, 2011; Nursing Midwifery Council, 2010a). The resounding question ringing in many educators' ears revolves around how a practice discipline requiring clinical judgment, acquired mainly through experiential learning, continues to use a paper-based examination for licensure (Benner et al., 2010). Some are calling for a radical transformation in assessing competency which requires formative and summative evaluations via simulation (Benner et al., 2010; Kardong-Edgren, 2010).

Benner (2010) believed that both formative and summative evaluation of competence should become a part of students' professional portfolio. As educators, we should busy ourselves developing a "new set of student performance assessments with three national examinations of performance...given in simulation laboratories or with trained patient actors" (Benner et al., 2010, p. 229). She advocated that such a set of assessments should start during the beginning of the last year of nursing school with the first performance examination. The next should be given at the same time the students sits whatever state final required by their country's governing boards, and the last should occur at the end of a one-year post-licensure residency (Benner et al., 2010). Benner argued this will help ensure that student gaps in learning and practice are addressed and students continue to learn as they move into professional practice with an ability to make sound clinical judgments (Davis & Kimble, 2011; Dillard et al., 2009) based on appropriate clinical reasoning (Lapkin et al., 2010; Levett-Jones et al., 2011).

Clinical simulation provides a simulated real-time nursing care experience which allows students to integrate, apply, and refine specific skills and abilities that are based on theoretical concepts and scientific knowledge. Simulation may include videotaping, de-briefing and dialogue as part of the learning process (Gates et al., 2012; Jeffries, 2007; Nehring & Lashley, 2010). Simulation usage, as a replacement for clinical hours, is occurring for a variety of reasons (Totman et al., 2013) which include competition for clinical sites (Kline, Hodges, Schmidt, Wezeman, & Coye, 2008), staff overload or insufficient qualified staff to train students (Totman et al., 2013), lack of standardised opportunities for all students across all sites (McNelis et al., 2011), and a decrease in patient census along with increasing patient complexity (Krichbaum et al., 2007).

In reviewing this literature I came to see that more work needs to be done to build an evidence base necessary to determine to what extent simulation can be used as a substitute for traditional clinical experiences (Gates et al., 2012). I am recognising that the specific design and replacement of some clinical hours with high-fidelity simulation must begin with determining what

types of scenarios and content should be covered in undergraduate nursing. The literature revealed the breadth of issues that I will need to be mindful of in order to ensure that my students have high-fidelity simulation opportunities which will best scaffold them into professional practice. The research which has inspired this discussion can be found in Table 3.4 (pp. 64-69).

Table 3.4 Literature Summary for Substituting Simulation for Clinical Hours

Category 1.4: High-fidelity simulation as an accepted substitute for clinical hours	
Garrett, 2007	
Purpose	The purpose of this project is to develop an inventory of simulation use for healthcare professional preparation in Canada and explore the evidence base for its use, cost effectiveness and possibilities for multi-professional collaboration.
Issue underpinning study	Simulation underutilised in health professional education in Canada.
Participant information	All Canadian Schools of Nursing with undergraduate education programmes comprised the primary target audience for the survey, giving the potential number of schools of nursing participating at 81. There were 71 respondents who agreed to complete the survey of which 11 respondents also took part in the telephone interviews.
Method	A research strategy and tools were developed, included 3 data collection methods: <ol style="list-style-type: none"> 1. A Web based survey questionnaire exploring usage, costs and perceptions of the value of clinical simulation (for pre-licensure education providers and post qualifying education providers and health care agencies), 2. A Delphi technique consensus survey of the pedagogic value of clinical simulation for clinical education providers, and 3. Telephone Focus groups (for educators/trainers, and preceptors using simulation).
Location of study	Canada
Critique	Strength: 71 schools responded to survey representing a large percentage of schools in Canada. Strength: 44% of professional programs provided interdisciplinary training opportunities using simulation thus strengthening interprofessional collaboration. Weakness: Telephone focus groups lack the collaborative feedback from the group members as part of the participatory process.
Findings	Lack of standardisation in use of terminology around simulation. 70% of respondents indicated they used simulation learning as an augmentation to clinical learning. 17/64 programs reporting used simulations as a formal requirement in their curriculum experience. Team building was seen as a particularly valuable use of simulation technique. Access to simulation technology is an issue due to cost or lack of access to appropriate devices. Improved client safety and better prepared practitioners are accepted as the key reason for using simulation in health professional education and training. There were mixed responses by educators on the ability of simulation to completely replace clinical practical experiences. The majority felt this was inappropriate, whilst some felt 10-20% could be replaced.

How findings relate to this research	Canada is thinking about replacing some clinical hours with simulation. They have found that simulation is a good team-building tool. Access to technology and cost are barriers to progression.
Dowie & Phillips, 2011	
Purpose	This article describes a small informal review that aimed to identify how lecturers felt about simulation in one faculty using high-fidelity simulated scenarios to inform the development of a subsequent research study. The results indicate that although many staff use simulation and believe it is a beneficial approach to learning, many also lack confidence and do not feel sufficiently prepared in its use. Most participants felt that the development of a simulation module for lecturers would increase their confidence.
Issue underpinning study	<p>Since 2001, simulation as a method of teaching has had renewed popularity in healthcare programmes.</p> <p>In November 2007, after completion of a pilot study examining the use and effectiveness of high-fidelity simulation in 13 institutions, the Nursing and Midwifery Council (NMC) distributed a circular, which allows training institutions to dedicate 300 hours to simulation out of 2300 hours of clinical practice (NMC 2007a).</p> <p>A significant number of nursing students were having difficulty learning essential clinical skills during their clinical placement because of the large numbers of students allocated to an area at any one time and a lack of qualified mentors to support them.</p>
Participant information	A total of 20 questionnaires were distributed with a 100% response rate.
Method	Questionnaires of nursing educators. Participants were recruited as a convenience sample from one institution, on the basis of their role as lecturers in nursing and midwifery and availability on the date of data collection.
Location of study	United Kingdom
Findings	<p>Simulation started to be used to help students develop confidence and clinical skills. 300 hours allocated to simulation out of 2300 hours of clinical practice.</p> <p>90% (n = 18) of educators were using high-fidelity simulation in their teaching, which contradicts the view often suggested in the literature that high-fidelity simulation is an underused resource.</p> <p>Only 40% (n = 8) of educators indicated that they felt confident in using simulation, with only 35% (n = 7) suggesting that they felt sufficiently prepared in its use.</p> <p>The results indicate that although many educators use simulation and believe it is a beneficial approach to learning, many also lack confidence and do not feel sufficiently prepared in its use.</p>
Critique	<p>Strength: Shows high uptake of high-fidelity simulation amongst educators to the tune of 300 hours out of 2300.</p> <p>Weakness: No mention of how to train the facilitators for this amount of simulation (and this in light of findings that only 35% felt prepared to use this tool).</p> <p>Weakness: Only 20 questionnaires were done which is not a big enough sample to draw strong conclusions.</p>
How findings relate to this research	<p>There is evidence to support the use of simulation for some clinical hours.</p> <p>Educators expected to facilitate simulation need to be educated in its usage.</p> <p>New Zealand needs to produce study so that simulation can be included in clinical hours.</p> <p>More research needs to be done on how to train the trainers for use of simulation.</p> <p>Participants felt that the development of a simulation module for educators would increase their confidence.</p>

Hayden, 2014

Purpose	The purpose of this article is to report the results of a longitudinal study begun in 2010 which by design integrated simulation at 10%, 25% and 50% replacement of clinical hours. The outcome was the finding that simulation did not hinder student progress. Further study is called for to address the ratio of traditional clinical hours to simulated clinical experiences. The upper limit of 50% simulation included in this study did not determine a point at which substitution affects educational outcomes. In addition, the impact of the proportion of time a student spent actively participating in a simulation, as opposed to observing, may also warrant further research.
Issue underpinning study	In 2010, the National Council of State Boards of Nursing (NCSBN) convened the National Simulation Study, a large-scale, randomised, controlled study that encompassed the entire nursing curriculum.
Participant information	Ten nursing programs, five and five BSN, were selected from institutions of various sizes, in geographically diverse areas across the United States and representing both urban and rural populations, to participate in the study.
Method	This article is reporting the results from the NCSBN longitudinal simulation study.
Location of study	United States
Findings	<p>At this time point, there were no statistically significant differences in clinical competency as assessed by preceptors and instructors ($p = 0.688$).</p> <p>No statistically significant differences in comprehensive nursing knowledge assessments ($p = 0.478$).</p> <p>No statistically significant differences in NCLEX® pass rates ($p = 0.737$) among the three study groups.</p> <p>Further, after moving into their first positions of nursing employment, manager ratings showed no statistical significance in the study subjects' clinical competency or readiness for practice at six weeks ($p = 0.706$), three months ($p = 0.511$), or six months ($p = 0.527$).</p> <p>The evidence suggests that the amount of simulation used in a program is not a factor in that program's success, so long as a culture of institutional support, feed-back, and ongoing faculty training is cultivated by administrators.</p> <p>In both environments, when structure, an adequately prepared faculty with appropriate resources, dedication, foresight, and vision are incorporated into the pre-licensure nursing program, excellent student outcomes are achieved".</p>
Critique	<p>Strength: This research brings together 10 schools and their use of high-fidelity simulation use in place of clinical hours in three different percentages (10%, 25%, 50%). This design is robust in breadth and scope.</p> <p>Weakness: Analysis of communication skills or students' ability to work in teams is not assessed in this research.</p> <p>Comment: The impact of the proportion of time a student spent actively participating in a simulation, as opposed to observing, warrants further research.</p>
How findings relate to this research	The study's results align with other research that has substituted simulation for a portion of traditional clinical experiences.

Health Workforce Australia, 2010

Purpose	This literature review identified opportunities for expanded use by highlighting the body of research (national and international) that indicates the efficacy of Simulation in a disparate range of settings.
Issue underpinning study	The Simulation Environments National Project focuses on enhancing the capacity of clinical placements through the use of simulation environments. The planning process for the distribution of Simulation will be guided by a nationally developed and endorsed approach as to what aspects of the various professions' curricula are suitable for simulation.

Participant information	n=12 Stakeholders from across the country, n=34 heads of schools for survey, n=47 electronic survey responses
Method	<p>This was a government-funded project. A Project Governance Group was established and the project methodology refined. The following five phases to the project were developed:</p> <p>Phase 1: Literature review</p> <p>Phase 2: Head of Schools Survey (n=34)</p> <p>Phase 3: Stakeholder Consultation (n=12)</p> <p>Phase 4: Electronic Survey: Forty-seven responses were received (response rate of 78%).</p> <p>Phase 5: Consultations on Findings</p>
Location of study	Australia
Findings	<p>There is discontent and frustration with the lack of clinical placements, and the data collected indicates a desire to utilise simulation for unavailable clinical experiences or events.</p> <p>Despite rapidly increasing use of simulation based teaching methods, there is little robust research on the effect of simulation-based facilities on learning outcomes in nursing.</p> <p>While acknowledging the evidence supporting the use of simulation to facilitate the transfer of knowledge to performance is in its infancy, responses indicate that simulation is perceived to be a valuable method of learning, which has a positive effect on the clinical effectiveness of students approaching the transition to registered nurses.</p> <p>No studies definitively identify opportunities to expand the use of simulation platforms to achieve learning outcomes of clinical placements.</p> <p>41% of nominees state they have simulation equipment that is sitting idle or is underutilised.</p> <p>There is a lack of professional development (training) programs to up-skill instructors/educators that work in simulation, and 69% of nominees believe there is a need for certification/credentialing, or a required level of training/understanding, to ensure there is an understanding of the fundamentals of simulation terminology and concepts.</p>
Critique	<p>Strength: Participant numbers large and methods are varied in this research which has a robust design.</p> <p>Weakness: Continued lack of training in simulation design and implementation is not addressed with any effective strategies.</p> <p>Further research: Ratio of clinical hours to simulation hours needs further study. Current study used a 1:1 ration, but more research needs to be done to see what the ratio should be to maximise both settings.</p>
How findings relate to this research	<p>Clinical placement access is a problem in Australia and simulation is looked to as an answer.</p> <p>More research is needed on the effect of simulation on learning outcomes in nursing.</p> <p>More research needed on how to use simulation platforms to achieve learning outcomes in clinical placements.</p> <p>There needs to be commitment on all involved that equipment does not sit idle. Plan/vision required to use simulation to its fullest capacity.</p> <p>A certification/credentialing system needs to be developed in New Zealand for those desiring to work in simulation.</p>
Kardong-Edgren et al. 2012	
Purpose	The purpose of this article was to report the results of National Council of State Boards of Nursing Simulation Survey, Part II. The outcome demonstrated that simulation continues to be adopted in nursing programs, but there is a lack of funding for both faculty training and increased simulation use.

Issue underpinning study	Inconsistencies in undergraduate preparation in nursing education in regards to the amount of simulation. Need to gain consensus on both kinds and amount of simulation used in undergraduate nursing degrees.
Participant information	All pre-licensure nursing programmes in the USA were mailed the survey, 62% responded (n = 1060)
Method	Survey with 62% response rate.
Location of study	United States
Findings	Standardised patients are used by slightly over 1/3 of programmes. More than 50% required some scenarios for all students. 1/3 felt that communication and organisational culture could not be learned in simulation. Simulation is one way to provide nonlinear complex learning opportunity required in today's clinical settings. Simulation is essential to supplement weaknesses of traditional clinical time. 83% of respondents were in the process of adopting simulation as a teaching strategy.
Critique	Strength: Large number of participants with 62% response rate. Weakness: Just requiring simulation does necessarily meet the needs of undergraduate education. It would be useful to know what kinds of simulation are used along with which were most effective in producing improved clinical judgment, reasoning, and teamwork.
How findings relate to this research	When simulation is a curricular add-on, it is more expensive than when integrated into the programme as a modifying structure. Faculty must have training in order to ensure safe and effective learning environments. Over half of respondents to survey are in process of adopting simulation as a teaching strategy. We in New Zealand need to be more proactive about following suit.

National Council of State Boards of Nursing, 2011

Purpose	The purpose of this article is to report on research involving a collaboration amongst learning institutions across the U.S.A. The National Council of State Boards of Nursing (NCSBN) embarked on a research initiative exploring the role and outcomes of simulation in pre-licensure clinical nursing education.
Issue underpinning study	The number of undergraduate programmes has increased, creating more competition for clinical placement sites. Patient safety initiatives at some acute-care facilities have reduced the number of nursing students permitted on a patient unit at one time, creating even fewer educational opportunities. In addition, faculty members report that restrictions on what students may do in clinical facilities have increased and that students' time in clinical orientation are barriers to optimising students' clinical learning. Clinical competency upon graduation for many students is not what is required by clinical settings.
Participant information	The survey was sent to all pre-licensure nursing programmes in the US in January 2010. Responses were received from 1060 programmes, representing all 50 states (a 62% response rate). Ten nursing programmes, across the US, were selected to participate as sites for the National Simulation Study. Five associate degree and five baccalaureate programmes were selected based on an application process and the ability to meet study eligibility criteria.

Method	<p>The NCSBN National Simulation Study was conducted in three phases. Phase I involved a national survey of simulation use in pre-licensure nursing programs. Phase II was a randomised, controlled study examining the outcomes of various amounts of simulation to replace a portion of the hours spent in traditional clinical settings. Phase III was a longitudinal study that will follow the nurse graduates into their clinical practice as new registered nurses.</p> <p>In August 2011, new nursing students were randomised to one of three study groups: clinical as usual (control), 25% simulation or 50% simulation. Students remained in their assigned study group for all of the core clinical courses in their nursing programme. Each semester and in each of the core clinical courses, students were assessed on their nursing knowledge, clinical competency and how well they perceived their learning needs were met in both the clinical and simulation environments.</p>
Location of study	United States
Findings	Still being reported and published. This final phase of the study will examine how well the new graduate nurses were prepared for practice. This phase of data collection began when the study cohort graduated in May 2013, and continues through June 2014. See report (Hayden, 2014) for final results.
Critique	<p>Strength: Research design is robust using longitudinal, randomised controlled trial.</p> <p>Strength: 10 schools involved giving breadth to the study.</p> <p>Strength: Varying levels of simulation as substitution for clinical hours gives increased strength to truthfulness and validity of study.</p> <p>Weakness: Students are evaluated in nursing knowledge and clinical competency, but there is no evaluation of teamwork or communication skills in any cohorts.</p>
How findings relate to this research	The US is studying the effects of replacing 10%, 25%, and 50% of clinical hours in hopes of coming to an understanding of how much simulation undergraduate nursing schools should be using to ensure competency and exposure of their graduates. New Zealand would be wise to consider similar research, and reconsider current restrictions on simulation replacing clinical hours.
Nehring, 2008	
Purpose	The purpose of this research is to do a reconnaissance of current boards of nursing as to their stance on simulation as a tool.
Issue underpinning study	Lack of quality clinical sites and need to prepare undergraduate nurses to a higher level of competency in knowledge, competency, and clinical reasoning and judgment.
Participant information	Boards of nursing in all 50 states in the USA, District of Columbia, and Puerto Rico
Method	<p>A survey was mailed to the boards of nursing in all states, the District of Columbia, and Puerto Rico to ascertain the use of high-fidelity patient simulators for clinical time in current regulations.</p> <p>Participants were asked if high-fidelity patient simulation could be substituted for clinical time in the regulations and, if so, for what percentage. If not, they were asked whether they gave approval to nursing programmes to substitute clinical time with high-fidelity patient simulators and, if so, for what percentage.</p> <p>Finally, the participants were asked whether they felt that the regulations would be changed in the future to allow the use of high-fidelity patient simulators to substitute for clinical time.</p>
Location of study	United States, District of Columbia, and Puerto Rico

Findings	Five states and Puerto Rico have made regulation changes to allow for such substitution, but only Florida has indicated a percentage of time. Sixteen states currently give approval for simulation substitution, and 17 states may consider regulation changes concerning high-fidelity patient simulation in the future. Such findings have implications for alterations in the pre-licensure nursing curriculum that could examine patient safety and quality concerns addressed by the public and leading health and nursing organisations.
Critique	Strength: Breadth of research included all 50 states, District of Columbia and Puerto Rico. Weakness: Simple use or non-use of simulation may not be enough information to determine the depth and quality of undergraduate preparation required for competency.
How findings relate to this research	These findings have implications for New Zealand as to their stance on forbidding simulation to replace any of the 1100-1500 clinical hours currently required.

Nursing and Midwifery Council, 2010

Purpose	Outlines requirements for pre-registration of nurses in the United Kingdom.
Issue underpinning study	This document outlines the standards for pre-registration nursing education in the United Kingdom.
Participant information	Legislative document.
Method	Legislation
Location of study	United Kingdom
Findings	2300 hours of clinical experience required for pre-registration nurses in the UK. 300 of these hours may be simulated.
Critique	Strength: This document allows 300 clinical hours of simulation to replace clinical hours in the United Kingdom. This legislation provides opportunity to move undergraduate nursing students away from an apprenticeship model of education and into immersive learning environments. Weakness: No provision is made for training educators in the design and implementation of simulation. This is significant as 300 hours is a lot of hours to fill with no trained facilitators.
How findings relate to this research	If the United Kingdom is allowing 300 clinical hours of simulation to replace clinical hours, New Zealand might need to rethink its stance on not allowing any part of mandatory clinical hours to be simulated.

Totman, 2013

Purpose	The purpose of this article is to report on the Board of Registered Nurses (BRN) commissioned study done in San Francisco (UCSF) to conduct a historical analysis of data collected from the 2001-2002 through the 2010-2011 in the form of a survey. In this report, we present ten years of historical data from the BRN Annual School Survey.
Issue underpinning study	In 2011-2012, the Northern Sacramento Valley had a total of four pre-licensure nursing programmes. Between August 2011 and July 31, 2012 all four Northern Sacramento Valley nursing schools reported using clinical simulation. The most frequently reported reasons why schools in the region used a clinical simulation centre were to standardise clinical experiences and to provide clinical experiences not available in a clinical setting.
Participant information	4 nursing schools in Northern Sacramento Valley.
Method	Survey of the four nursing schools using historical analysis of data from 2001-2002 through 2010-2011.

Location of study	United States
Findings	<p>Two of the four nursing programmes had experienced being denied access to clinical sites due to student numbers.</p> <p>Reasons for being denied access included competition for clinical space due to increasing numbers of students.</p> <p>All four programmes in the Northern Sacramento Valley reported using clinical simulation in 2011- 2012, and two of these programmes plan to expand its use in the coming year.</p> <p>These schools managed lost clinical time with simulation.</p>
Critique	<p>Strength: Longitudinal study using historical analysis shows opinions as they change over time.</p> <p>Weakness: Little detail around kinds of simulation and how it was implemented in particular programmes.</p>
How findings relate to this research	<p>The importance of clinical simulation is underscored by data showing an increase in out-of-hospital clinical placements.</p> <p>75% (n=3) of schools reported that their students had faced restrictions to specific types of clinical practice during the 2011-2012 academic year. New Zealand struggles with similar restrictions.</p> <p>These schools have found the use of simulation an effective means of managing this problem. New Zealand may find the same solution in simulation.</p>

2.0 High-fidelity Simulation Requires Vision, Planning, and Facilitator Training

2.1 The training must be frequent and specific for educator needs.

The use of high-fidelity simulation is nothing less than a paradigm shift in nursing education. Many nursing schools have responded to calls to prepare undergraduate nurses for complex clinical environments using simulation by buying a manikin. However, it has been very appropriately stated that developing a simulation programme involves much more than purchasing a manikin (Seropian et al., 2004b). Equipment is often purchased with the expectation that faculty will embrace the new technology. The reality appears to be that many faculties are not prepared for this type of teaching, and many do not want to go through the hard work of preparing themselves to use yet another technological advancement. The belief that content knowledge and clinical experience alone will produce a safe, confident and effective student is likely fiction (Seropian et al., 2004a). The development of an integrated simulation programme requires more than the simple learning of a new technological advancement.

Several authors (Dowie & Phillips, 2011; McNeill et al., 2012) have noted nursing educators' overall lack of preparation when institutions surge forward with high-cost simulation laboratories. Institutions typically take a three-step process to simulation which starts with deciding that simulation is interesting. The second step can often involve contacting simulation manufacturers and sampling their wares through demonstrations or trade shows — which often leads to purchases of high-fidelity manikins. The third step is the gathering of support (which should have really happened in the first step). It is in this third step that the cracks may begin to show which can prolong or impede the process (Seropian et al., 2004a). The necessity of an individual or

group required to use this tool effectively, and make decisions around what types and topics to include in high-fidelity simulation can become daunting. It is at this point that many institutions realise that there are many more than three steps in the integration of simulation into undergraduate nursing curricula. Additional steps include getting stakeholder buy-in, a business plan, collaboration with other disciplines, a budget, and training the potential educators who will deliver this pedagogy (Conrad, Guhde, Brown, Chronister, & Ross-Alaolmolki, 2011; Seropian et al., 2004a).

Although many nursing faculty recognise the value of learning through simulation, implementing a programme of simulation within the curriculum is a challenging endeavour. The fundamental problem in the proliferation of new programmes is the lack of accessible expertise (Seropian et al., 2004a). Few, if any, how-to resources exist without the burden of considerable cost (Spunt, 2007). Simulation requires a support system in order to ensure effective operation of the manikins, educator time to learn the use of the teaching method, and most importantly, someone to 'lead the charge' that is empowered and equipped for the task (Conrad et al., 2011; Dillard et al., 2009). This type of leadership has been termed "transformational" (Conrad et al., 2011, pp. e-2).

Transformational leadership provides a structure for success and gives freedom to the team members to define success. The process begins with transformational principles which are initially communicated to educators in the form of vision. The subsequent transformation of educators forms the second stage. This is achieved through the communication of the vision, team-building, educator support in the form of release time and education, and recognition of key faculty (Conrad et al., 2011). Finding a fit between the vision, and the talents of those on the team is key for success. The third stage of transformational leadership involves the transformation of students through: (1) engagement, (2) becoming familiar with the process of simulation, and (3) providing practice opportunities to improve performance.

In reviewing this literature I came to see that transformational leadership is the kind needed in order to bring change to my own teaching, and then to share what I have learned with colleagues interested in working with high-fidelity simulation. More particularly I recognised that the changes need to start with 'me' and the type of leadership I exhibit when developing a simulation plan for the school. I am mindful that there is so much that I must 'get right' in the design and development of this simulation plan, and that I must communicate my vision as my research unfolds. Furthermore, I would like incorporate into the action research cycles of this study feedback from the students, technical staff and educators engaging in simulation training at this university. My purpose is to glean insights into what is and is not working in high-fidelity simulation education. The research inspiring this discussion can be found in Table 3.5.

Table 3.5 Literature Summary for Vision, Plan and Training

Category 2.1: High-fidelity simulation requires vision and plan and specific training of facilitators	
Conrad et al. 2011	
Purpose	The purpose of this article was to describe how the principles of transformational leadership were used to guide the development and integration of a simulation programme into the curriculum.
Issue underpinning study	The demands of the health care environment, the need for clinical placements, the changes in health care delivery, and the high volume of nursing students all have created a need for innovative tools, such as the use of high-fidelity simulation. Although many faculty recognize the value of teaching and learning through high-fidelity simulation, implementing a program of simulation within a curriculum is a challenging process.
Participant information	Review article.
Method	Descriptive review around instituting a simulation programme using transformational leadership.
Location of study	United States
Findings	Transformational leadership principles are an effective guide for the development of a simulation programme. Faculty development and recognition are essential to the integration of simulation into the curriculum. A faculty support system including administration and facilitators is essential to sustain and grow a programme of simulation.
Critique	Strength: Identifying specific strategies for change is essential in the use of high-fidelity simulation. Weakness: More detail around how to identify and support leadership in change would be helpful.
How findings relate to this research	My institution has struggled to develop an integrated programme due to lack of leadership which was recognised and valued by the undergraduate programme. The use of transformational leadership principles may have assisted with this process.
Dillard et al. 2009	
Purpose	The purpose of this article is to describe faculty development in the use of the Lasater Clinical Judgment Rubric. The outcome was clearer understanding of the need for staff preparation before the rubric is used in student performance.
Issue underpinning study	High-fidelity simulation experiences are expected to ease some of the clinical burden for faculty and hospital staff in educating nursing students. Improvement in the integration of clinical judgment and use of a conceptual framework and evidence-based rubric is required to progress forward.
Participant information	68 students enrolled in a junior adult health course and their faculty participated in a simulation.
Method	Case study used to evaluate simulation learning after one case, examine effectiveness of faculty development workshop, and explore perceptions of students: Each student provided care to a patient with heart failure (HF). Students were first expected to notice, interpret, and respond to the patient's respiratory distress. Faculty also evaluated: 40-item questionnaire.
Location of study	United States

Findings	<p>Faculty development in simulation educational methods is an urgent need.</p> <p>While faculty overall were satisfied with the faculty development workshop, this project demonstrated that transforming clinical education and student evaluation to a framework of clinical judgment requires on-going support and reinforcement.</p> <p>Cognitive change is not a sufficient assessment method to use when evaluating performance in high-fidelity simulation.</p> <p>Students left the simulation experience believing they had "got the concepts" that addressed the care of heart failure patients.</p> <p>Student belief in their level of understanding was not sufficient.</p> <p>High-fidelity simulation could actively engage students individually in the learning process.</p>
Critique	<p>Strength is in emphasis on need for faculty development.</p> <p>Strength is in showing cognitive change is not a sufficient assessment method.</p> <p>Weakness: Need to instigate some kind of rubric to evaluate student performance.</p>
How findings relate to this research	<p>There is a need for ongoing training for educators in simulation. This must continue in New Zealand.</p> <p>Faculty/student ratios do not consistently allow faculty opportunities to observe students making clinical judgments as they move through the learning process.</p> <p>Clinical experiences that allow for the development of clinical judgment skills are often random opportunities.</p> <p>(HFS) allows for a more comprehensive evaluation of the development of students' clinical judgment as well as recognition of gaps in their understanding of clinical practice.</p>

Seropian et al. 2004 (Simulation: Not just a manikin)

Purpose	This article introduces and clarifies the different types of simulation equipment, and attempts to make sense of the roles and limitations of these technologies.
Issue underpinning study	Frequently, institutions develop simulation programmes based on a narrow understanding of the technology and teaching potential of this tool. The purchase of simulation equipment often precedes the development of a sound program vision and plan.
Participant information	Review article.
Method	<p>Review of process of setting of simulation programme.</p> <p>Goal is to provide needed background information on simulation and a framework for faculty interested in building a simulation facility.</p>
Location of study	United States
Findings	<p>This article reviews the various types of simulation available as of the writing:</p> <ul style="list-style-type: none"> Task and skills-training equipment Low-fidelity manikins Medium-fidelity manikins High-fidelity manikins Computerised simulation Standardised patients Full-scale simulation
Critique	<p>Strength: This article is an excellent resource for enhancing knowledge around the type of simulation and importance of learning how to use the most appropriate manikins for the simulation design.</p> <p>Weakness: Specific detail around how to design and implement training for simulation facilitators is not offered. This would be helpful for those just beginning this journey.</p>

How findings relate to this research	The need to consider which types of simulation are most appropriate for each of the courses at our institution is pivotal. Simulation outcomes must align with course learning outcomes so that they are both met with the simulation experience.
Seropian et al. 2004 (Approach to simulation program development)	
Purpose	The fundamental problem in the proliferation of new simulation programmes is the lack of accessible expertise. Few, if any, how-to resources exist without the burden of considerable cost.
Issue underpinning study	Vision development is crucial to the establishment of a viable simulation programme. The vision must address several issues: <ul style="list-style-type: none"> Size of the facility Collaboration with other disciplines Budget Population to be served Type of simulation used Structure of <i>ownership</i> Governance
Participant information	Review article.
Method	This article is a review of good practice required for setting up a simulation programme.
Location of study	Australia
Findings	<p>A <i>business plan</i>, with an executive <i>summary</i>, is paramount when seeking buy-in from potential stakeholders.</p> <p>A business plan shows the direction the facility will take, as well as its basic governance and budgetary plans. In addition, the exercise of developing a business plan is a worthwhile educational experience.</p> <p>Training is key. Selected individuals should begin training in the use of simulation tools.</p> <p>As with facility construction, the presence of experts is valuable. Without expertise, individuals gain only a basic understanding of the equipment. They lack context of use, as well as an understanding of equipment's potential and limitations.</p> <p>Collaboration requires stakeholders to shed their individual identities and assume the common goal of bringing simulation education to the population they intend to serve.</p> <p>Having a governance structure with equal representation is also important.</p> <p>The foundation of collaboration is trust, but this is a cultivated phenomenon, not an instantaneous one.</p>
Critique	<p>Strength is the articles clear outline of exact steps required in the development of a simulation programme. Focus on training is clear along with need for expertise and buy-in from stakeholders.</p> <p>Weakness: Specific strategies in how to deal with resistant staff and stakeholders is present, but could be more detailed.</p>
How findings relate to this research	<p>Many people still doubt simulation's worth and significance.</p> <p>Allow faculty to see and experience the technology in a nonthreatening environment.</p> <p>Gain their trust and answer any questions truthfully. Admitting that simulation may not work for all situations may be as powerful as stating when it will work.</p>
Spunt, 2007	
Purpose	To describe the processes and detail involved in the set-up of a simulation lab.
Issue underpinning study	The replication of a clinical setting allows the learner the opportunity to integrate theory and practice, think critically, and ensure patient safety.

Participant information	This is a book chapter. Chapter 8 in book Jeffries, P. (Ed.). (2007). <i>Simulation in Nursing Education</i> . New York: National League for Nursing.
Method	Case study around setting up a simulation plan.
Location of study	United States
Findings	<p>It is essential to work from a detailed plan when setting up a simulation lab/centre. This plan must reflect a variety of items as above. Communication to all involved must be frequent and continual in order to ensure that detail is not forgotten and vision sustained.</p> <p>Develop a plan which describes the new or existing space which includes (1) quantity and type of simulation space needed; (2) detail around how and by whom space will be used; (3) location in building and adjacent spaces (e.g. toilet, elevator, etc.); (4) location of support and other ancillary spaces (e.g. storage, office); (5) equipment and infrastructures needed to support learning; (6) special features (e.g. sizes of doors, linoleum or tile, lights, dimmer features, etc.); (7) means to schedule learning across all programmes; (8) supplies (disposable) inventory and ordering processes, staff to tend to ordering of disposables; and (9) record-keeping for tracking borrowed equipment, room schedules, tours/workshops, student data, open lab times, and supplies required.</p> <p>Include cost-calculations per student, per group, per course, per programme.</p>
Critique	<p>Strength: This chapter gives excellent detail as to the specifics of developing a plan for an existing or new simulation space.</p> <p>Weakness: No evidence given as to if this plan has been used in previous settings, and how this has worked. Would be good to know if this direction has been effective.</p>
How findings relate to this research	Our institution needs to revise its simulation centre (labs). The rooms and equipment need updated and maintained and the above provides a checklist for detail required.

2.2 The training must be frequent and specific to educator needs.

2.2.1 Simulation requires training to reduce facilitator anxiety.

Barriers to high-fidelity simulation use in undergraduate nursing include a simulation anxiety syndrome, a fear exhibited by educators who do not want to adopt a teaching platform which they have not been trained to use (Blazeck, 2011). The cost of manikins which educators are unable or untrained to use is a concern for administrators in hospitals and academic institutions (McKeon et al., 2009). Additionally, simulation is labour intensive in its development, and requires a significant amount of training in order to maximise its effectiveness (Lane & Mitchell, 2013; McNeill et al., 2012). The effort required to instigate immersive, scaffolded, curricular-aligned simulation experiences requires resourcing and time that may not be uniformly available in the in the context of undergraduate nursing institutions across New Zealand.

Simulation as a teaching tool is extremely labour and task intensive, not to mention costly (McKeon et al., 2009). One of the most significant barriers is a fear of failure on the part of nursing educators (Blazeck, 2011). Nursing educators are being forced to adopt a tool they have only minimally or not been prepared to use, and there is a significant fear of failure. Most lecturers have had extensive experience in lecturing large groups of students, using power point, and marking case studies. High-fidelity simulation emerged around 15 years ago, with little or no training in its usage. There is a tendency for educators to resist simulation due to not wanting to look foolish or unprepared in front of colleagues, or students. This experience has been termed

“simulation anxiety syndrome” (Blazeck, 2011, p. e57). The root of simulation anxiety syndrome is the misconception that simulation poses more of a risk than a benefit to all involved. The treatments for this syndrome is to remove the risk through training, and ensure the success of the simulation. This is done through training educators in simulation design and implementation before they are expected to use it.

2.2.2 Simulation design requires alignment and sequencing of learning objects.

Understanding the basic elements of a well-designed simulation scenario is essential to ensure effective simulation design. If designed carefully, the result is improved student meta-cognition, memory retention, and comprehension that will enable students to recognise patterns and enhance their decision-making abilities in new and unfamiliar environments (Guimond et al., 2011). Learners who demonstrated metacognition, those who considered their past performance and modified their subsequent actions accordingly to improve performance, exhibited improved task knowledge, superior performance strategies, and higher levels of confidence (Guimond et al., 2011). Scenarios designed to support the development of meta-cognition can improve performance, resilience, and the transfer of knowledge, skills and attitudes from the training to the clinical environments. Some research shows (Burke & Mancuso, 2012) that theory-based integration of simulation supports metacognitive growth of adult learners in undergraduate nursing programmes and thus must become an integral component of the same.

Several studies have focused on implementation and possible frameworks for designing simulation-based training. However, the design and alignment of pre-training content (which focuses on the potential causes, and interventions to be implemented) as part of simulation is often limited or missing (Guimond et al., 2011). It is as if educators have only unwrapped one present under the tree — the manikin. The pre-briefing and debriefing are often skimmed over or missing (Burke & Mancuso, 2012). Without proper understanding of the underlying pedagogy and sequence of all segments of simulation using evidence-based standards (Boese et al., 2013), the effectiveness of the simulation in achieving learning outcomes is limited. Nurse educators must receive training in the planning, implementation and evaluation of simulated scenarios in order to assure that the planned knowledge, skills, and attitudes are embedded in the learning outcomes and thus the scenario (Guimond et al., 2011).

2.3 High-fidelity simulation training requires a plan.

For many educators, a knowledge and skill gap exists between the demand for simulation and competence in developing and using simulation (Dowie & Phillips, 2011; McNeill et al., 2012). Knowing how to develop scenarios, integrate them into teaching, and assess simulated performance effectively is becoming a core role for educators in health care (Boese et al., 2013). Lane and Mitchell (2013) have proposed an effective process to train simulation facilitators which involves three basic steps. These include champion identification, champion development, and champion integration.

Once champions are identified as simulation educators, ongoing development can include multiple strategies (e.g. sending champions to off-site training, retreats where simulation as

pedagogy is the focus or online learning through the Simulation Innovation Resource Centre (SIRC)). The SIRC can provide an opportunity for nurses to network with experts and peers and provides a complete list of resources, including vendors, free scenarios, tools and instruments, research studies, and sources for funding (<http://sirc.nlm.org>). Care must be taken to monitor potential champions to ensure that core modules are part of their training process. SIRC modules that might be helpful to include are: (1) designing and developing simulations; (2) debriefing and guided reflection; (3) teaching and learning strategies; (4) evaluating simulation; (5) maximising realism; and (6) developing faculty (Lane & Mitchell, 2013). The suggestion is made that a time line for completion be established, such as one course per month.

The third and final step in the development of simulation trainers is the integration of champions into the role of simulation educator. This integration requires champions to come together, plan simulation activities, and practice implementing and evaluating simulations. To facilitate this immersion of educators into their role as simulation champions, some suggest a one to two-day retreat (Lane & Mitchell, 2013). A retreat provides the opportunity for the champions to immerse themselves in the integration of their new, expanded knowledge of simulation in a space away from the daily demands of work. At the conclusion of the retreat, desired outcomes may include: (1) identification of proposed educational activities that will include simulation; (2) development of simulation scenarios; (3) practice in implementation of designated simulation activities; (4) practice in the use of simulation equipment; and (5) identification of resources needed for planned programmes (Lane & Mitchell, 2013). The planning and implementation of such a retreat should prepare individuals to assume the role of simulation champion.

Simulation educators should plan to meet regularly to determine overall needs for simulation education and integration in their undergraduate programme. Additionally, an evaluation plan should be developed to measure the processes and outcomes of the train-the-trainer programme as it evolves. The plan should help to ensure that the simulation is not only well integrated into the curricula, but that trainers are being continually updated as to how to use simulation in a more seamless manner as expected by Millennial learners.

Some (Benner et al., 2010) have also noted that there is a “sharp divide between pedagogies of the classroom and effective pedagogies of the situated teaching in the clinical setting” (p. 14). This divide is seen to be broadening with educators delivering content in traditional models of teaching and learning while expecting students will be able to transfer knowledge and skills to clinical experiences (Jeffries, 2008). Faculty development in strategies that integrate theory with clinical practice is imperative; and this includes training in simulation facilitation as a teaching and learning tool (McNeill et al., 2012).

In reviewing this literature I came to see that educator training in the design and implementation of high-fidelity simulation is essential to decrease anxiety on the part of educators having to work with new technologies and teaching platforms. I also became aware of the importance of aligning the learning objects of the simulation with overall curricular and simulation objectives. Moreover, I recognised the need to develop an educational plan which could be used in training new facilitators in the use of high-fidelity simulation. This literature revealed the breadth of issues that will need to be addressed in order to ensure that educators are prepared to both

design and implement high-fidelity simulation. It is likely that these issues are beyond the scope of this study but where opportunity arises I am keen to benchmark how New Zealand educators perceive their training needs. The research which has inspired this discussion can be found in Table 3.6.

Table 3.6 Literature Summary for Facilitator Training

Category 2.2: Simulation requires training the trainers	
Blazeck, 2011	
Purpose	The purpose of this article is to provide a description of one distance-based, video supported orientation to simulation for educators
Issue underpinning study	There are many initial barriers preventing faculty new to simulation from welcoming or even tolerating simulation. One of the most significant barriers is fear of failure. A distance-based, video-supported orientation and initial course providing a defined low-risk environment supporting new-to-simulation faculty's gradual, self-determined engagement results in a cost-effective, enthusiastically accepted simulation experience.
Participant information	N/A
Method	Case study detailing how to run simulation for large student groups.
Location of study	United States
Findings	<p>An effective educational programme for simulation facilitators includes a pre-course orientation which includes:</p> <p style="padding-left: 40px;">A distance-based, video-supported orientation and initial course providing a defined low-risk environment supporting new-to-simulation faculty's gradual, self-determined engagement results in a cost-effective, enthusiastically accepted simulation experience;</p> <p style="padding-left: 40px;">A pre-course orientation consists of the schedule; the Students Meet <i>SimMan</i> video, the <i>Teaching Students about SimMan</i> video, a skills and medications communication, The <i>Luxury of Time</i> video, and simulation roles and viewing guide communication; and</p> <p style="padding-left: 40px;">An introduction to simulation which begins 3 months before the actual course.</p> <p>The communication begins with a schedule providing the usual information as to who, when, and where. However, the purpose is not to say what the new-to-simulation faculty members are responsible for but to provide a clear delineation of what specifically is not their responsibility.</p> <p>To prepare the faculty for possible simulation roles, the roles are listed with a note as to what faculty members in those roles may be asked to do. These are nonthreatening roles where they see they know what is happening. The threat is gone. By the end of the simulation course, the dialogue is about what else the student could learn better with simulation. Rather than expressing concerns about looking foolish.</p>
Critique	<p>Strength: A detailed presentation about how to run a large group of students through a simulation. There is also detail around how educators work within this setting.</p> <p>Weakness: Small institutions or those in rural areas might not have facilities or staff to create the videos which are used in this simulation plan.</p>
How findings relate to this research	This method of training those who show an interest in simulation might be an option for us in New Zealand.
Boese et al. 2013	
Purpose	This article reviews the best-practice standards for the simulation educator.

Issue underpinning study	Many who facilitate simulation are not clear on various aspects of their role. A proficient facilitator is required to manage the complexity of all aspects of simulation. The facilitator has specific simulation education provided by formal coursework, continuing education offerings, and targeted work with an experienced mentor. The facilitator is key to participants' learning. The facilitator guides and supports participants to understand and achieve the objectives. The facilitator helps the participants explore the case and their thought processes used in decision making. In addition, the facilitator engages the participants in searching for evidence-based practice solutions to foster skill development, clinical judgment, and reasoning.
Participant information	This is a descriptive article outlining the role of simulation facilitator.
Method	Description of the role of simulation educator.
Location of study	United States
Findings	To achieve the desired outcomes of a simulation-based learning experience, the facilitator: <ul style="list-style-type: none"> Clearly communicates the objectives and expected outcomes to the participant(s). Creates a safe learning environment that supports and encourages active learning, allowing repetitive practice, and reflection. Promotes and maintains fidelity. Uses facilitation methods appropriate to the participants' level of learning and experience. Assesses and evaluates the acquisition of knowledge, skills, attitudes, and behaviours. Models professional integrity. Fosters student learning by providing appropriate support throughout the simulation activity, from preparation through reflection. Establishes and obtains evaluation data regarding the effectiveness of the facilitator and the simulation experience. Provides constructive feedback and debriefing with the participants.
Critique	Strength: Specific detail as to the role of the simulation educator is clearly outlined and could be used to train simulation educators in other programmes. Weakness: The actual steps required to design and create a simulation scenario are not outlined. This would be helpful detail for the new or emerging simulation educator.
How findings relate to this research	New Zealand educators need to take on board these standards as they work with students in simulation so that the method is respected and maximised for undergraduate students.

Burke & Mancuso, 2012

Purpose	The focus of this article is to describe how intellectual factors in social cognitive theory are influenced during each step in the simulation learning process and to exemplify that theory-based integration of simulation supports metacognitive growth of adult learners in an associate degree nursing programme. Nurses function in a constant state of controlled chaos, responding to multiple patients, staff, and organisational demands, often simultaneously. Active learning in a simulation laboratory helps students learn to intervene in a way that is responsive to the often-competing needs of the patient at that time and in that place.
Issue underpinning study	Simulation integrates principles of social cognitive theory (SCT) into an interactive approach to learning that encompasses the core principles of intentionality, forethought, self-reactiveness, and self-reflectiveness.
Participant information	N/A
Method	Descriptive analysis of how simulation works within social cognitive theory framework.
Location of study	United States

Findings	<p>Implementation of simulation as a teaching and learning method supports symbolic coding operations by assigning appropriate pre-simulation activities.</p> <p>Simulation optimises student attentiveness and motor retention processes by skilled implementation supporting student discovery and self-esteem.</p> <p>Debriefing supports self-monitoring, self-diagnosis, and affective self-reaction so that the student becomes self-directed to apply new behaviours and learning in subsequent similar situations.</p> <p>Self-efficacy is supported by success in the learning laboratory.</p> <p>Skilled debriefing is central to the development of critical thinking skills, achievement of expected learning outcomes, reflective learning, and the intent to apply the knowledge that has been acquired.</p>
Critique	<p>Strength: This article outlines how social cognitive theory as a theoretical underpinning in lived out in high-fidelity simulation. This is useful to help educators in their design of environments using this tool.</p> <p>Weakness: Specific detail as to how to encourage metacognition and self-directed learning with the high-fidelity simulation is missing or implied. It would be helpful for emerging simulation designers to have this information in order to better understand how social cognitive theory underpins simulation.</p>
How findings relate to this research	Theory-based facilitation of simulation optimizes efficacy of this learning method to foster maturation of cognitive processes of social cognitive theory, metacognition, and self-directed entry-level practitioners.

Guimond et al. 2011

Purpose	<p>The purpose of this article is to describe effective simulation design. When training is effective, learners exhibit:</p> <ul style="list-style-type: none"> Improved meta-cognition, memory attention, and comprehension skills that enable them to recognise patterns and enhance their decision-making skills in new and unfamiliar environments. The ability to embed desired knowledge, skills, and attitudes, learning objectives, instructional strategy, evaluation of learning, and transfer of knowledge to the clinical setting.
Issue underpinning study	To optimise the simulation experience for students, a comprehensive analysis of the problem being addressed in the simulation activity should first be done. This concept has not been addressed in the nursing literature. Simulation design is critical.
Participant information	None as this is a literature review.
Method	Literature review.
Location of study	United States
Findings	<p>The identification of what to include in training is critical. Aviation training was historically skills-based; however, when a thorough analysis was applied, the following elements were identified as the major factors in safety breaches in clinical settings:</p> <ul style="list-style-type: none"> Communication Ability to make decisions Interpersonal interactions
Critique	<p>Strength: This is an excellent article outlining specifically how to improve meta-cognition, memory attention and comprehension within high-fidelity simulation. This detail is key for simulation designers.</p> <p>Weakness: Specific detail around which types of high-fidelity simulation would best highlight communication, inability to make decisions, and interpersonal interactions is not available. This would be extremely helpful for novice designers.</p>

How findings relate to this research	<p>Attention to educational design is essential for effective simulation.</p> <p>Design for simulation needs to focus on safety breaches, communication, ability to make decisions and interpersonal interactions.</p> <p>Educators need to be trained in how to design effective simulation. This should not be left to chance or individual opinion.</p>
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Jeffries, 2008

Purpose	The purpose of this article is to give an adaptation of the report given by Pamela Jefferies to the NLN foundation for nursing education. It describes drivers influencing simulation (lack of educators, low resourcing, and no training for educators, no standardised programs).
Issue underpinning study	On clinical units, students are expected to recognise alterations and deterioration of patients, but are not prepared for this skill/ability. Simulation can assist in preparation for working in these environments.
Participant information	<p>There is currently no standardised definition of what a simulation is and how it should be conducted to achieve the best learning outcomes from learners.</p> <p>Many faculty implement simulations to the best of their abilities based on intuitive thinking and basic teaching-learning principles.</p>
Method	This is a report of conference presentation
Location of study	United States

Findings	<p>Concerns about patient safety have led to calls for lower student-faculty ratios that ultimately will increase the need for more clinical sites and increase the cost of clinical education.</p> <p>When incorporating simulations into the teaching-learning environment, ensure that faculty development is included in the planning. Faculty need to know how to conduct simulation and achieve the desired outcomes.</p> <p>This article is a <i>critique of how to prepare educators</i> in use of high-fidelity simulation.</p> <p><u>S.T.E.P.</u>: Simulations Take Educator Preparation. These initials refer to four essential elements:</p> <p>S = standardised materials</p> <p>T = train the trainer</p> <p>E = encourage the development of a simulation design and integration team</p> <p>P = plan to coordinate the simulation development and implementation activities. Ensure that specific simulation <i>objectives match the content</i> of the simulation.</p>
Critique	<p>Strength is ability to delineate exactly what is required in educator preparation, and to acknowledge simulation's ability to create standardised learning experiences.</p> <p>Weakness is lack of clear and concise steps that need to be taken in order to move current schools along in their process of simulation development.</p>
How findings relate to this research	<p>Equipment is often purchased with the expectation that faculty will embrace the new technology, when the reality is that many <i>faculty are not prepared for this type of teaching</i>.</p> <p>There is <i>no standardised curriculum</i> for simulation nor set of competencies that will prepare nurse educators for this pedagogy.</p>

Lane & Mitchell, 2013

Purpose	This article describes a unique three-step train-the trainer model to prepare nurse educators to use simulation effectively. The outcome of following this process is buy-in from educators in involvement and interest in simulation design and implementation.
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Issue underpinning study	Staff development departments are challenged with: Addressing the entry of new graduates into the work force Updating the competencies of practicing nurses Providing nurses with educational support to reduce turnover
Participant information	Descriptive article around one example of champion development and integration using SIRC site.
Method	This is a descriptive article
Location of study	United States
Findings	<i>3-step model</i> for champion development: <ol style="list-style-type: none"> 1. Identify nurse educators who would champion, or be the change advocate for, simulation education. 2. Champion development; the nurse educator champions would receive education and training in the skills and knowledge needed to develop and implement simulation. 3. Integration which involves a retreat with group to plan integration for curricula.
Critique	Strength: This article is an excellent resource as to exact content required for training of simulation facilitators. Weakness: Funding for simulation training is not always available for smaller schools or those in rural areas. A plan for how this content could be delivered to these areas would be helpful.
How findings relate to this research	This article is an excellent resource for assisting nurse educators to learn to develop and integrate simulation into their particular learning environments. Use of the National League for Nursing's SIRC, an online e-learning site that provides more than 15 online courses on simulation development, could be an option in New Zealand.

McNeill et al. 2012

Purpose	This article is a synthesis of research evidence regarding current practices in preparing educators to use simulation providing a foundation for faculty development.
Issue underpinning study	Clinical simulation challenges educators to think beyond conventional educational practice and leap into something that revitalises faculty approaches in classroom and clinical settings.
Participant information	Four schools of nursing. Two offerings of the CE programme (N=17/20, N=15/33, for a response rate of 60%) An overview is provided of the two prongs: a short course for novice educators, and examples of continuing education programming for experienced faculty members new to simulation to enhance effective application of this tool
Method	Case study employing Roger's Diffusion of Innovation Model
Location of study	United States
Findings	The evaluations from the reported high satisfaction and the workshop experiences, were evaluated as engaging and informative. The 14 who participated in two offerings of the Educator 101 course reported high satisfaction with the course.

Critique	<p>Strength: This article employs a model of change which could be used at our institution. The evidence for effectiveness is documented in the article.</p> <p>Strength: NLN SIRC provides 11 self-paced courses in the components of planning, implementing, and evaluating simulation. New Zealand might be able to tap into some of this for our training of educators.</p> <p>Weakness: These SIRC courses must be purchased and the cost may be prohibitive for smaller schools or those outside the continental USA.</p>
How findings relate to this research	A two-pronged approach to develop experienced faculty and novice educators was useful in introducing and increasing simulation use as a teaching–learning strategy in four schools of nursing in a regional collaboration.

2.4 High-fidelity simulation encapsulates millennial classroom preferences.

In undergraduate nursing education, four generations may be working together. Key differences among these generations include age, values, attitudes, and life experiences along with their comfort and knowledge of technological usage (Borges, Manuel, Elam, & Jones, 2010). Some tertiary institutions are beginning to recognise the tensions of primarily Baby Boomer educators teaching primarily millennial students (Koeller, 2012; McNeill et al., 2012). This combination, much like mixing oil and water, means that students who have grown up in a media-immersed world are being taught by educators for whom technology is often perceived as scary, unnecessary, or just too hard. Traditional models of teaching and learning in didactic courses have failed to transfer knowledge and skills to clinical experiences or to provide opportunities for safe and effective practice (Jeffries, 2008). As technology is not going to disappear, and will continue to evolve, educators no longer have the luxury of pleading digital naiveté. Simulation, in all its various forms, provides an intermingling of traditional teaching platforms with technology. However, this transition and intermingling must involve an effective training of Baby Boomer educators to simulation usage and integration. This process must be done in a way that demystifies roles and responsibilities when design and delivering high-fidelity simulation (McGlynn, 2010). Further research needs to be done in order to understand ways of assisting Baby Boomer educators in integrating millennial preferences into current delivery methods (Earle & Myrick, 2009). Given the global nursing shortage, efforts are needed to attract millennial students into the nursing profession and to retain them once they enter the nursing workforce.

Some have noted that classroom lecturing is actually the most ineffective delivery method to use with Millennials due to its passive-learning, teacher-driven qualities (McGlynn, 2010; Nicoletti & Merriman, 2007). Most Millennial students expect faculty to incorporate technology into their teaching and be proficient in its use (Borges et al., 2010; Koeller, 2012). Millennials have also been noted to communicate differently than other generation cohorts, and this must be addressed in professional educational settings (Hartman & McCambridge, 2011). The argument has been made that this generation is truly wired differently than preceding cohorts and that simulation not only speaks their language, it ‘resonates’ with how they learn (Aviles & Eastman, 2012; McGlynn, 2010; Nicoletti & Merriman, 2007).

Technological advances in health care are also revolutionising the design, delivery, and evaluation of nursing education (Jeffries, 2007). These strategies are often embraced by digital natives, students born between 1980 and 2000, for which technology is a way of life (Aviles & Eastman, 2012; Fountain & Alfred, 2009; McGlynn, 2010). High-fidelity simulation provides a technologically embedded tool capable of linking theory to practice (Alfes, 2011). Its usage has shown an enhancement in learning technical skills as well as increased confidence and critical thinking (Harris, 2011; Lewis & Ciak, 2011). High-fidelity simulation also caters to the Millennial preference of working collaboratively in teams (P. Brown, 2011).

With the acuity of patients increasing in acute healthcare settings, the experiential learning platform of simulation offers students an anatomically correct human substitute that can physiologically respond to nursing interventions (Seropian et al., 2004b). Simulation allows students to observe the interventions they choose along with their subsequent effects in a manner which causes no harm to actual patients (Gates et al., 2012). All of these characteristics make simulation as a teaching tool for Millennials (Koeller, 2012). However, the usage of simulation as a teaching platform has encountered significant challenges in educational settings.

As they suffer from short attention spans, Millennials require learning strategies that are actively engaging such as simulation (M. Olson, 2009). They learn most effectively when a large variety of instructional strategies are used (Koeller, 2012), and they are introduced to confusing clinical environments before entering actual clinical settings (C. A. Olson, 2012). Millennials may have difficulty finding their voice, and the relationship with the facilitator is pivotal in developing this voice for the practice setting (M. Olson, 2009). The argument has been made that their preferred pedagogy is one based on collaboration coupled with increased participation in the context of realistic immersion (Skiba, 2007). However, this type of learning environment is labour intensive and challenging to create, and it requires advanced training for the simulation facilitator.

Millennials benefit from pedagogies where professional communication is learned and refined (Hartman & McCambridge, 2011). High-fidelity simulation has also been shown to ease the transition from student to professional practice (M. Olson, 2009). Companies are beginning to recognise that Millennials can have a profound impact on workplace environments, and that with proper management, they can be a true asset (M. Olson, 2009). Their overall confidence with technology and desire to work collaboratively can add to workplace cohesion (P. Brown, 2011).

In reviewing this literature I came to see that simulation does 'tick many of the desired boxes' for millennial students. If design is carefully considered, high-fidelity simulation has the potential to create more desirable classrooms for millennial students than transmission models of educational practice. However, done poorly it can become a source of angst and cause decreased confidence in students. It is incumbent upon me as the facilitator to seek to improve the design, integration, and implementation of high-fidelity simulation in order to maximise this teaching tool. The research which has informed this discussion can be found in Table 3.7.

Table 3.7 Literature Summary for Millennial Preferences

Category 2.3: High-fidelity simulation and millennial learners	
Aviles & Eastman, 2012	
Purpose	The purpose of this article is to discuss how technological tools, such as Web 2.0 and online learning management systems, can be utilised to improve Millennials' educational performance. These tools can meet Millennials' need for affiliation, low ambiguity, immediate feedback and a personalised learning experience.
Issue underpinning study	The Millennial generation is very different from the Generation X or Baby Boomers who are trying to effectively teach them. With a better understanding of students' perceptions, educators can better utilise technology to improve their Millennial students' performance while providing them with an active, engaging educational experience.
Participant information	The data were collected from business students in a variety of business classes at a south-eastern public university incorporating both qualitative and quantitative topic areas. A total of 229 surveys were collected of which 227 were usable. Seven descriptors of Millennial learners: <ol style="list-style-type: none"> 1. Believe that they are 'special' 2. Sheltered by their helicopter parents 3. Confident they can change the world 4. Socially and team-oriented with strong peer bonds 5. High achievers who expect meaningful experiences that allow them work/life balance 6. Feel pressured to perform 7. Conventional in that they like to know what exactly to expect in any situation
Method	Survey
Location of study	United States
Findings	Effective use of technology improves student engagement with a course as well as develops communication skills. The technology tools that students perceive as most effective include personal computers, laptop computers, course websites, discussion groups, message boards, and online assessments. Millennials have low tolerance for ambiguity and appreciate having real time information. Millennials desire a personalised interactive learning experience.
Critique	Strength: This article provides specific detail as to how many member of the Millennial generational cohort may warm to the technology of high-fidelity simulation. Weakness: Survey does not give quantitative evidence as to how to implement technology of high-fidelity simulation most effectively.
How findings relate to this research	Technology must enhance learning and demonstrate connection to the course objectives. Millennials expect special individualistic-customized learning experiences that are self-paced. If they do not see the benefit of learning the material, they can be apathetic. We have seen this in our simulation.
Borges et al. 2010	
Purpose	This study explored generational differences in medical students regarding motives using the Thematic Apperception Test (TAT). The outcome was a clearer understanding of millennial traits and capabilities.

Issue underpinning study	Differences do exist across the generations on such personality factors as extraversion, self-esteem and narcissism and other factors such as 'self-satisfaction, high expectations, confidence in future performance, and a desire for leisure. Current millennial students have scored higher on these dimensions than students of previous generations.
Participant information	426 students in total: 229 Generation X 197 Millennials
Method	Multiple analysis of variance using analysis of a story written after being shown two TAT cards. Participants wrote a story after being shown two TAT picture cards. The TAT14 was used as an open-ended method of measuring students' personal motives. The TAT is a projective assessment technique comprised of picture cards. Each TAT picture card depicts a unique situation with different people and events. Responses purport to indicate underlying needs, motives, drives and personality conflicts.
Location of study	United States
Findings	A multiple analysis of variance ($p < 0.05$) showed significant differences between Millennials' and Gen Xrs'. The main effect for gender was significant for both TAT cards regarding Achievement. No main effect for ethnicity was noted. Differences in needs for Achievement, Affiliation and Power exist between Millennial and Generation X medical students. Generation Xrs scored higher on the motive of Power. Millennials scored higher on the motives of Achievement and Affiliation.
Critique	Strength: This article provides multiple analysis of variance between Millennials and Gen Xrs. There is therefore strong evidence for working with the generations differently. Weakness: While generational differences were shown, this data does not apply in 100% of cases.
How findings relate to this research	Millennials scored higher on achievement (the trophy generation needs to succeed), and affiliation (they prefer to work in teams and value peer input). This has implications for learning environments we create for them in New Zealand.
Brown, 2011	
Purpose	The purpose of this article is to discuss tendencies shown in millennial workers. It was found that Millennials in the work environment inhabit the opposite end of the beliefs and values spectrum from Baby Boomers. Work is not an inherent part of the Millennials' self-identity, and building a career is not a primary motivator.
Issue underpinning study	Millennials bring a unique set of desires to the work environment. These do not always dovetail well with other generational cohorts (Baby Boomers and Gen Xrs). A review of recent management studies literature and social research has yielded potential solutions to these issues.
Participant information	References and participant details were omitted for space reasons and so were not reported.
Method	Qualitative descriptive analysis using interviews.
Location of study	United States

Findings	<p>Typical Baby Boomers hate teams: they want to be in charge; they want to stand out as being special.</p> <p>The sceptical Generation X hate teams as well; they prefer to work autonomously and notoriously abhor meetings and group work.</p> <p>Millennials love teamwork and can find it difficult to work in relative isolation.</p> <p>Even as young adults, workaholic Baby Boomers had no concept or work-we balance which just so happens to be the Millennials' primary concern.</p> <p>To a Millennial, work-life balance is crucial and something to be preserved at all costs.</p> <p>Millennials love to communicate via technology but this may cause decreased social skills.</p> <p>Millennials' team-focus may actually be an attempt to avoid the risk associated with independent thinking and decisions.</p> <p>Millennial traits:</p> <ul style="list-style-type: none"> Were conditioned to question Love a challenge Desire feeling connected, and expect to be kept in the loop Multitask and view time as a valuable resource Tend to not like 'punching the clock' <p>Viewed as odd for desiring flexible working hours by Boomers.</p>
Critique	<p>Strength: Specific details as to Millennial characteristics is outlined in this article which may be used to influence the design of high-fidelity simulation.</p> <p>Weakness: Specific detail as to number of participants and design of research is missing from this article.</p>
How findings relate to this research	<p>Consider implementing collaborative software tools such as Google Docs, Microsoft Live, and Adobe Buzzword.</p> <p>Millennials' love for teamwork makes simulation an effective learning environment as it can work with teams.</p> <p>Simulation may help to develop the compromised communication skills of Millennials by using ISBAR.</p> <p>Modelling expected performance in simulation makes it more palatable for risk-averse Millennials.</p>
Earle & Myrick, 2009	
Purpose	<p>The purpose of this article is to explore the importance of evidenced-based practice and its application to current nursing pedagogy. This pedagogy is examined, with the intention of stimulating a philosophical discourse amongst nurse educators regarding fundamental values and beliefs about pedagogical practice. The outcome was an understanding that there is disconnect between educational values of millennial students and faculty warranting further research into this area.</p>
Issue	<p>This article examines the effects of intergenerational diversity on pedagogical practice in nursing education and highlights the need for nurse educators to engage in a critical discourse regarding the adequacy of current pedagogy in fostering an ethos that can optimize the teaching-learning process and promote ongoing learning for the future.</p>
Participant information	<p>This is a review article around intergenerational diversity</p>
Method	<p>Review article</p>
Location of study	<p>Canada</p>

Findings	<p>There are four generations of employees working together, and often employees of different generations do not share the same work ethic or expectations. Promoting awareness and insight into generational differences can help create a dynamic work culture that values diversity and avoids unnecessary stress, discomfort, conflict, and frustration. <i>Millennials</i> as a generational cohort were noted to have close relationships with parents, they were comfortable with new and ever-changing technologies being integrated into their academic and social lives, they were oriented toward their peer group, and they preferred to work in teams.</p> <p>There is wide variability in the use of educational information technology and that overall, the resources are inadequate. In order to build capacity and promote innovative changes to nursing curricula, ongoing education for faculty in this area is needed.</p> <p>This study indicated that there is a disconnection between the educational values of students and faculty and thereby raises further awareness of the need to examine these intergenerational differences.</p>
Critique	<p>Strengths: this article further reinforces the idea that there are tendencies in both preference, ways of working, and engagement with technology that apply to different generational cohorts.</p> <p>Weakness: Little exists that faculty are knowledgeable about how to implement innovative changes to accommodate the learning preferences of today's students. This is an area where further research is needed.</p>
How findings relate to this research	<p>Educators working with students in the Millennial generational cohort need to be aware of the potential preferences of this cohort. There is a definite tie to working in teams, integrating technology, comfortableness with change, and orientation towards their peer group. These tendencies can easily be integrated into simulation in all of its forms.</p>

Hartman & McCambridge, 2011

Purpose	<p>Stereotypical views of Millennials characterise them as technologically sophisticated multi-taskers, capable of significant contributions to tomorrow's organizations, yet deficient in communication skills. This article offers insights for business educators to help Millennials understand the influence of communication styles when optimizing communication effectiveness. Developing style-typing and style-flexing skills can serve as building blocks for Millennials' subsequent interpersonal skill development in key areas such as audience analysis, active listening, conflict management and negotiation, and effective team building.</p>
Issue underpinning study	<p>Common perceptions about Millennials and their parents include the following:</p> <ul style="list-style-type: none"> They crave feedback and praise; Parental hovering may leave others to question independent thinking; Job-hopping can lead employers to question loyalty; Overconfident opinionated, and expect to be heard; May believe that they do not have to 'pay dues;' Uncomfortable with criticism, aggressive and caustic; Enjoy structure and dislike ambiguity; Prefer clear rules; Desire work life balance; See themselves as indispensable beings; and See technology as necessity not something they try to integrate.
Participant information	<p>This is a review article.</p>
Method	<p>Qualitative thematic analysis using questionnaires.</p>
Location of study	<p>United States</p>

Findings	<p>Well-developed communication skills enhance both individual success and organisational success.</p> <p>Our role as educators is to be sure that we fill the Millennials' tool box with communication choices and strategies capable of augmenting their existing capabilities as we endeavour to prepare them for success in the workplace.</p> <p>It is important for students to be involved in the identification of their own dominant style. It is useful and necessary for Millennials to focus on identifying strategies whereby they can predict the various communication styles of those with whom they will interact.</p> <p>Educators must style-type and style-flex to be successful when coaching the Millennials to do the same.</p> <p>It is critical for educators to understand that Millennials need to feel engaged and to participate in the learning process. Simply being presented with information is insufficient; they should enjoy the process.</p> <p>Goals in communication:</p> <ul style="list-style-type: none"> • No person communicates in just one style • It is important to understand our own communication style, and then to style-flex to accommodate others' communication styles • Millennials have not always developed to professional levels in communication and must be educated as to their own communication style as well as how to work with those in other styles
Critique	<p>Strength: This article is significant in its detail around the effect of good communication on organisations, and preferred Millennial communication styles and strategies useful in maximising these.</p> <p>Weakness: Ways of managing outdated or unique communication styles are missing from this discussion and would be helpful in developing Millennials within high-fidelity communication.</p>
How findings relate to this research	<p>Millennials need to be taught communication choices and strategies and simulation offers this opportunity with the use of the ISBAR tool.</p> <p>Millennials have been characterised as being deficient in oral, written, and interpersonal communication skills.</p> <p>As educators, our responsibility is to address these shortcomings in ways that are both appealing to the student and ultimately effective in the global marketplace.</p> <p>Millennials will benefit from developing a broadened understanding of the multiple styles of communication that are personally available to them. This has applications for simulation.</p>
Howe & Nadler, 2008	
Purpose	The purpose of this article is to enhance a clearer understanding of who Millennials are and where they came from with the intention of giving educators the key to energising the next generation of student leaders.
Issue underpinning study	<p>Techniques that motivated students 20 years ago do not work on this generation.</p> <p>Proliferation of child safety products made Millennials most protected generation ever to grace the planet.</p> <p>Due to their upbringing Millennials are most confident, optimistic, technologically savvy generation ever to enter the tertiary setting.</p>
Participant information	Book chapter outlining Millennial tendencies.
Method	Qualitative thematic analysis using questionnaires and interviews.
Location of study	United States
Findings	<p>3 generations preceding Millennials:</p> <p><i>Silents (born before 1945):</i> Rule-abiding, children during crisis years of the Great</p>

	<p>Depression and World War II. Youth in the 1940s and 1950s, the so-called 'golden age' of the American high school.</p> <p><i>Baby Boomers (born 1945-1965):</i> Tend to be argumentative and values-obsessed. Today squarely in midlife. Defined youth in the 1960s and 1970s, an era of social turmoil, youth anger, and steeply worsening educational outcomes.</p> <p><i>Gen X (born 1966-85):</i> Pragmatic and survivalist. Defined the youth of the 1980s and 1990s. Product of an America that had simply lost interest in kids.</p> <p><i>Millennials (born 1980-2002)</i> have a tendency towards risk aversion; desire to do well; willingness to keep rules despite struggle to think outside the box; desire to work in teams, coupled with a tendency towards conformity; and greater emphasis on protection and structure in families, and schools.</p> <p>Millennials are often called <i>baby boomerlet</i> or <i>echo boom</i> generation, the large demographic product of a birth rate reversal. In stark contrast to Gen-Xrs, they have arrived in an era of glorified family values.</p> <p>7 core Millennial traits:</p> <ol style="list-style-type: none"> 1. Sense they are special (helicopter parents) 2. Sheltered-most protected generation in history 3. Confident with high levels trust and optimism 4. Team-oriented and collaborative 5. Conventional and comfortable with parent's values 6. Pressured to excel 7. Smartest, best educated generation ever
Critique	<p>Strength: This book gives the most detailed presentation of characteristics of generational persona found to date. These characteristics are easily dealt to using high-fidelity simulation which is capable of incorporating them easily.</p> <p>Weakness: Not all individuals 'fit' into the characteristics of the majority of their generation. This must be kept in mind in order to allow flexibility in creating learning environments for these students.</p>
How findings relate to this research	<p>Every generation is uniquely shaped by the era in which its members come of age, and that formative influence has enduring effects.</p> <p>Classroom must be designed with core Millennial traits and learning styles woven into learning environments.</p>
Koeller, 2012	
Purpose	<p>The purpose of this article is to showcase new techniques for matching instructional strategies for the Millennial generation. Some comparisons with previous generations have been outlined. These strategies are meant to meet the learning needs of Generation Y Millennial students in order to make their education more meaningful in both the on ground and online teaching and learning environment.</p>
Issue underpinning study	<p>Classrooms to cater to this generation are essential in order to maximise learning.</p> <p>Research around pedagogies that work well is essential in order to create effective Millennial learning environments.</p> <p>College students have spent 10,000 hours playing video games, 20,000 hours watching television. Get bored with teachers who insist on lectures as main way of delivering information.</p> <p>These students have grown up in a media conscious world so the use of technology in classrooms is valued.</p>
Participant information	<p>This is a descriptive article including ideas on how professors might structure classes for this media conscious generation</p>
Method	<p>Four groups were compared in various categories to make the transition to what is valued by the Millennials. Through these comparisons, various instructional strategies were outlined to produce an effective learning environment for today's students.</p>

Location of study	United States
Findings	<p>The current online teaching environment is especially suited to this group of students. E-companion courses with all the tools of the online course provide consistency in the content being taught either online or on ground.</p> <p>If groups used online, they should check each other's work and give constructive feedback. Millennials respect and want to please authorities unlike previous cohorts. Millennials like the interaction of discussing the content with other students.</p>
Critique	<p>Strength: Specific instructional design techniques and rationale for their benefit to educational platforms is useful in creating learning environments for Millennials.</p> <p>Weakness: Not all Millennial students can be put into a 'box,' or be expected to benefit from the changes thought best for other Millennials. Some flexibility must be allowed for these individual preferences.</p>
How findings relate to this research	<p>I must keep the following principles in mind when designing learning environments for Millennials:</p> <p>Millennials see themselves as the <i>Us-generation</i>, in contrast to the Boomers; the <i>Me-generation</i>.</p> <p>Egalitarianism disposes teachers to replace independent study with collaborative learning and peer review of performance.</p> <p>Simulation is particularly appropriate.</p> <p>Frequent and sincere communication which happens consistently is essential.</p> <p>Posting pictures on website makes Millennials feel special.</p> <p>Announcements are essential to keep students informed.</p>
McGlynn, 2010	
Purpose	<p>This report examines Millennials' demographics, political and social values, lifestyles and life priorities, their digital technology and social media habits, and their economic and educational aspirations.</p> <p>The study also compares Millennials with the nation's three other living generations, that is, Gen Xrs (ages 30 to 45), Baby Boomers (ages 46 to 64) and the generation known as Silents or, in other research, as Matures (ages 65 and older). When trend data permit, the report compares the four generations as they are now and also as previous generations were at the ages that adult Millennials are at this point in time.</p>
Issue underpinning study	<p>Generations, like individuals, have personalities.</p> <p>Millennials:</p> <ul style="list-style-type: none"> See connections to technology as a major component of their identity. Have racial/ethnic differences in some of these technology behaviours. Tend to respect their elders, and a majority say that the older generation is superior to their own generation in terms of moral values and work ethic. Do not consider computers as technology since, for them, there were always computers.
Participant information	Millennials (aged 18-32 at time of this writing).
Method	Review article around Millennial characteristics.
Location of study	United States
Findings	<p>Millennial characteristics include confidence, connection with technology, openness to change, self-expressive, up-beat, more ethnically and racially diverse than older adults, less religious, and less likely to have served in the military.</p> <p>Furthermore, they are on track to become the most educated generation in American history. Only about 60% were raised by both parents. They place parenthood and marriage far above career and financial success. However, fewer are married than those</p>

	<p>from previous generational cohorts at the same life stage.</p> <p>Millennial use of technology must be integrated into classrooms they learn in. As the most educated generation, they have high expectations for their classrooms, and for themselves. They view their cell phones almost as a body part, with 83% of them keeping their cell phones next to their beds at night when they sleep. This has profound implications for how they process information and learn.</p>
Critique	<p>Strength: Focus on Millennial use of technology and expectations for classrooms is helpful in designing high-fidelity simulation environments.</p> <p>Weakness: Not all Millennial students can be put into a 'box,' or be expected to benefit from the changes thought best for other Millennials. Some flexibility must be allowed for these individual preferences.</p>
How findings relate to this research	<p>Educational environments for millennial students must incorporate technology while remaining immersive and encouraging teamwork.</p> <p>Due to their immersion in technology from birth, Millennials as a generational cohort need engage with technology as part of their learning. Simulation could provide part of this immersion.</p>
Olson, 2009	
Purpose	<p>This article explores the professional nursing transition experience like for the newest generation of new nurse graduates. Millennials, through the first year in clinical practice? The existing research on new nurse graduates provides no clear answer to this question.</p>
Issue underpinning study	<p>Millennials show differences in judgment and decision-making skills.</p> <p>There is minimal and predominantly dated research devoted to understanding the transition into the nursing subculture and professional nursing practice from the individual nurse's perspective.</p> <p>What is missing in the literature is an insider's look from the perspective of the millennial born (1980–1999) novice nurse.</p> <p>Millennials have multi-tasking abilities beyond any seen in previous work generations.</p>
Participant information	<p>12 millennial novice nurse volunteers were recruited during their first week of orientation.</p> <p>Six participants from each of the subgroups of educational preparation were recruited, resulting in an overall sample size of 12 participants.</p> <p>The purposive sample for this study consisted of 2 subgroups of new nurse graduates.</p> <p>Six Bachelor of Science in Nursing [BSN] degree nurses.</p> <p>Six Associate Degree in nursing.</p>
Method	<p>Qualitative interpretive longitudinal study that utilized phenomenology as the philosophical and context method to illuminate the perceptions of millennial novice nurses.</p> <p>Audio-taped interviews were conducted at 3 months, 6 months, and 1 year.</p>
Location of study	United States
Findings	<p>Millennials reported:</p> <p>Surroundings unfamiliar: Being in unfamiliar surroundings, being confused and overwhelmed in simulation (this state was reported across BSN and ADN subgroups). Fear of making a mistake or actually making a mistake, with end-of-life experiences are reflected in the theme 'out of the blue.'</p> <p>Difficulty finding their voice: Relationship with their preceptor was pivotal to the Millennial finding their voice in the practice setting.</p> <p>Needing feedback: Anxiety and concern reflected as they wondered aloud about their relationship with their nurse manager. Not enough feedback on how doing 1st year.</p>

Critique	<p>Strength: This longitudinal phenomenological study offers rich data around the influence of different types of preparation and delivery methods on Millennial students.</p> <p>Weakness: Quantitative data would have strengthened conclusions in this research.</p> <p>Weakness: Not all Millennials will respond in like manner and flexibility in delivery methods must be available in high-fidelity simulation.</p>
How findings relate to this research	<p>Unfamiliarity with the acute care facility was a barrier which simulation could soften.</p> <p>These students stated 2-3x the amount of time in primary healthcare left them unprepared for the acute setting. Simulation could help soften this unfamiliarity.</p> <p>Millennials showed constant worry of making a mistake or actually making a mistake. Simulation could provide desired feedback along with helping students prepare of end-of-life experiences.</p> <p>Simulation could assist Millennials with finding their own voice along with providing desired feedback in the form of debriefing. This could then be communicated to managers resulting in a collaboration between simulation facilitators and managers working with novice professionals.</p>

Conclusion

The insights I gained from engaging with the literature around high-fidelity simulation are that it can be used as an adjunct to transmission models of education, and that due to its immersive qualities it can have a positive impact on clinical reasoning and judgment in undergraduate nursing students. I have learned that high-fidelity simulation can be used to assess competence of students, and that this is best done using some sort of rubric which assesses various aspects of student performance/thinking. This research motivated me to incorporate the assessment of some students' practice within a high-fidelity simulation context into the action research cycles of this study.

The literature also highlighted the use of simulation as a substitute for some clinical hours which motivated me to think about how this might work in my particular undergraduate nursing setting where clinical placements are at a premium. However, I was also reminded that in order to incorporate simulation to this extent, training would need to be offered for those involved in designing and implementing high-fidelity simulation. This training would require a vision, a plan, and leadership which was transformational and 'safe' for those involved. I would need to get feedback from current educators in the form of questionnaires and surveys in order to understand what is and is not working at our institution. I will therefore seek to incorporate data collection methods which will yield this educator feedback into the action research cycles of this study.

I have learned from the literature that students' insights and feedback are invaluable in implementing effective high-fidelity simulation design. These insights will also need to be incorporated into my data collection methods in order to improve my practice as a facilitator of high-fidelity simulation. While using simulation as an assessment tool has not been explored at my institution, this option would provide a more relevant and meaningful assessment tool than some pen and paper assessments currently employed. I would like to try assessing students using a rubric in the latter action cycles of this research.

As I immersed myself in the literature, I came to realise that the language used around high-fidelity simulation was at times confusing. Some seemed to imply that high-fidelity simulation was an actual pedagogy, while others emphasised that it was more important to understand the

pedagogies that underpinned high-fidelity simulation. This confusion around what is meant by the term pedagogy, how this relates to education, and what this has to do with high-fidelity simulation as a teaching strategy will be discussed in Chapter 4 of this thesis.

Chapter 4 – Pedagogies Underpinning High-fidelity Simulation

High-fidelity simulation is said to be an effective method of learning because it implicates four key facets of education in nursing: developing technical proficiency through practice of psychomotor skills and repetition; assistance of experts which is tailored to students' needs; situated learning within context; and incorporation of the affective (emotional) component of learning (Cant & Cooper, 2010). However, as high-fidelity simulation has been integrated as a technology into nursing curricula, there has been an associated need for theoretical frameworks to organise these teaching and learning experiences (Nehring, 2010). Understanding these theoretical frameworks, along with how they underpin nursing education involving high-fidelity simulation, is purported as vital for the maximisation of this tool (Parker & Myrick, 2009). As part of growing my living theory I have explored the educational pedagogies which underpin nursing education, and specifically those supporting high-fidelity simulation. This chapter will first overview the collection of theories which impact how teaching happens.

As my current role encompasses both teaching and research in a university undergraduate nursing programme, my living theory incorporates how I might improve in my role. Part of what I have added to my living theory at this point is the fact that high-fidelity simulation involves a tapestry of theoretical frameworks which, when actualised, have the potential to create a powerful immersive learning classroom. It is important that I, as the designer of these environments, become adept at using the best contributions from each of the theoretical frameworks which underpin high-fidelity simulation as a teaching tool. This chapter will review each of these frameworks along with how they might enhance the use of high-fidelity simulation.

Overview of Theoretical Frameworks

Theoretical frameworks which have been used by nursing educators employing high-fidelity simulation include Patricia Benner's (2010) theory of skill acquisition, Kolb's theory of experiential learning (1984), Schön's (1983) theory of reflective thinking, Jeffries and Roger's (2007) nursing education simulation framework, and Tanner's (2006) theory of clinical judgment (Lasater, 2007). Educational theories which have been used to underpin high-fidelity simulation include behaviourism (Skinner, 1938; Thorndike, 1913; Watson, 1925), and constructivism (Bruner, 1960; Dewey, 1938; M. S. Knowles, 1973; Mezirow, 2000; Jean Piaget, 1954). More recently, work in cognitive load theory and its influence on available working memory have also influenced the design of high-fidelity simulation (Artino, 2008; Fraser et al., 2012; Sweller et al., 2011). Each of these theoretical frameworks, to some degree, involves repetitive practice, feedback, personal and group reflection, a safe learning environment, and movement from dependent to independent learning. All of these theoretical frameworks offer insights when used with high-fidelity simulation. It is these influences which will be investigated in this review of high-fidelity simulation.

High-fidelity Simulation is not a Pedagogy

There has been some confusion with terminology used around simulation. Some have called simulation a pedagogy (McNeill et al., 2012). The Merriam Webster online dictionary (2015) defines pedagogy as the art, science, or profession of teaching. Parker and Myrick (2009) purported that pedagogy is an educational philosophy which underpins teaching (Parker & Myrick, 2009). A comprehensive definition of pedagogy includes considerations around the nature of knowledge; what is taught; how it is taught; what comprises learning; and, how students and teachers learn (Horsfall et al., 2012). Pedagogy is rarely made explicit in curricula, and is often assumed or taken for granted. The noun form (pedagogue) implies the function or work of a teacher (Horsfall et al., 2012; Pedagogy, 2015). High-fidelity simulation is, therefore, not a pedagogy in itself; rather a tool or method used to implement a pedagogy. High-fidelity simulation has been defined as a computer-controlled manikin that mimics interaction with students in a controlled simulated clinical setting (Parker & Myrick, 2009). There are at least three philosophical perspectives which underpin the use of high-fidelity simulation: behaviourism, cognitivism and constructivism.

Behaviourists' Contributions to High-fidelity Simulation

Pedagogies, as employed by educators, are underpinned by theories of learning. These theoretical underpinnings tend to classify learning as behaviouristic or cognitive (Bradshaw, 2014). Behaviouristic learning is the earliest pattern identified through educational research (Skinner, 1985; Thorndike, 1913; Watson, 1925). In behaviourist theory, learning is confirmed by behavioural responses to specific stimuli (Passmore, 2014). The benefits of this theoretical underpinning are the focus on skill development which improves responses in pre-determined situations. Behaviourism places the teacher in a dominant position over the learner (Atherton, 2011). Learning is confirmed by externally observed behavioural and mental solutions to specific stimuli (Passmore, 2014). Behaviourism is primarily expressed in the writings of Edward Lee Thorndike (1913), John B. Watson (1925), and B.F. Skinner (1938).

Behaviourism has held a long association within nursing education (Nehring & Lashley, 2009). It has its roots in empiricism which states that certain laws govern human behaviour, and that learning takes place as a result of a response to a specific stimulus (Chen, 2009). Internal thought processes are not considered in behaviourism as the focus is on external response to stimuli. The human mind is considered a memory bank for human knowledge, with the teacher being responsible for transmission of knowledge (Chen, 2009). The learner is a passive recipient. Behaviourists believe that the environment shapes behaviour, that factors external to the individual determine behaviour, that it is independent of the individual, and that it can be manipulated to produce desirable actions (Parker & Myrick, 2009).

The behaviourist aspects of simulation include repetition, classroom supplementation in the form of content knowledge, modular learning, and drill and practice used in skill acquisition (Parker & Myrick, 2009). Repetition can be a useful strategy for nurse educators to use with students in order to ensure skill development. It is the path to learning in the stimulus-response cycle, as repetition conditions the learner to respond to the presented stimuli. Individuals learn

behaviours that lead to satisfying results, and the repetition of these satisfying results produces learning (Cohen, 1999). Skill development of this type requires regular feedback in order for students to modify their performance and gain competence (Clapper & Kardong-Edgren, 2012). This type of learning has behavioural tendencies which when mastered allow the student to focus on critical thinking and problem solving.

Thorndike (1913), a behaviourist, proposed the *law of exercise*, which suggests that practice strengthens the connection between the stimulus and the response, while disuse weakens it. This law provides the theoretical underpinning behind repetition and practice of skills in undergraduate nursing education. Repetition is a valuable aspect of behaviourist philosophical thought. With practice and repetition, clinical skills can become automated, thus requiring less conscious effort (Roblyer, 2003). This aspect of behaviourist philosophy is helpful when designing high-fidelity simulation as automated skills can be stored and easily recalled; thus freeing up working memory for critical thinking and problem solving (Artino, 2008; Sweller et al., 2011). Repetition as a design concept has been used in high-fidelity simulation experiences to allow for refined skill performance and offer a path to skill improvement (Clapper & Kardong-Edgren, 2012). Repetition as a strategy is a behaviourist influence which is used in high-fidelity simulation. Skinner's (1938) operant conditioning purports that repetition combined with reinforcement can assist learners in retaining new knowledge.

Skinner's (1938) focus on operant conditioning includes the idea of positive reinforcement. A reinforcer is anything that strengthens the desired response. A reinforcer could be verbal praise, a good grade, or a feeling of satisfaction. This positive reinforcement has influenced high-fidelity simulation in the form of feedback or debriefing, in which students are given feedback in order to enhance or refine their performance (Neill & Wotton, 2011; The INASCL Board of Directors, 2011). Improved student performance in simulation often reinforces a desired response and can leave students with a feeling of satisfaction and confidence (Khalaila, 2014; Swanson et al., 2011).

The behavioural emphasis on breaking down complex tasks into individual skills that are taught separately has had a powerful influence on instructional design in nursing education (Bradshaw, 2014). This type of design has been used to teach skills, and then to embed these skills into high-fidelity simulation (Alfes, 2011; Brydges, Peets, Issenberg, & Regehr, 2013). The practice of breaking down tasks into smaller subunits to assist with learning is a behaviourist theoretical underpinning (Chen, 2009). However, this is not the only behaviourist tendency used in high-fidelity simulation.

Rote learning of factual knowledge arises from behaviourist theory (Parker & Myrick, 2009). Rote learning, while basic, forms the foundations of any professional healthcare career. It provides students with a body of facts, such as lab values, anatomy and physiology, and even some clinical protocols (Passmore, 2014). This manner of acquiring knowledge through memorisation has behaviourist underpinnings, and is essential to build upon when designing high-fidelity simulation (Lewis & Ciak, 2011).

Another way that behaviourism impacts high-fidelity simulation is in the area of learning objectives (McLeod, 2003). A carefully written objective describes exactly what behaviour the learner will demonstrate to indicate that he or she has mastered the knowledge or skills specified in the learning environment (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956). This is very important for high-fidelity simulation in order to minimise student distractions, and to assist in achieving the outlined goals (Burke & Mancuso, 2012). The presence and communication of learning objectives assists both the facilitator and students to focus on the relevant aspects of the simulation in order to achieve the learning goals. Once the goal is met, practice will stimulate the connection between the stimulus and response, another behaviourist principle.

Strengths and weaknesses of behaviourism.

The positive aspects of behavioural theory include the development of skills in response to certain stimuli, and an assurance that learners will respond in similar ways when in similar circumstances. While this has its place in nursing education, it does involve a mechanistic stimulus-response approach which cannot account for all behaviour (Haw, 2006) or meet the needs of unexpected situations. Behaviourism as a philosophy is not concerned with creativity or autonomy of learners, nor with their internal mental states. Problem solving is not part of the behaviourist perspective, which is only concerned with outward, observable responses to stimuli (Atherton, 2011). This lack of influence on judgment, critical thinking, and analysis has become part of the criticism of this philosophical perspective (Haw, 2006).

One of the criticisms of Skinner's operant conditioning is that he denied the existence of *free-will* or what some call self-control (Chen, 2009). He theorised that humans do not have the ability to control their responses but are simply responding to external stimuli. This belief is one of the weaknesses of behaviourism as a philosophical underpinning for high-fidelity simulation due to its focus on stimulus and response as the sole motivation for action (Parker & Myrick, 2009). Internal thought processes are not considered, and this is part of what high-fidelity simulation is intending to influence in the form of clinical judgment (Lasater, 2007; Tanner, 2006). This weakness may be contributing to a decline in behaviourist theoretical thought in nursing education.

Conventional behaviourist pedagogy is increasingly less prominent within the discipline of nursing (Parker & Myrick, 2009). There are several reasons for this. Students may find themselves in a situation where the stimulus for the correct response does not occur; therefore, he or she cannot respond (Chen, 2009). Behaviourism cannot always rectify this difficulty. Additionally, a focus on external behaviours leaves all critical thinking and reflection out of the focus. Critics to behaviourism also argue that behaviourist pedagogy's passive-learner role limits the ability to engage students in developing problem-solving skills (Roblyer, 2003). Problem-solving and critical thinking remain essential skills for nurses when managing complex or deteriorating situations (Fero et al., 2010; Melenovich, 2012). However, there are some contributions that behaviourism does offer.

A strength the behavioural approach lends to instructional design is that the learner is focused on a clear goal (i.e. learning objectives) and can respond automatically to the cues of

that goal (Chen, 2009; McLeod, 2003). The modular approach of behaviourism is helpful in assisting students perfect psychomotor skills, which can then be introduced in high-fidelity simulation (Parker & Myrick, 2009). Furthermore, modular learning can assist learners by dividing content into chunks which can be arranged in a different order to maximise the learning experience for students (Tomei, 2005). The concept of repetition comes from behaviourist tendencies around reinforcement and this characteristic provides benefits in high-fidelity simulation (Abe, Kawahara, Yamashina, & Tsoi, 2013). All of the above behaviourist tendencies contribute to high-fidelity simulation in a positive manner. While the focus of behaviourists is on controlling the environment and providing stimuli to elicit responses from students, cognitivists define learning in a different way.

Cognitivism's Contribution to High-fidelity Simulation

While behaviourists believe that learning occurs as a response to stimuli, cognitivism carries the notion that learning involves the reorganisation of experiences (McLeod, 2003). The leading, and most influential, cognitive theorist in the West is Piaget (1973), while Vygotsky's work is more influential in Eastern Europe (Jarvis, Holford, & Griffin, 2003).

An assumption within cognitivism is that that existing knowledge structures must be present to process new information (McLeod, 2003). This existing knowledge structure is called a schema (McLeod, 2003). Cognitivists believe that learners develop through receiving, storing, and retrieving information from cognitive schemata. It is the job of the instructional designer to choose tasks which will assist students to retrieve and work with knowledge as they reorganise experiences in cognitive schemata. The result is the development of perceptions and insight, with subsequent changes in thought patterns and actions (Bradshaw, 2014). This type of learning includes the ability to recognise and deal with alternatives and sequences, and the ability to prioritise (Bradshaw, 2014). Cognitive theory underpins high-fidelity simulation in the area of developing clinical reasoning and problem solving through the development of cognitive schemata (Burke & Mancuso, 2012).

Benefits and weaknesses of cognitive theory.

Cognitive learning theory has the potential to provide more meaningful learning to students than behaviourist theory which focuses on stimulus and response. Cognitive theory takes learning beyond rote memorisation and makes connections to current knowledge structures (Ivie, 1998). Rote learning, because it is not connected to current cognitive structures, can be quickly forgotten (McLeod, 2003).

Assimilation, where the learner adds new knowledge to existing cognitive structures, is meaningful learning in which the individual develops a more complex cognitive structure or schema (Ivie, 1998). This process of assimilation involves associating new meanings with old ones that already exist within the learner's frame of reference (Bradshaw, 2014). These principles are very much a part of high-fidelity simulation where the student is often making associations with previous knowledge in order to make a clinical judgment which will improve a deteriorating clinical situation (Ashcraft et al., 2013; Fisher & King, 2013).

A weakness of cognitivism is that there are pre-determined goals, which in themselves are a good thing. The difficulty arises when the learner wants to assimilate something into his or her cognitive framework that is not in line with pre-determined goals (McLeod, 2003). At this point the potential learning for the student may be restricted as the new knowledge does not align with learning goals. This can be managed by changing the goals of the learning experience, but may not always be anticipated from the design phase of the simulation.

Ironically, another weakness of cognitivism arises from its strength. Whereas schemata can make learning more meaningful, a learner is at a marked disadvantage whenever relevant schemata or pre-requisite knowledge do not exist (McLeod, 2003). Therefore, the design and facilitation of high-fidelity simulation must be appropriate for all skill levels and experiences. This is both time consuming and resource intensive (Dowie & Phillips, 2011; Richardson & Claman, 2014). These implications have formed part of the challenge of implementing high-fidelity simulation in healthcare curricula. While cognitivist learning involves a reorganisation of experiences within cognitive frameworks, constructivists have a different contribution to make to how high-fidelity simulation is designed and implemented.

Constructivist Contribution to High-fidelity Simulation

Constructivism is another theoretical perspective which holds that learners have some prior knowledge and experience, and are capable of building their own content in order to solve a particular problem (Haw, 2006). Constructivism is a learner-centric educational paradigm in which the learner constructs meaning in a team-based, collaborative learning environment. The needed knowledge is not delivered to them from the educator, thus changing the role of the educator from a content expert to a facilitator (Boese et al., 2013). Constructivist learning supports creativity in problem solving as the student assimilates new information or concepts into their knowledge structure (Passmore, 2014). How the student organises and recalls current knowledge is key to meaningful learning, as the knowledge is bundled in concept packets and recalled from long-term memory (Artino, 2008; Merriënboer & Sweller, 2005). The learner moves from a passive stance in behaviourism, to an active participant in the learning process guided by constructivism (Passmore, 2014).

Constructivist thought draws from a variety of disciplines including education, psychology, and philosophy. John Dewey, Jean Piaget, Jerome Bruner, John Mezirow, and Malcolm Knowles represent some profound thinkers whose work contributes to contemporary constructivist thought (Morphew, 2009). Constructivist knowledge develops by a process of active construction and reconstruction of theory and practice by those involved (Foreman-Peck & Murray, 2008). Constructivists view knowledge as something that is actively constructed in a learning environment comprised of meaningful experiences and interaction with others (Morphew, 2009).

Constructivists believe that individuals actively construct knowledge based on experience (McLeod, 2003). Constructivist learning theory supports creativity in problem solving because it asks the student to approach the problem from different perspectives where knowledge of previous protocols may be advantageous, but not necessary (Passmore, 2014). This differs from cognitivists who insist that previous knowledge must be present (Jean Piaget, 1954). To the

cognitivist, learning takes place by the assimilation of new concepts into existing conceptual or cognitive structures held by the learner (Ivie, 1998). To the constructivist, learning is a result of the learner building his or her own set of content to solve a particular problem (Haw, 2006) regardless of previous knowledge. The content is not delivered, but constructed in a learner-centric, team-based, collaborative learning environment. Constructivist learning theory has six assumptions:

1. Learning is an adaptive activity;
2. Learning is situated in the context where it occurs;
3. Knowledge is constructed by the learner;
4. Experience and prior understanding play a role in learning;
5. There is resistance to change; and
6. Social interaction plays a role in learning. (McLeod, 2003, p. 40)

One prominent theorist in constructivist philosophy was Malcolm Knowles (Harper & Ross, 2011; M. S. Knowles & Knowles, 1955), who focused on adult education and believed that there were three principles to consider when working with adult learners:

- the self-concept of the learner;
- accumulated life experience;
- and the purpose he or she has in mind. (Haw, 2006, p. 55)

Knowles (1973) believed that those who have had a successful learning experience in the past will have a higher likelihood of a positive experience in the future. He was concerned with what self-directed learning implied for teachers and learners, and what this meant for adult education (Jarvis et al., 2003). Knowles believed that self-directed learners were better learners due to their ability to take initiative and construct their own meaning (Harper & Ross, 2011).

Jerome Bruner (1960) was another contributor to constructivist thought with his *discovery learning theory*. This theory was based on the premise that learners are more likely to remember concepts if they discover them on their own, apply them to their own knowledge, and structure them to fit their own backgrounds and life experience (Haw, 2006). The emphasis is on the learner who sets the objectives and structures the knowledge that is to be learned. These concepts apply to simulation where the learner must do exactly as Bruner envisaged; setting their own goals, relying on past knowledge, and integrating new knowledge and concepts into their management of patient care.

John Mezirow's (2000) *transformative learning theory* also involved the learner creating meaning within individual experiences. Transformative learning theory addresses the revision of meaning structures (in other words, changing one's perspective). Mezirow identified how perspective transformation assists adults in revising their meaning structures. This process of changing one's perspective involves experience, critical reflection on that experience, and rational discourse with others (Haw, 2006). New meaning is constructed as a result of these processes. As simulation involves all of these processes, it is definitely underpinned with the constructivist philosophical perspective.

Human cognitive architecture in constructivist theory.

Jean Piaget's (1954) writings, while cognitivist in origin, also contributed to constructivist thought. Piaget believed that thought develops by growing from one state of equilibrium to another (Morphew, 2009). Piaget's thinking involves an experience precipitating conflict with what the learner already knows. In the face of inconsistency, the learner either ignores the new experience, modifies the experience in his mind to fit, or modifies his thinking to fit the experience. In other words, there is a drive to produce a state of equilibrium between cognitive structures and the environment (Schunk, 2014). When this process is engaged, critical thinking occurs (Morphew, 2009).

This cognitive imbalance, in the face of inconsistency, leads to the creation of a new question, which then leads to an inner quest to restore balance to inner cognitive structure (Parker & Myrick, 2009). This inner conflict relies heavily on the learner's reflection and creation of new knowledge (McCaughey & Traynor, 2010), with the ultimate result that knowledge is unique to each person. This serves to counteract the behaviourist's notion of an ultimate truth or reality (Parker & Myrick, 2009).

Jean Piaget (1954) was one of the first constructivist theorists to consider cognitive human architecture and the formation of schema which would enhance learner performance. Piaget's notions of assimilation and accommodation which are used to create schema are part of constructivist thinking around how humans manage experiences (Jarvis et al., 2003). Piaget (1973) examined the interaction between human experiences and their reflexes or behaviour-patterns, and called these systems of knowledge *schemata*. Schemata have become important in instructional design due to their ability to be stored in long-term memory thus reducing the cognitive load on working memory (Merriënboer & Sweller, 2005; Sweller, 2004). This constructivist thinking has implications for high-fidelity simulation design and implementation (Paas et al., 2003).

Novice learners are only able to handle two or three new elements in working memory if the learning elements are interactive (Paas et al., 2003). However, schemata can be stored as units in long-term memory through a process called automation (Artino, 2008). Long-term memory has nearly infinite capacity. These schemata can then be accessed for usage when required, thus freeing up the working memory for problem solving and critical thinking (Merriënboer & Sweller, 2005). These constructivist concepts around cognitive architecture can assist designers to manage cognitive load on working memory when designing simulation environments (Sweller et al., 1998).

A constructivist learning environment is informed by an active, student-centred pedagogy requiring the interaction of students with the environment and other individuals to form new meaning (Newton, Harris, & Pittiglio, 2013). The constructivist learner shapes knowledge from everything and connects personal attitude and aptitude to previous constructed knowledge. For new learning to occur, knowledge must be integrated into the learner's existing cognitive schema (Parker & Myrick, 2009; Schunk, 2014). High-fidelity simulation allows this intermingling of knowledge, previous understandings, and interaction with other individuals to occur in a manner

which has proven more effective than transmission models of educational practice (Newton et al., 2013).

Constructivism is a learner-centric educational paradigm in which the learner constructs meaning in a team-based, collaborative learning environment. The needed knowledge is not delivered to them from the educator, thus changing the role of the educator from a content expert to a facilitator (Boese et al., 2013). Constructivist learning supports creativity in problem solving as the student assimilates new information or concepts into their knowledge structure (Passmore, 2014). How the student organises and recalls current knowledge is key to meaningful learning, as the knowledge is bundled in concept packets and recalled from long-term memory (Artino, 2008; Merriënboer & Sweller, 2005). The learner moves from a passive stance in behaviourism, to an active participant in the learning process in constructivism (Passmore, 2014).

Social interaction in constructivist theory.

Constructivist learning theory states social interaction plays a role in learning (McLeod, 2003). Social interaction is very much a part of high-fidelity simulation, which some discuss as teamwork (Cooper et al., 2013). Within the collaborative environment of high-fidelity simulation, students are able to refine clinical skills (Lapkin et al., 2010), improve communication (Finnigan et al., 2010; Kuehster & Hall, 2010), and develop more effective ways of working in teams (Doody & Doody, 2012; Garbee et al., 2013). Dewey (1922) also spoke of interacting with a “matured social medium,” which is most likely the simulation facilitator, but could also be other students in the simulation (p. 90). Student learning can be constructed from the experience of working together in high-fidelity simulation, and is therefore evidence of constructivist theoretical underpinnings.

John Dewey (1938) contributed to constructivist thought when he emphasised the construction of *meaning* in the learning environment through *experiences* and *interactions* with others. Dewey’s (1922) emphasis on student interaction with a “matured social medium” (p. 90) in order to facilitate new habit formation places the learner firmly in the driving seat of constructing their own knowledge. This process involves habit formation as a means of personal reconstruction, a concept at the heart of constructive thought. Furthermore, Dewey’s thinking around managing the “means” — a series of acts viewed at an earlier stage, in order to achieve the desired “ends” — a series of acts viewed at a remote stage, is integral to designing constructive learning environments (Dewey, 1922).

“Habits,” in the mind of Dewey (1922), are a reflection of our society. They depend on the physical world, which along with the social environment, place objective limits on which habits are beneficial and which are not. “Impulses” are spontaneous, natural, and unlearned actions which become important when our old habits fail to keep up with changing times or come in conflict with each other. When this happens, “impulses” become the raw material for the development of new habits and customs. Dewey has a particular kind of intelligence in mind at this juncture. Intelligence, he claimed, cannot be reduced to calculation, cost-benefit analysis, or logical ability. Instead, intelligence boils down to a process of dramatic rehearsal that explores different courses of action in response to specific, concrete problems. The decisive factor in choosing one course

of action over another is how the individual reacts to them — whether with pleasure or pain, attraction or aversion (Dewey, 1922). This type of intelligence involves, at its heart, constructivist thought.

The thoughts of John Dewey particularly resonate with me; I have chosen to incorporate them into my living theory of maximising high-fidelity simulation. Dewey gives students the privilege of interacting in a social medium, of creating their own learning, and of allowing old habits to fall away in order to make change relevant and effective. As a researcher working in social environments, part of my living theory in designing high-fidelity simulation involves managing the series of teaching moments that occur at an early stage in order to improve learning as students move through the simulation toward its conclusion. This line of thinking informs my living theory of how to create educative environments for students, ones which will inspire them to seek out further learning. Further, I believe bringing Dewey's notions into my theory will add a new lens to the literature currently available in this domain of high-fidelity nursing education.

Benefits and weaknesses of constructivist theory.

One of the benefits of constructivist theory is that content can be presented from multiple perspectives (McLeod, 2003). Teachers can use case studies, online content, video podcasts, and quizzes to assist learners to develop and articulate new and individual representations of information. Active knowledge construction is promoted over passive transmission of information. This pedagogy is learner-centred and places the student firmly in control of their own knowledge construction (Passmore, 2014). However, with this benefit comes a potential challenge.

Learners may inadvertently construct knowledge that is inaccurate or not the best 'fit' for the problem they are trying to solve (Kala et al., 2010). Some pre-existing ideas may be ad hoc or unstable (Sjøberg, 2010). Proceeding with these ideas may lead the learner to incorrect conclusions. Furthermore, some students may find themselves getting off-track in a particular simulation. If the facilitator is not aware of what that particular student is 'thinking,' they may not be able to correct the knowledge construction at this early stage. This problem can be mitigated by training simulation facilitators to monitor and guide student thinking in the debriefing session, but this is time consuming and does require further training in situated teaching (Benner et al., 2010; Neill & Wotton, 2011). This is one reason why debriefing, to ensure refinement of new knowledge, is an essential component when using high-fidelity simulation (Crookall, 2011).

Summary: Theoretical Underpinnings Influencing High-fidelity Simulation

The above discussion emphasises the pedagogies which underpin high-fidelity simulation as a teaching and learning tool. In summary, the pedagogies are behaviourism, cognitivism, and constructivism. These form a continuum of learning theories beginning with the behaviourist theory, where learning is confirmed by specific behavioural responses to specific stimuli; passing through the cognitivist theory, where learning is confirmed by the behavioural and mental solutions to specific stimuli; and ending with the constructivist theory, where learning is individualised and based on the stimuli as they are presented (Passmore, 2014). This continuum

might more simply be described as moving from rote learning or memorisation through meaningful learning and problem solving to autonomous learning and invention (Novak & Cañas, 2006; Passmore, Owen, & Prabakaran, 2011). It is this progression of movement through the learning theories which I aimed to incorporate into my living theory of how to design and implement high-fidelity simulation in order to address the research question:

How can I improve my pedagogical practices working with undergraduate students in the high-fidelity simulation environment?

The three pedagogical approaches of behaviourism, cognitivism, and constructivism describe the learning theories which underpin high-fidelity simulation as method or model. That is, high-fidelity simulation as a teaching tool can be used to integrate behaviourist, cognitivist and constructivist pedagogies into educational practice. As stated at the beginning of this section, there arises some confusion as to the term *simulation* with some calling it a pedagogy (McNeill et al., 2012). Simulation as a teaching tool builds on different theoretical approaches, but is not a pedagogy as such. It is easy to understand how this differentiation has led to some confusion in terminology. Further research into the pedagogical and educational philosophy underpinning simulation is important to guide the future development of this teaching method (Parker & Myrick, 2009).

It must also be acknowledged that the nursing programme in which this research was nested was not working from any clearly explicated pedagogy. This fact represented one of the major challenges in designing a simulation suite, as it has proven to be difficult to integrate simulation into a curriculum which was not built around any particular pedagogical approach. This remains one of the limitations of this research.

Having dwelled with these educational theories I have come to recognise the need for my developing living theory to incorporate the rote learning, modular components, and skill acquisition of the behaviourists. I will then integrate the automation of these skills into long-term memory as highlighted by the cognitivists. I will carefully manage new knowledge and the complexity of that knowledge in order not to overwhelm the working memory of novice students in high-fidelity simulation. Ultimately, my living theory will incorporate the creation of new meaning by involving students in participative learning environments in which they are encouraged to identify specific elements of the simulation which enhanced their habit formation with the ultimate aim of better managing deteriorating clinical situations.

Chapter 5 - Methodology

Overview

Action research, using a living theory approach, is the chosen methodology to answer the research question being addressed in this thesis:

How can I improve my pedagogical practices working with undergraduate students in the high-fidelity simulation environment?

In the most general terms, action research is a form of practitioner-centred research that is carried out by professionals into a practice problem for which the researcher is in some way responsible (Foreman-Peck & Murray, 2008). Unlike other forms of practitioner research which involve studying a situation in retrospect, action research involves a process whereby the researcher takes action in a particular situation while simultaneously researching the effect of the said action. The goal is to solve a problem or improve a particular situation (Mills, 2014; Reason, 2004). It is concerned with improving practice, creating knowledge, and improving learning (McNiff & Whitehead, 2010). The problem being addressed in this thesis is my understanding of how I can improve my pedagogical practices working in high-fidelity simulation environments.

The reason action research is written in the first person using the term 'I' is that it is a form of professional learning and research where the researcher asks questions like; "What is my concern? Why am I concerned? and What can I do about it?" (McNiff & Whitehead, 2011, p. 9). In practical terms, and in the writing up of this thesis, I speak in the first person as I interact with the living theory I am creating as I move through this research process. By using first person, I am fostering an inquiring approach to my own life-as-educator in contrast to third person where the researcher is looking from an objective point of view and is not part of the intimate social contexts being researched. Action research in the tradition of McNiff and Whitehead (2011) is about self-study, the living 'I', studying one's own practice with the aim of creating a living theory which constitutes a way of dealing with the research question.

The purpose of all research is to generate new knowledge. Action research is a special kind of knowledge which involves both action and research (McNiff & Whitehead, 2011). The goal is to improve professional practice while also developing new knowledge through the generation of a living theory. Action research involves taking action to improve personal and social situations while offering explanations for why these solutions are beneficial. Action research as a methodology involves a cycle of inquiry (observe, reflect, act, evaluate, modify next cycle) (McNiff & Whitehead, 2011). This cycle is represented in Figure 5.1 (p. 105). It is this cycle which will be adhered to in each of the three data collection sequences of this research. Each cycle depicts a new phase, with cycles two and three being informed with the living theory gleaned from the previous cycle. Within this thesis, each action cycle is described in sequential chapters. Cycle one is described in Chapter 7, cycle two in Chapter 8, and cycle three in Chapter 9. As all action research involves the instigation of some sort of change, a change process originating with the 'father' of action research will be outlined in this chapter. Part of my living theory involved

understanding the types of action research followed with why I chose to use the approach espoused by McNiff and Whitehead (2010) in particular.

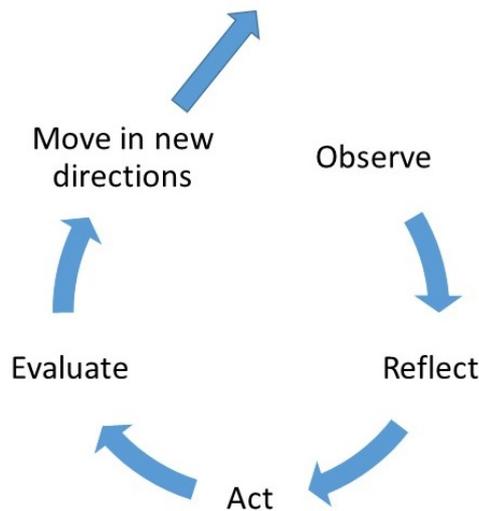


Figure 5.1 An action-reflection cycle.

From *All you need to know about action research* (McNiff & Whitehead, 2011, p. 9). Reprinted with permission.

Historical Roots of Action Research

Kurt Lewin.

Kurt Lewin, who is known as the father of action research, was born in 1890 in a small town in Prussia (now belonging to Poland) (Kruse & Graumann, 2005). He grew up as one of four children in a Jewish family. After finishing his tour of duty in World War I, he was appointed to the *Psychological Institute of Berlin University*. He later advanced as an assistant in a new section of applied psychology, where he remained until his emigration to the United States in 1933. Although he received the title of professor in 1927, it was impossible for a Jewish citizen to be appointed to a tenured position. Therefore, Lewin concentrated on experimental studies of will, affect, and action, which became the basis for the development of his field theory.

In 1929 Lewin received an invitation to attend an international congress at Yale University. His lecture on environmental forces (presented in German), along with a short film on the effect of these forces (demonstrated by a small girl trying to sit on a stone), apparently impressed his audience so much that he was invited as visiting professor to Stanford University in 1932. Lewin was forced to leave Germany when the Nazis seized power in 1933, and was fortunate to receive a timely invitation to join the faculty at Cornell University. After two years he was offered a position at the Iowa University Child Welfare Research Station, where he worked for eight years as a professor of child psychology (Kruse & Graumann, 2005).

Lewin's experiences throughout his life were at times mirrored in his research. As a member of a minority group, a Jewish emigrant, and an immigrant forced to adapt to another culture, he experienced change from a disadvantaged position. These experiences underline his interest in

a synthesis of social research and social change. Lewin's work would go on to influence the area of organisational development and working through change. His often-quoted equation $B = f(PE)$, behaviour is a function of the person and the environment, is less concerned with the behaviour than with the total event (Stam, 2000). However, the focus on the environment and behaviour, as it is influenced by the environment, is key to the action cycles of this research.

Lewin believed that the behaviour of an individual should be considered within a group setting. In fact, the behaviour of the individual is shaped by both the individual's psychology, and the group setting or context in which said individual finds herself. The idea is that person and context are interdependent variables shaping behaviour (Spector, 2013). Lewin's theoretical premise is intricately tied into individuals working in groups — thus Lewin's interest in the function and impact of groups on individual behaviours and change. Lewin coined the term "group dynamics" to describe the positive and negative forces in a group; which always assumed that a group is an organic whole. He believed that theory should inform social problems and social problems should inform theory; lest theory become "too sterile and abstract, and research too trivial" (Stam, 2000, p. 46). These concepts became the cornerstone of Lewin's change model.

Lewin's change model.

By the time Lewin left Iowa for Massachusetts Institute of Technology in 1944, his thinking had shifted to working with the problems of group processes and the resolution of social conflict (Stam, 2000). His study of change implementation can be traced back to his work in the aftermath of World War II. He published two path-breaking essays, *Behaviour and development as a function of the total situation* (Lewin, 1951) and *Frontiers in group dynamics* (Lewin, 1947). Through this work, Lewin highlighted the importance that *context* plays in shaping individual behaviours. Secondly, he argued that the only way to motivate an individual to change his or her pattern of behaviour is to create a sense of the *disequilibrium or dissatisfaction* with the status quo within that individual (Spector, 2013).

Lewin was adamant that what does *not* work is telling people to change. Giving a speech about the need for change will not motivate new behaviours. This is due to the fact that change can be risky, terrifying and painful. Lewin's basic change model of unfreezing, changing, and refreezing has become foundational in managing change along with becoming a foundation upon which change theory could be built (Schein, 1999). Lewin believed that human change was a profound psychological and dynamic process that involved painful unlearning without the loss of ego identity. Difficult relearning was then required in order to restructure one's thoughts, perceptions, feelings, and attitudes (Schein, 1999).

Unfreezing, the first step in the change process is difficult to achieve. This is highlighted by the fact that the stability of human behaviour is based on the "*quasi-stationary equilibria*" (Schein, 1999, p. 59) supported by a large force field of driving and restraining forces. For change to occur, this force field has to be altered under complex psychological conditions. Simply adding a driving force toward change often produces an immediate counterforce to maintain the equilibrium, thus stopping change from occurring (Schein, 1999). This observation led to the important insight that the equilibrium could more easily be moved if one could remove the

restraining forces, since there were already driving forces in the system. Removing restraining forces allows more impetus to driving forces already present.

Restraining forces are often harder to access because they involve personal psychological defences or group norms embedded in the organisational community or culture. The full ramifications of these restraining forces were only uncovered after decades of frustrating encounters with resistance to change. The answer would come in the work of psychoanalysts around what exactly is involved in denial, splitting, and projection, and to Argyris' seminal work on defensive routines (Argyris, 1990). Through this work it was discovered that unfreezing involves three processes, each of which has to be present in some degree for readiness and motivation to change to occur. The three processes are:

- *Disconfirmation*: Some form of dissatisfaction or frustration generated by data that disconfirm our expectations or hopes;
- *Survival anxiety*: This "learning anxiety," arises when we admit to ourselves and others that something is wrong or imperfect (the above dissatisfaction). With the potential change, we must accept the possibility that we will lose our effectiveness, our self-esteem, and maybe even our identity. This learning anxiety is the fundamental restraining force which goes up in direct proportion to the amount of disconfirmation—leading to the maintenance of the equilibrium through the avoidance of the disconfirming information. Dealing with learning anxiety is the key to producing change; and
- *Creation of psychological safety to overcome learning anxiety*: Sufficient psychological safety must be created to prevent denial of the disconfirming information. Once this happens, survival anxiety can be dealt with and change can occur.

(Schein, 1999, pp. 60-61)

The key to effective change management, then, becomes the ability to balance the amount of threat, produced by disconfirming data, with enough psychological safety to allow the change target to accept the information, feel the survival anxiety, and become motivated to change. This process involves what is commonly called cognitive redefinition, frame breaking, or reframing. Reframing occurs by taking in new information that has one or more of the following impacts:

- *Semantic redefinition* — we learn that words can mean something different from what we had assumed;
- *Cognitive broadening* — we learn that a given concept can be more broadly interpreted than our previous experience allowed us to assume; and
- *New standards of judgment or evaluation* — we learn that the anchors we previously used for judgment and comparison are not absolute. If we change our anchors, our scale of judgment shifts (Schein, 1999, p. 61).

Lewin was able to bring about change with housewives through semantic redefinition, cognitive broadening and changing their standards of judgment or evaluation. He helped them to change their choices around what was 'acceptable' meat (e.g. kidney and liver are acceptable

meats) thus allowing them to reframe their thinking. This kind of cognitive restructuring is fundamental to producing change that will last. Cognitive redefinition occurs when the learner has become unfrozen (i.e. motivated to change); therefore opening him or herself up to new information. When individuals open themselves up to cognitive redefinition, action research can occur.

The Nature of Action Research

Action research, within the educational domain, requires teachers, as researchers, to understand data collection, evidence-based instructional practices, and informal diagnostic assessments. Some have described the action research process as a “wonderfully uncomfortable” place to be (Lytle, 1997). Once the researcher begins the journey of investigation, there is no way of knowing in advance where it will end up. Action research is an on-going creative activity that exposes the researcher to surprises along the way. What appears to matter in the planning stages of an action research investigation may provide only a hint of what will become the focus of investigation (Mills, 2014). Action research has as its primary directive “to change the world, not just describe it” (Candy, 1989, p. 19). It is a type of applied research that is essentially a social experiment, introducing some new policy or procedure and then monitoring its effects (Payne & Payne, 2004). It is especially useful when implementing new methods and/or resources with the goal of improving student learning. Therefore, it is particularly applicable in helping understand the theories underpinning simulation as an emerging teaching/learning tool. Additionally, such applied research has been described as empowering for teachers, giving them opportunities to grow within their professional roles and responsibilities (Glanz, 2003). In the case of this research it is initially empowering for me the researcher, helping me to become more skilled in working in the high-fidelity simulation environment. However it is likely that output of the process will also usefully engage other teachers who work in similar contexts. The theory offers the strength of having its genesis in the rigorous, reflective thinking of a person who is both researcher and practitioner (McNiff & Whitehead, 2010). The ideas have been tested in the real world, with all the associated challenges.

Types of Action Research

It is common to name three different types of action research (Kemmis, 2006; McNiff & Whitehead, 2011). Interpretative or practical action research is hermeneutic, aiming at uncovering actors’ meanings and aims and a deeper understanding of situations from actors’ various perspectives. Critical action research is directed towards an idea of emancipatory knowledge and involves uncovering false beliefs about practice. Technical action research has positivist epistemological assumptions and seeks causal explanations and predictive generalisations (McNiff & Whitehead, 2011). I have chosen to move beyond these categories to engage in what McNiff and Whitehead (2010) described as a living theory form of action research. It is an emergent process whereby the researcher thinks through each experience within the action research cycle, situating themselves as researcher at the heart of the study. Through reading, writing, acting, talking, listening and reflecting, they shape and re-shape their insights

and understandings into a living theory, context specific and infused with their own bias. The methods employed in the action cycle are chosen on the basis of what will, most clearly, reveal the issue at hand, bringing both the rigour of quantitative processes where that is important and the openness of interpretive approaches to listening and reflecting. The goal is not to claim to have developed a propositional theory; rather to offer a theorised explanation for one's own practice initiatives.

Epistemological Underpinnings of the Living Theory Approach

Epistemology is to do with how we understand knowledge, and how we come to acquire and create knowledge. Action research with its participatory worldview, involves an extended epistemology where the researcher draws on diverse forms of knowing while interacting with the world (Reason & Bradbury, 2006). The epistemological assumptions of action research, as described by McNiff and Whitehead (2011), include the following:

- The object of the enquiry is the 'I.'
- Knowledge is uncertain.
- Knowledge creation is a collaborative process. (McNiff & Whitehead, 2011, p. 31)

The implication of the object of the enquiry being the 'I' is that personal accountability is very important. While I cannot accept responsibility for what others do and think, I can accept full responsibility for myself in this research. Furthermore, the knowledge that I will create in this process is uncertain due to the unique and unpredictable characteristics humans bring to the process. One question I ask may generate multiple answers. As knowledge is discovered, any answer to the problem is tentative and open to modification. I must live with the dissonance of not having the entire 'answer' at the end of any particular action cycle. Therefore, epistemologically, I do not produce a fixed outcome which will apply in any and all circumstances. Instead, my efforts will help produce a living theory which shows what I am learning, and invites others to learn with me.

Ontologically, action research is characterised by (1) "being value laden, (2) morally committed, and (3) involving an inter-relation of individuals within their social contexts" (McNiff & Whitehead, 2011, p. 27). It aims to understand what the 'I' is doing, not what 'they' are doing. While positivist forms of research are notionally value free, with the researcher staying outside the research field, action researchers are attempting to live in the direction of values that inspire their lives. Thus, action research is value laden as it provides direction for the values of 'I,' ultimately forming a living theory of practice.

Such action research is appropriate for this study because of its use of multiple forms of investigation coupled with a participatory data collection process mixing both quantitative and qualitative methods. In this research, the first two action cycles employed interpretive forms of data collection and analysis whereby students were observed, and the researcher analysed this data, offering a description and explanation in response to the simulated event and debriefing. The students offered their own understandings both during and after the simulation event,

maximising consultation. The students interacted with the researcher, sharing their experiences in a participatory manner. Reflection both during the simulation and afterward was an integral part of this process.

The third action cycle employed a more empirical process which drew on a mixed method approach and brought associated disciplines to seek reliability and validity (McNiff & Whitehead, 2011). This was appropriate for the research question in that it facilitated an understanding of lived experiences elicited from students during and after simulation, coupled with statistical analyses of student performance via the Lasater Clinical Simulation Rubric and pre- and post-tests. Using an interactive strategy known as 'merging' the two data sets were brought together in a combined analysis. Both sets of data were related to each other in order to facilitate comparisons and interpretations (Creswell & Plano-Clark, 2011; McNiff & Whitehead, 2011). The merging of data in this manner allowed for understandings which encompassed both the lived experience of students along with specific performance indicators in the form of Lasater rubric evaluation and pre- and post-tests.

Action research cycle of inquiry.

The cyclical nature of the action research process is key to taking one focus and then spiralling it on to the next. The action cycle begins with observation — an investigation into current practice with an aim of understanding the situation from the participant's viewpoint. Reflection on what the current situation embodies (by the action researcher), along with the formation of a plan forms the next step (McNiff & Whitehead, 2011). The plan is then acted upon by the action researcher, followed by an evaluation of its effectiveness in view of the original goals. The evaluation fuels improvements which will be put into place with participants in the next action cycle. Each cycle feeds the next in a progressive implementation of change which helps support reframing of the problem while influencing the thinking of those involved. This process provides an integrated approach to change that attends to economic, technical, human, and organisational considerations (Reason & Bradbury, 2006).

Figure 5.1 (p. 105) above, demonstrates the cyclical nature of the process. Each cycle of data collection and analysis informs the next in a manner which allows the 'I' to modify practice in light of the evaluation from the previous cycle. It must be emphasised that the object of enquiry is not other people, but the 'I' in relation to the 'we' (McNiff & Whitehead, 2011). In practical terms, this means that the researcher identifies a particular concern, tries out different ways of addressing it, reflects on outcomes, checks out any new understandings with others, and ultimately tries a different way that may or may not be more successful than the first. The process of "observe — reflect — act — evaluate — modify — move in new directions" (McNiff & Whitehead, 2011, p. 9) is known as the action — reflection cycle. The process is ongoing as the researcher progresses to a point where things are satisfactory. It is at that point that new questions arise, and a new cycle of inquiry commences.

Through the cyclical process, the potential for cognitive restructuring (a change process), occurs within the mind of the 'I'. Cognitive restructuring is the formation of new knowledge within the mind of the researcher (Schein, 1999). This is important as it is integral to continued

development and improvement of educational practises. With each action cycle, educational methods are improved based on feedback and analysis emerging from previous cycles (McNiff & Whitehead, 2010, 2011). This process involves the often painful demands of change, which can be uncomfortable for educators and students alike (Hegarty, Walsh, Condon, & Sweeney, 2009). Through this change process, the 'I' is encouraged to cultivate improved teaching processes in the form of a living theory, which will inform, in this case, how high-fidelity simulation is implemented. This forms part of the researcher's own professional development.

Theoretical Underpinnings Informing Interpretation of Data

As stated in Chapter 4, my living theory around the design and implementation of high-fidelity simulation includes a tapestry of theoretical frameworks which, when actualised, have the potential to create a powerful immersive learning classroom. It is important that I, as the designer of these environments, become adept at using the best contributions from each of the theoretical frameworks which underpin this teaching tool. In summary, the theoretical frameworks are behaviourism, cognitivism, and constructivism. These form a continuum of learning theories beginning with the behaviourist theory, where learning is confirmed by specific behavioural responses to specific stimuli; passing through the cognitivist theory, where learning is confirmed by the behavioural and mental solutions to specific stimuli; and ending with the constructivist theory, where learning is individualised and based on the stimuli as they are presented (Passmore, 2014). This movement from rote learning through meaningful learning and problem solving to autonomous learning and invention provides a valuable theoretical underpinning for use in simulation design (Novak & Cañas, 2006; Passmore et al., 2011). It is this process which I would like to embed into my living theory of implementing high-fidelity simulation as a teaching tool.

The writing of Dewey intrigued me right from the proposal stage of this study. Dewey (1938) was a pragmatist and one of the early thinkers informing constructivism. He believed that genuine education comes through experience, but that not all experiences are educative. The most intricate and seemingly brilliant simulation design might not be educative. Some experiences are what Dewey terms "*mis-educative*" (Dewey, 1938, p. 37). A mis-educative experience is defined as one that has the effect of arresting or distorting the influence of further experience (Dewey, 1938). "When an experience engenders callousness; it may produce lack of sensitivity and of responsiveness" (Dewey, 1938, p. 247). As an educator I am responsible for creating learning environments which inspire learning.

Dewey (1938) believed that the aim of education is not to get a job or produce people with employable skills. The aim of education is to enable mental, spiritual, and physical growth — in essence to put learners on a pathway of acquiring more education. Thus, the aim of education is to teach students how to manage their learning, thus enabling a continual cycle of education that will last throughout a lifetime. Action research has encouraged me to improve my professional practice through the development of a living theory in relation to high-fidelity simulation (McNiff & Whitehead, 2010). My desire to form this living theory dovetails well with Dewey's beliefs around the aim of education. Dewey (1922) believed that:

If education were conducted as a process of fullest utilization of present resources, liberating and guiding capacities that are now urgent, it goes without saying that the lives of the young would be much richer in meaning than they are now (p. 270).

This focus on *enriching the lives of the young* through education provides a strong philosophical underpinning for my research. Dewey (1922) was interested in the formation of what he called habits. This constructivist notion involves assisting the learner in organising activities and problem solving. The challenge is that habits are not native, but acquired (Dewey, 1922). Thinking cannot escape the influence of habit, and habit formation is necessary in order to order to help organise daily activities. The formation of more mature habits is dependent upon interaction with what Dewey describes as a “matured social medium” (Dewey, 1922, p. 90). Within the context of high-fidelity simulation this matured social medium is me, or possibly other students, involved in the high-fidelity simulation. Either way, interaction with these relatively mature individuals in an experiential setting allows students to change their own habits, thus organising their activities in a more effective and influential manner.

The epistemological notions of Dewey (1922) have strong alliances with action research. He believed that knowing is a way of doing — a “distinctive activity” (Dewey, 1922, p. 186). A central concept in his theory of knowing is the notion of experience. Dewey surmised that there exists a close connection between living organisms and their environments — a double relationship in which “the organism acts upon its surroundings resulting in changes, and then the organism suffers the consequences of its own behaviour which caused these changes” (p. 199). Consequently, knowledge comes from experience. Action research echoes this same sentiment as knowledge creation involves a collaborative process of the ‘I’ working in a participatory manner with the ‘we’ (McNiff & Whitehead, 2011) in a social setting.

In a similar fashion, action researchers feel compelled to act on knowledge acquired by doing (Brydon-Miller, Greenwood, & Maguire, 2003), thus giving a voice to the transformative power of participative processes. This sounds remarkably similar to constructivist learning paradigms, which support creativity in problem solving as the student assimilates new information or concepts into their knowledge structure (Passmore, 2014). Dewey’s dramatic rehearsal (in the imagination) of various competing possible lines of action allows the individual to ‘try out’ potential responses in the mind to see how they ‘fit’ with the problem at hand (Dewey, 1922, p. 190). Action research allows the same exploration of different courses of action in a problem-solving process that fosters the development of new habits (McNiff & Whitehead, 2011). This constructivist underpinning is key to creating new knowledge and is at the heart of my living theory.

Dewey’s (1938) thinking will underpin the analysis of data gathered as students are observed in teaching/learning situations that involve high-fidelity simulation. Attention will be given to the formation of “impulses” within the simulation environment upon which new habits will develop. Interaction with a matured social medium in the form of an educator and other students will encourage new habit formation (Dewey, 1922). These new habits will enable students to better manage the deteriorating patients they encounter in the simulation (Cooper et al., 2012). The ultimate goal is to manage the “means,” in order that students will attain a better “end” for their

patients (Dewey, 1922). Furthermore, both the “means” and the “ends” must be defensible. In other words, the “end” cannot be properly assessed until the “means” are evaluated (Foreman-Peck & Murray, 2008).

Conclusion

Action research is an applied research methodology that is a social experiment with the aim of improving learning with social intent (McNiff & Whitehead, 2011). It is the chosen methodology of this research as applied to high-fidelity simulation using a living theory approach. Action research is concerned with developing my living theory, creating knowledge, and improving learning with the ultimate goal of changing practice in the design and implementation of high-fidelity simulation. Changes in high-fidelity simulation as a teaching method will be accomplished through empowering students, in consultation with myself, to engage in research; ultimately influencing how high-fidelity simulation is designed and integrated into the university undergraduate nursing programme.

The philosophical underpinnings that inform the thinking and interpretation of this research will include behaviourist notions of rote memory, skill acquisition, and modular learning applied to high-fidelity simulation (Parker & Myrick, 2009). This will be coupled with cognitivist theory around automation of skills, and management of new or complex elements within high-fidelity simulation in order to minimise cognitive load on working memory (Fraser et al., 2012). Finally, constructivist thinking of John Dewey (1922), who believed that the aim of education is to enable mental, spiritual, and physical growth — in essence to put learners on a pathway of acquiring more education, is also employed. Dewey’s interest in the formation of habits which assist students in organising activities and progressing in their learning is integral to the development of simulation as a teaching tool. All of the above theories will underpin my living theory as I develop professional skills and insights in the implementation of high-fidelity simulation.

Chapter 6 will describe the process by which this research unfolded including the literature review process, ethics approval, and the initial design. A brief description of the data gathering processes which occurred in each cycle will ensue. This is followed by a short description of recruitment processes, data gathering methods, data analysis and trustworthiness.

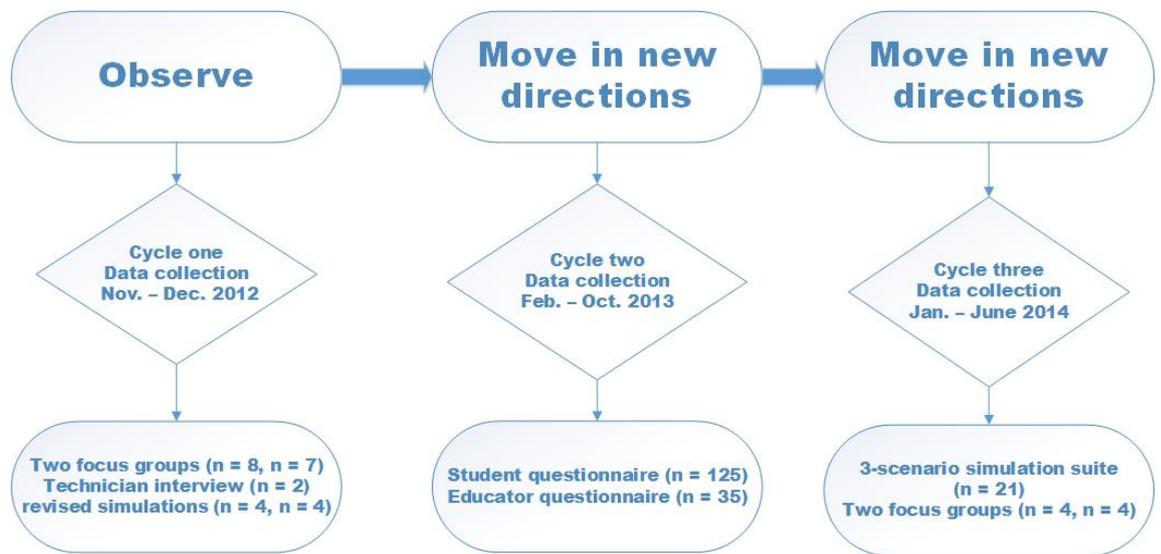
Chapter 6 - Methods

Introduction to the Emergent Research Process

This chapter presents the methods used in this study that emerged as three action cycles designed to understand how high-fidelity simulation with undergraduate nursing students could be improved were actioned. This study addresses the question:

How can I improve my pedagogical practices working with undergraduate students in the high-fidelity simulation environment?

Figure 6.1 (p. 118) overviews the action research cycles and timeline. Attention was paid to each step being conducted ethically, respecting the ethical principles of partnership, participation, and protection. Applications for supplementary ethics approval were made within, and between, the three cycles as understanding emerged. Scholarly integrity was served through continuous reflection on how the methods were congruent with the pedagogy and methodology used in this study, and through methodically documenting the process and methods used. The participants were consulted as well as acting as co-subjects as the research design emerged, and as I developed my living theory for the instigation of quality, high-fidelity simulation. For clarity, the research methods (acknowledging pre-understandings, ethics and inclusion criteria) which are common to the action research cycles are described first. Then, the particular methods (recruitment, data gathering, data analysis, and reflections) used for each emergent action research cycle are described.



Three action cycles

Figure 6.1 Timeline and detail of action research cycles

Acknowledging My Pre-understandings

A potential lack of transferability or generalisability of the results is one of the criticisms of action research. Generalisability refers to the applicability of findings to settings and contexts different from the one in which they were obtained (Mills, 2014). Of particular concern is the potential influence of the researcher's pre-understandings. Therefore, the potential for researcher pre-understandings to influence the methods and study results must be managed methodically and transparently. The methods I used to manage the potential risk of my existing pre-understandings unduly influencing this study were:

- I developed a list of propositions about what would be expected in findings before and during the data collection process. These were stored in the memo section of NVivo™ and referred to frequently in order to raise awareness of personal understandings. These propositions provided a window into my personal beliefs and existing knowledge that could potentially creep into the investigation. My documented propositions provided a good starting point for examining my personal theories about teaching, learning, and simulation, and for understanding the origins of these theories.
- I put in place a plan that used multiple data sources and repeated measures to help build in a check-and-balance system for bias (Reason & Bradbury, 2006). In other words, multiple datasets were compared for congruence and difference. Ultimately, triangulation of the literature review findings, multiple data sources, and thesis supervision helped to manage the potential for my existing understandings to unduly influence this study.
- I developed a reference group (called the *Simulation User Group*), which included the technicians and purposively selected educators from midwifery, paramedicine, and nursing, who assisted in simulation development and delivery within each school. For inclusion, each educator had to be working with high-fidelity simulation on a weekly or monthly basis. I consulted regularly with this group regarding filming simulation events, various ways of managing debriefing, and how to maximise my own performance as the simulation development leader. Feedback and support from those in the Simulation User Group assisted me in managing my own and student bias as the research progressed.
- I kept a reflective, working journal which included thoughts related to ensuring rigour in data collection and analysis, making my existing understandings explicit and considering how to minimise how they influenced the study. Journaling helped to clarify conceptual frameworks I was using and how they were influencing the investigation. That kept me mindful of the assumptions within my developing theory.

Gaining Ethical Approval

Ethics approval (number 12/208) for the first phase of this project was gained from the Auckland University of Technology Ethics Committee (AUTEC) on October 1, 2012 (Appendix A1). Requested ethics amendments were approved as the direction of action cycles emerged (Appendices B, C, & D). One of the main ethical considerations for this study was the power differential between me, in my role as educator within the school in which the study was being

conducted, and the student participants. The potential for coercion to participate along with an unconscious coercion toward favorable responses to 'the teacher' were foremost in my thoughts.

Managing the power differential ethically.

No students with whom I was currently involved in assessing performance in either clinical or on-campus learning were recruited. Hence, information about the study was only provided when all academic assessments were completed and graded. It was made clear that participation in the study would not influence grades in any way. While I acknowledge that I was known to some of the students through past relationships, I believe this strengthened the study as it meant there was a ready-made foundation of trust in which students felt free to voice their concerns. Their openness confirms they did not appear intimidated or shy of speaking up.

Managing the researcher's academic responsibilities.

Initially, my second supervisor for this study was the Head of School of Nursing, who held a mandate for high-fidelity simulation within the undergraduate programme. Her resignation during the course of my project resulted in a gap in the formal relationships with nursing educator stakeholders. To manage this change ethically, I approached the nurse educators using simulation as a learning tool to inform them of the study methods and to engage them as stakeholders in this research. This process was repeated as the action cycles emerged.

Informed consent.

Each potential volunteer in this study received a participant information sheet (Appendices B2, C1, and D2) and had the opportunity to have any queries answered before consenting to participate. All participants gave written consent (Appendices B4-5, C2 and D3-5) prior to data being gathered for each step in the emergent research process. The information provided and the consent procedures were tailored to the methods used in each action cycle. Participants were given the contact details of the researcher, the primary supervisor, the AUTECH Executive Secretary and the University student health and counselling centre to address any queries or concerns. Confidentiality was maintained in this report by way of using aggregated data and/or pseudonyms.

Inclusion Criteria

To be eligible for inclusion in this study, potential participants needed to be enrolled in the undergraduate nursing programme at the University, be enrolled in semesters three, five or six in which simulation was used as a learning tool, and have existing experience of learning through high-fidelity simulation.

Students being assessed by me, in either clinical or theoretical settings, at the time of the study, were excluded from participating in any of the research processes in which participants were identifiable to me.

The Action Research Cycles

This research project encompassed three action cycles. Insights gained from the first cycle informed the subsequent cycle, and so on, within a continually evolving process of action research (McNiff & Whitehead, 2011; Mills, 2014). This section of the methods chapter details the recruitment, data gathering, and data analysis methods used in the study, as well as my reflections at the end of each cycle and how my emergent understandings informed the design of the subsequent cycles. Table 6.1 sets out the methods used, the aim of each step in the research process, and the participants enrolled.

Table 6.1 *Data Collection Methods in Each Action Cycle*

Action Cycle One		
Data collection method	Aim	Participants
Student focus group (FG) interviews (2)	Scoping exercise to understand 2 nd and final year students' current experiences and ideas to improve high-fidelity simulation (HFS)	15 students from across semesters (sem) using simulation: sem 3 (n = 7), sem 5 (n = 6), sem 6 (n = 2)
Student narrative debriefing data after trial simulation event (recorded and transcribed for both groups' revised simulations).	Trial a redesigned HFS learning experience using recommended pedagogical practices and gather student feedback Thematic coding (NVivo) of feedback from debrief with students; main themes regarding usefulness of simulation changes	8 (of the 15 FG) students sem 3 (n = 4), sem 5 (n = 4) Run as 2x FG with 4 students each
Student narrative feedback data post debrief (emailed to Gwen)	To gain feedback in a on the changes made to the HFS. These changes were based on focus group themes/requests.	5 (of the above 8) students
*Supplementary process: Technician group interview [*see definition]	Explore perspectives on how high-fidelity simulation is implemented and gain opinions on what educators could do to improve high-fidelity simulation design and process	2 (of 2) technicians who implemented high-fidelity simulation trial (same 2 for entire project)
<i>Researcher's memos and journal</i>	<i>Reflect on all data across cycle one in order to implement redesigned high-fidelity simulation learning experiences for students within cycle two.</i>	

Action Cycle Two		
Data collection method	Aim	Participants
Student pre-simulation questionnaire using 5-point Likert scale	Survey students' most and least valued aspects of high-fidelity simulation learning events	125 students from final year sem 5 (n = 125)
Student 'thinking aloud' data during revised high-fidelity simulation event	Gather students thoughts during simulation: What worked? What did you learn from that?	125 students (as above) In 32 simulation groups
Student post-simulation questionnaire using 5-point Likert scale	Survey students' most and least valued aspects of the revised high-fidelity simulation learning event	125 students (as above)
*Supplementary process: NZ nursing educators (national) questionnaire (convenience sample)	Survey opinions on resources required to assist student learning using high-fidelity simulation as an education tool	35 (5 from AUT) nurse educators from 17 national programmes, experienced in HFS
<i>Researcher's memos and journal</i>	<i>Reflect on the themes emerging from NVivo coding, student frustrations, passions, and what seemed to be working well. I also reflected on how I was integrating these changes (both frustrating and positive aspects).</i>	

Action Cycle Three		
Data collection method	Aim	Participants
Student pre-simulation written tests, for each of 3 (shock, croup, ACS) simulation events (quantitative data)	Measure content knowledge around each of three simulation topics (repeated measures method) Results collated and analysed with SAS quantitative software	21 students from sem 6 (had not participated in previous simulation events)
Video data of student teams completing simulation suite of three scenarios	Measure student performance in noticing, interpreting, responding, and reflecting skills; scored by nominated educators using the Lasater Clinical Judgment Rubric. Analysis of student performance done with SAS quantitative software	21 students (as above) participated, in 6x groups of 4 or 3 students each. 18 (of 21) students evaluated (3 played family members; no clinical judgments).

Student post-simulation written tests, for each of 3 suite of simulation events (quantitative data)	Measure content knowledge around each of three simulation topics (repeated measures method) Results collated and analysed with SAS quantitative software	21 students (as above)
Student post-simulation questionnaire (5-point Likert scale)	Measure how satisfied students were with the overall suite; how the suite (of 3 simulations) affected their knowledge base, their confidence, and their ability to work in teams. Gather data on what role they played and whether it was harder or easier than the other roles. What was least valuable aspect of the day, and what changes would make it perfect. All data transcribed and coded in NVivo [Likert scores not informative as almost all responses were coded highly as 1/5 pre-simulation and 4/5 or 5/5 post-simulation]	21 students (of the 21 who completed the pre- & post-simulation tests)
Student narrative feedback data during debrief	What did you like/not like? What worked etc.	21 students (as above)
Student focus groups (2) post-simulation experiences	Depth exploration of the post-simulation questionnaire questions (confidence, content knowledge etc.)	8 (of 21 above) students [4 volunteers, 4 from snowballing]
<i>Researcher's memos and journal</i>	<i>Reflect on recommendations to the Head of School of Clinical Sciences regarding best practise.</i>	

*Supplementary: Also, supplemental. Of the nature of or forming a supplement; additional. To add to the main or whole (Merriam-Webster Online Dictionary, 2015).

First Action Cycle

The **first action cycle** was planned as a scoping phase in which I sought an understanding of student experiences of high-fidelity simulation, including what was and was not working in high-fidelity simulation environments.

Participant recruitment.

A notice about the study was distributed via global email to students enrolled in relevant papers. Fifteen students were purposively recruited, from across the three semesters in which high-fidelity simulation was used, for focus group interview and participation in a trial simulation event. There were seven students from year two of the programme (semester 3), and eight from

the final year (six from semester 5 and two from semester 6). Eight, of these 15 students (four from semester 3, and four from semester 5) subsequently volunteered for a small group debriefing exercise. Five students volunteered to give feedback by email.

The technicians who implement high-fidelity simulation with nursing students were invited to participate in a small group interview. Two technicians employed by the University, volunteered.

Data gathering.

The 15 student volunteers engaged in one of two focus group interviews aimed at describing the scope of their existing experiences of simulation as a learning tool and to discuss ideas about how they thought the teaching/learning methods could be improved. Each focus group ran for approximately 60 minutes until no new ideas were emerging from the discussion. As focus group facilitator, I focused on asking open questions (Appendix B7) to promote discussion, such as “Please describe the type of simulation you’ve been involved with up to this point in your degree programme.” I aimed to ensure that each participant had a say by noting who had spoken and encouraging all members to speak. Rather than seek a consensus of ideas, I invited contributions from anyone who had differing experiences or ideas to those already voiced. Data were audio-recorded and transcribed verbatim by me.

E-mail questionnaires were used in the initial stages of this research as a way to elicit feedback about changes made in the revised high-fidelity simulation. Open-ended questions such as, “I tried to orient you to the simulator, the skills required, and the assessment parameters required BEFORE the simulation. How did that affect your learning—if at all?” were sent to participants and aimed to elicit feedback on the changes made to the high-fidelity simulation. The full email questionnaire can be viewed in Appendix B8. This data collection technique did not produce feedback from all participants, and thus its contribution to the data was limited.

A trial high-fidelity simulation was designed integrating features the students recommended, and implemented in two simulation groups with eight of the 15 student focus group members. These eight students then engaged in a face-to-face group debriefing about the simulation design and their experiences. Debriefing data were audio-recorded and transcribed by me. Participating students were then emailed a questionnaire in which they gave feedback as to the effectiveness of focus group themes. Five chose to respond and their feedback was transcribed, and themes coded in NVivo™.

Supplementary data were then drawn from the small group discussion with the two technicians who implemented the trial simulation. The indicative questions (Appendix B11), such as, “Were there any techniques used by educators or yourselves during the simulation that helped or hindered what you perceive students took away in the way of learning?” were designed to elicit their opinions on what I could have done differently in the trial simulation exercise, and what nursing educators at the University could do to improve student learning through high-fidelity simulation. The discussion was audio-recorded and transcribed verbatim.

Data analysis.

Verbatim transcripts from the two student focus groups, the post-trial simulation debriefing, the student emailed feedback, and the technicians' discussion were imported into NVivo™ and analysed. Themes were coded using NVivo™ data analysis software, with the research question as a guiding inspiration. This was done by keeping the research question at the forefront so that when I was coding I was continuously mindful of how the student responses informed the research question. Themes were initially coded into free nodes at the end of each cycle. These free nodes were then amalgamated into tree nodes (hierarchical) showing a clustering of ideas around major themes. The themes captured "something important about the data in relation to the research question, and represented some level of patterned response or meaning within the data set" (Braun & Clarke, 2006, p. 84).

Key themes were not necessarily dependent on quantifiable measures such as the overall percentage of coding; rather, on whether the theme captured something important in relation to the overall research question. Themes or patterns within data can be identified in one of two primary ways in thematic analysis. There can be an inductive or "bottom up" way, or in a theoretical, deductive or "top down" manner (Braun & Clarke, 2006, p. 87). This research employed more of a "top down" approach when developing themes known as "theoretical" thematic analysis (Braun & Clarke, 2006, p. 88). This type of thematic development is driven by the researcher's theoretical or analytic interest in the area, and is thus more explicitly analyst-driven. This form of thematic analysis provided a less rich description of the data overall, yet complex account of data and more detailed analysis of some aspects of the data.

Once transcribed verbatim, the analytic notes were read several times in order to gain an understanding of what was occurring in the high-fidelity simulation settings. This flexibility meant that thematic analysis was enhanced by the pedagogical and philosophical underpinnings in order to gain clarity around the context being analysed.

Once uploaded into NVivo™, document folders were arranged in order to create workspaces which aligned with different sections of the research project. In this study, I developed workspaces for each of the three action cycles, and then populated each workspace with data from that cycle. The transcribed documents were read several times and coding checked in order to ensure consistency and accuracy as the coding process evolved. Themes were then used to develop a sense of salience around student perceptions in high-fidelity simulation. These themes were then used to implement a revised, trial high-fidelity simulation. Thus, these themes were also used to inform the next action cycle.

My reflections.

Thinking back over cycle one and the data gathered, I redesigned the high-fidelity simulation learning events that would be implemented with the upcoming semester five students. My reflections developed through the use of the memo function within NVivo™. Memos served as a kind of 'snapshot in time' for each stage of the coding process. I soon began to see that there were some nodes which were subcategories (termed child nodes in NVivo™), and other nodes which were overarching categories (termed parent nodes in NVivo™). In my case, some of the

parent nodes became, 'improving high-fidelity simulation,' while the child nodes under this were: 'be in the room to assist students', 'give friendly feedback,' and 'orient students to simulation beforehand.' The overall themes were used to inform the changes and movement in new directions for action cycle two.

Second Action Cycle

The evaluation of changes in the high-fidelity simulation in cycle one formed the backbone for a high-fidelity simulation in the **second action cycle**. This cycle had the goal of evaluating the interventions implemented in cycle one with a larger cohort of students in their third year (penultimate semester) of a three-year undergraduate nursing programme.

Participant recruitment.

The participants in this cycle were recruited via invitation of an intermediary. Interested students were invited to sign up for a high-fidelity simulation on a wiki on a global student website. The students were invited to form their own groups thus fostering a sense of independence and collaboration. The students (n = 125) were in semester five of the six-semester undergraduate nursing programme.

The second action cycle also included a supplementary cycle involving educators from both my University and around New Zealand. Participants were recruited by public invitation or via an intermediary.

Data gathering.

Semi-structured questionnaires were used predominantly in the second action cycle. These can be viewed in Appendix C3. This method of data collection required the respondents write their narrative responses on the form provided. The students were asked to fill out a pre-simulation questionnaire focusing on their previous experience in high-fidelity simulation. Open-ended questions were used such as, "How did you feel about coming to the simulation today?" After participating in the high-fidelity simulation, students completed a post-simulation questionnaire which included open ended questions such as, "What did you value most in today's high-fidelity simulation experience? What could the simulation facilitator have done better?" The questionnaires elicited responses around the positive and challenging aspects of the high-fidelity simulation, along with any suggestions students might have if, "...the world were perfect and you could run this simulation any way you so desired."

Educators (n = 35) were given a questionnaire (Appendix C5) after attending a conference or training event. The intention was to elicit feedback as to how the conference or training event influenced the educators' confidence and enthusiasm around high-fidelity simulation as a teaching tool. The questionnaire included open-ended questions such as, "What did you value most in today's conference or learning experience? How might what you've learned today influence your professional practice as an educator of nurses?"

Data analysis.

All student questionnaire responses were transcribed verbatim into an Excel spreadsheet and uploaded into NVivo™ as described in cycle one. Dewey's (Dewey, 1910b, 1922, 1938) pragmatism, along with philosophical underpinning of the behaviourists (Watson, 1925), cognitivists (Sweller et al., 2011), and constructivists (R. Miller, 2011; J. Piaget, 1973) were used as philosophical underpinnings as themes emerged.

Themes are described as 'nodes' within NVivo™, and free nodes are created through a 'drag and drop' or 'right click' action over selected text (Bazeley, 2007, p. 14). Once these free nodes were created, patterns began to emerge. I was then able to arrange the 'free nodes' in a hierarchical manner in what NVivo™ terms 'tree nodes' (Bazeley, 2007, pp. 14-18). Tree nodes helped to show the relationship between free nodes, and the groups of ideas that were forming. Commonly used words were explored along with their relationship to particular themes. Once this process was completed, I was able to view all nodes coded in each document by turning on the coding stripes. With this feature enabled, all of the coding for a particular nodes showed in a 'coding stripe' to the right of the text in a characteristic colour for that theme (Bazeley, 2007, p. 88). All of the themes across the entire research project were able to be observed by accessing the nodal view. All of these functions within NVivo™ helped me to track thinking as it evolved (Bazeley, 2007). Themes were coded first into free nodes which were then amalgamated into tree nodes.

The responses from educators (n = 35) were transcribed verbatim, uploaded into NVivo™, and coded for themes as described above. The themes in the tree nodes were used as inspiration for the design of the high-fidelity simulation in cycle three.

My reflections.

Memos were also created as part of my reflection in this thesis. I usually created these after completing the coding for a particular document. Memos helped to summarise what had been coded in that document before leaving it and moving on to the next. In my case, some of the parent nodes became, 'improving high-fidelity simulation,' while the child nodes under this were, 'allow repeat of simulation', 'use ISBAR (Identify, Situation, Background, Assessment, Requirement) tool,' and 'model expected performance.' This process of creating parent and child nodes helped me to begin to 'sift' the themes and gain a clear understanding of how they worked together to inform my research question. The overall themes were used to inform the changes and movement in new directions for action cycle three.

Third Action Cycle

The themes coded from the student and educator responses in cycle two (above) were incorporated into a *simulation suite* in the *third action cycle*. The students in cycle two had requested a simulation suite of at least three scenarios be delivered in the final semester of their undergraduate programme. In response to this request, the *third action cycle* involved the creation of a suite of three scenarios coupled with pre-briefing podcasts, pre-tests, model clips of expected performance, debriefing, and post-tests.

Participant recruitment.

Due to time and access constraints, recruitment for the third action cycle was done via global email and snowballing. The students in this cycle were in their final semester of the three-year undergraduate nursing degree. Time constraints meant that only four students from the final semester were initially recruited via global email which can be viewed in Appendix D1. When this first group of four students completed the simulation suite, they voluntarily, and unbeknownst to me, went away to their 'secret' Facebook™ page and shared their experience. I started to receive emails requesting participation in the study. By the end of the first week, 12 students had volunteered and been recruited for the next simulation suite. Thus, the students had, of their own accord, participated in 'snowballing' where the initial participants assisted me in identifying other potential participants. This form of recruiting fell under, "via public invitation, or via invitation of an intermediary," and so was still in line with ethics requirements.

Data gathering.

Action cycle three employed mixed methods; (1) pre- and post-simulation written test scores; (2) *Lasater Clinical Judgment Rubric (LCJR)* evaluation scores; and (3) focus groups and qualitative questionnaire. This type of investigation is called triangulation. Triangulation refers to the use of more than one approach to the investigation of a research question in order to enhance confidence in the ensuing findings (McNiff & Whitehead, 2011). It is a key strategy used to establish the validity of each data stream. In order to establish the authenticity of this study, the design included three data streams. Denzin (1978) identified four types of triangulation; (1) methods triangulation, (2) triangulation of sources, (3) analyst triangulation, and (4) theory/perspective triangulation. It is methods triangulation, checking out the consistency of findings generated by different data collection methods, which was used in this research. The methods employed in this study were:

- pre- and post-test results;
- analysis of student performance using Lasater simulation rubric; and
- focus groups and qualitative section of pre- and post-tests coded for themes (interpretive descriptive analysis).

The three high-fidelity scenarios were run over three days and involved 21 students. The students were divided into six groups and they proceeded through the following steps in each of three simulated scenarios (hypovolaemic shock, croup, acute coronary syndrome). Upon arrival, the students were:

- given information sheets and consented to participate and be filmed; followed by a
- pre-test for that particular scenario; followed by
- pre-briefing video podcast of between 10-14 minutes; followed by
- performing their first (cold) simulation scenario; followed by
- watching the model clip of how this scenario was performed by educators; and then
- performing their second (Oscar) simulation scenario; followed by a
- post-test which was identical to the pre-test, and finally
- debriefing with learning outcomes used as a framework.

As can be seen from the above list, the first data stream involved pre- and post-simulation test scores. The pre-simulation tests were given before each scenario in the simulation suite (hypovolaemic shock, croup, acute coronary syndrome). The same test was repeated after the high-fidelity simulation had been completed twice (repeated measures design). These 10-question, multiple choice questionnaires 'tested' student knowledge of specific details about best practice patient assessments, medications, and interventions used to manage the acute situations presented in the high-fidelity simulation. These pre- and post-tests can be viewed in Appendices E12-17.

There was a two-fold intention with this design. Firstly, to expose the students to theoretical content in a manner which highlighted what they did and did not know. Secondly, to closely align the exposed knowledge gaps with learning objects (e.g. pre-tests, pre-briefing, high-fidelity simulation, model clips, post-tests, and debriefing) which would scaffold student knowledge resulting in an improved post-test score. I wanted students to be able to see, in a concrete manner, their progression as they moved through the simulation suite. This was done in an attempt to build student confidence as this was a theme which emerged as not occurring in the first action cycle.

The first two action cycles helped me develop my living theory around how to design and implement high-fidelity simulation to maximise student learning. However, I did not evaluate critical thinking or ability to make clinical judgments in the previous two cycles. In line with the research question of improving my pedagogical practices in high-fidelity simulation, I wanted to start to look beyond the surface behaviours being exhibited (a behaviourist underpinning), and extend my analysis into the internal thought processes of the students (a constructivist underpinning).

The second data stream in this cycle involved following the progress of students ($n = 21$) in the area of developing clinical judgment (an internal thought process). Students who were not in the role of family members ($n = 18$) were evaluated for clinical judgment using the *Lasater Simulation Rubric* (Lasater, 2007). I chose this rubric due to its reliability and validity as an effective instrument in measuring student clinical judgment (Adamson et al., 2012). I evaluated the students' progress in clinical judgment development as they moved through the three scenarios while staying in the same role (hypovolaemic shock, croup, acute coronary syndrome). The order in which the students encountered the scenarios remained the same for all 6 groups (repeated measures design). The four roles used in the scenarios were:

- *Role one:* Taking vital signs and voicing these to the recorder;
- *Role two:* Assessments and airway/respiratory management, and medication administration;
- *Role three:* Recording of all relevant data from above two roles and calling ISBAR report to physician; and
- *Role four:* Family member.

These roles arose out of the second action cycle, with one exception. In the third cycle, a family member was used as the fourth role. The reason for this was that I wanted to give students an additional opportunity to communicate in a professional manner with the family as well as the

physician. Communication is essential when managing deteriorating patients (Cooper et al., 2012; Cooper et al., 2013) as it influences both the ability to put effective interventions into place, and the ability to mobilise a team to assist with the patient's deterioration. Communicating with the family is also an essential aspect of this management, even if the communication initially only involves conveying basic information and instruction (Hartman & McCambridge, 2011). This cycle did not involve focusing on the student playing the family member, but on seeing the progression of communication as it evolved between the students and the family.

The third data stream in this cycle involved two focus groups. These groups were held on the day following the simulation suite. The students were asked questions to gain clarification around role performance and most and least valuable aspects of the simulation suite such as, "Which role do you think was the most difficult and why?" Audio recordings were taken at each of the focus groups. These were transcribed verbatim and subsequently uploaded into NVivo™ where they were coded for themes with the research question continually in mind. The qualitative responses to the post-test questionnaire were also transcribed, uploaded into NVivo™ and coded for themes. Focus group questions can be viewed in Appendices E13, 15, and 17.

Data analysis.

Cycle three involved added layers of complexity over the previous two cycles due to the addition of an embedded quantitative section (Creswell & Plano-Clark, 2011). The point of interface or mixing began at the design stage, and extended into the data collection, interpretation and analysis stages as quantitative (i.e. pre- and post-tests, Lasater scores) and qualitative strands (i.e. focus group data and qualitative survey data at end of post-tests) were analysed. This mixing strategy embedded a quantitative form within a larger qualitative design (Creswell & Plano-Clark, 2011). Both sets of data were related to each other in order to facilitate comparisons and interpretations.

The first data stream in this cycle consisted of pre- and post-simulation test scores. The pre- and post-simulation test scores were analysed using Statistical Analysis System (SAS) quantitative data analysis software. SAS has the capability to import, export, and manipulate data sets of various formats. It is widely used for statistical analyses in many fields, such as the insurance industry, public health, scientific research, finance, human resource management, information technology service management, utilities industries, and the retail industry (Yang & Wang, 2010). SAS continues to be the standard statistical analysis software used for the submission of reports of clinical pharmaceutical trials to the U.S. Food and Drug Administration (Yang & Wang, 2010). This software enabled analysis of the variance between pre- and post-simulation test scores, determined the mean scores across the three scenarios, and analysed the standard deviation as the students proceeded through the scenario suite (one-way repeated measures). Detail around the results in this cycle can be found in Chapter 9 of this thesis.

The final video recorded student performances were viewed by two educators and evaluated in terms of four indicators; (1) noticing, (2) interpreting, (3) responding, and (4) reflection (Lasater, 2007). These scores were then analysed using SAS in terms of how certain variables affected students' overall performance (i.e. scenario type, category of Lasater Clinical Judgment

Rubric, role, and group effects). Each of these four variables was determined to be statistically significant in the overall design of this cycle with a p -value $<.05$. Detail around this analysis can be found in Chapter 9 of this thesis.

The focus group data were transcribed verbatim by the researcher and subsequently uploaded into NVivo™ software and coded for themes as described in cycles one and two. NVivo™ was especially effective as I was working with qualitative and multimedia data, and for assisting with my organising and classifying data from multiple sources (Mills, 2014). As this project involved filming of simulated events, NVivo™ provided a platform for analysis in a manner which supported the type of data being collected. The focus group data were coded, keeping the research question at the forefront so as to gain further insights into the research question as the students shared their thoughts on the simulation suite.

My reflections.

I often returned to earlier journal entries to remind myself of ideas, thoughts, and concepts I wanted to integrate into future action cycles. This process helped to inform the living theory I was creating as a result of this research. My journal acted as a narrative technique to record the events, my thoughts, and my feelings that seemed to have importance for the project. The record documents my changing thoughts and new ideas as well as my progression of learning. The journal was also used to examine and help manage my existing knowledge, or researcher bias, and it provided a way to revisit, analyse, and evaluate my experiences over time (Mills, 2014). Journaling was ultimately an on-going attempt by me to systematically reflect on my own practice by constructing a narrative that honoured the unique and powerful voice that I brought to thoughts and language.

Trustworthiness

Several measures were implemented within this action research project to ensure that it was credible and trustworthy. Trustworthiness in this research was enhanced by employing *triangulation* of data sources (Standal & Rugseth, 2014). I used a variety of data sources including focus groups, interviews, reflective journals, debriefings, and participant observation. A second researcher participated in random checking of the Lasater Clinical Judgment Rubric Scores, and in reviewing pre- and post-tests for alignment with scenario content. I observed simulation to identify pervasive qualities as well as atypical characteristics (Mills, 2014). I immersed myself in high-fidelity simulation with the students in order to provide opportunity to test my own biases and perceptions. I employed the use of a *reflective journal* to reduce the chances of unwanted bias because of the immersive tendencies of much of this research. I presented *tentative analysis* to colleagues and received feedback that was redirected back into the analytic processes.

Research reflexivity was an integral part of this action research project as the circular relationship between cause and effect unfolded in each cycle. An *audit trail* was kept to document the actions, reflections, and movement in new directions as each cycle unfolded. This audit trail was kept within the memo sections of NVivo™. Additionally, I used both student and other educator participants as *member checkers* for interview, debriefing, and focus group data. This

involved transcribing the interviews and focus groups into Word, and then asking those involved if they represented an accurate representation of the focus group or interview.

Member checking is a recommended practice to enhance trustworthiness of qualitative studies (Brantlinger, Jimenez, Klinger, M., & Richardson, 2005; Mills, 2014). As called for in action research projects, the students in this study were partners in reflection. I was constantly checking that the students' experiences aligned with the themes I found emerging in the coding process. This was done through group and individual discussions as well as clarifying questions during debriefing and focus groups. The students and I reflected together on possible improvements that could be made in the simulation that would enhance their learning and ability to manage deteriorating clinical situations. These discussions were facilitated using Schön's (1987) reflective cycle and Kolb's (1984) experiential learning cycle. Insights gleaned were integrated into each cycle as the project unfolded. Student participation and contribution were integral to this process.

Conclusion

The methodology of action research as espoused by McNiff and Whitehead (2011) was selected to guide the research methods implemented within the three cycles of action and reflection in this study. The methods used to collect data for this project included focus groups, interviews, questionnaires, email feedback, journaling, filming of simulated events, video and audio recording, Lasater scores, and debriefing. All of these data collection techniques were used to better understand the current simulation practice at our university, and devise ways of maximising simulation for undergraduate learners. All participants in this research entered this process with different experiences, needs, expectations, and assumptions about what high-fidelity simulation should encompass. The students feedback in focus groups and while participating in the simulations recorded and thematically coded in order to allow feedback to maximise high-fidelity simulation while at the same time meeting our group expectations.

Those participating in this project used the tools of reflection-in-action, reflection-on-action, debriefing, and collaborative sharing to make transformative change to our simulation in the undergraduate nursing programme. I wanted to continue to improve simulation as a teaching method as I balanced theoretical knowledge, clinical reasoning, and an ability to perform with both integrity and appropriateness in the management of deteriorating patients.

Chapter 7 will describe the unfolding findings of the first action cycle from the focus groups through to the revised high-fidelity simulation experiences. Comments as to the effect of current simulation in the undergraduate programme were coupled with student observations as to the changes put into place from focus group themes. A group interview of technicians involved in the running of these high-fidelity scenarios provided supplemental data in cycle one. A discussion around student preferences in learning environments coupled with Dewey's thoughts on creating educative environments formed the movement in new directions in cycle two.

Chapter 8 describes the unfolding findings of the second action cycle with the implementation of a high-fidelity simulation informed by the recommendations from cycle one. This cycle included

students (n = 125) from the third year of an undergraduate nursing programme. There was also a supplementary cycle which questioned educators from my University and around New Zealand as to their use and need for training in high-fidelity simulation. Themes emerging from this cycle informed the movement in new directions in cycle three.

Finally, Chapter 9 describes the unfolding findings of the third action cycle which was informed by recommendations from cycle two. This cycle involved mixed methods and looked at pre- and post-simulation test scores, Lasater Clinical Judgment Rubric scores, and focus groups of students (n = 21) involved in a suite of three scenarios (hypovolaemic shock, croup, and acute coronary syndrome). The development of my living theory of how to best design and run high-fidelity simulation with undergraduate nursing students emerged in its fullest form in this cycle. My living theory is described in Chapter 10 of this thesis.

Chapter 7 - Action Cycle One: Working with students to enhance pedagogy

The essence of critical thinking is suspended judgment.
How We Think (Dewey, 1910a, p. 238)

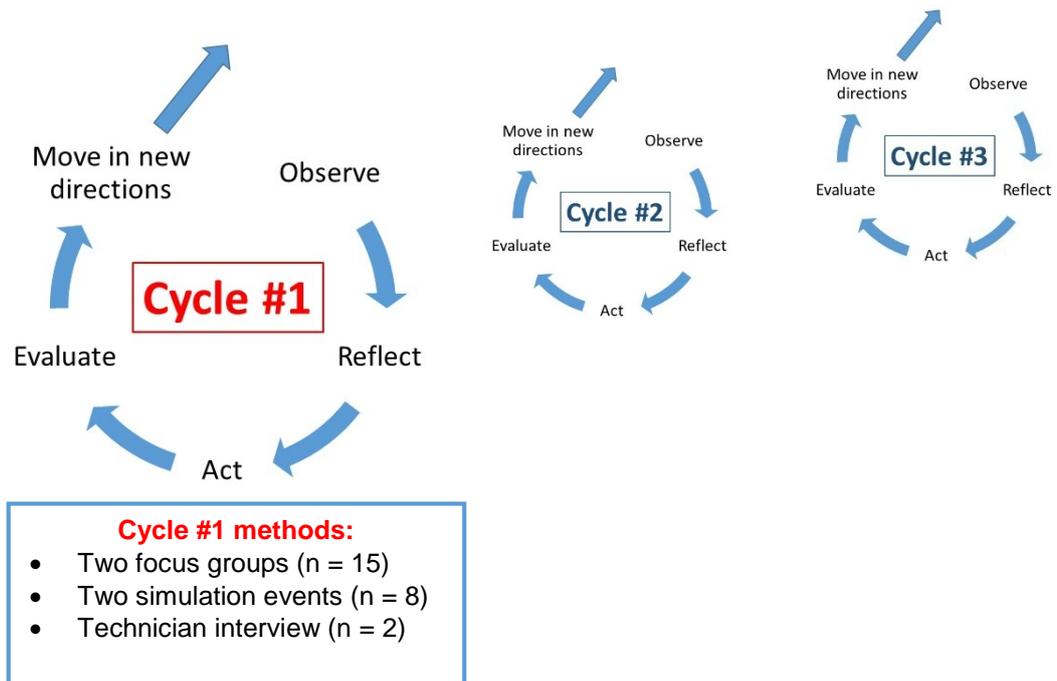


Figure 7.1 Action Cycle #1

From *All you need to know about action research* (McNiff & Whitehead, 2011, p. 9).

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Introduction

As I began this study, there was no coherent plan; no common approach to the use of high-fidelity simulation in the undergraduate curriculum. As can be seen in Figure 7.1, action research involves a cyclical process beginning with observation, and progressing through reflection, action, evaluation, and implementing findings in new directions the next cycle (McNiff & Whitehead, 2011). I had observed that with staffing and resourcing already overextended, high-fidelity simulation was often cancelled due to exhaustion, illness and/or lack of available resources. This devaluing of high-fidelity simulation was often modelled by educators and quickly picked up as 'normal' by students.

Educators were not trained in simulation design or implementation. Little or no resourcing was put into high-fidelity simulation development and equipment was often broken or non-

functioning. For these reasons, students often did not show up for high-fidelity simulation as it was not considered a valued part of their studies. When high-fidelity simulation did manage to emerge in the undergraduate curriculum, it was often implemented in an ad hoc manner. It was not uncommon for 70-80 students to be placed in a high-fidelity simulation environment in one afternoon. Groups of four to seven were often placed in the simulation environment with no pre-briefing, no debriefing, and often no orientation to the manikin or what was expected of them. This left students with a negative feeling around the experience which often resulted in their avoiding simulation altogether. This overall context is vital to understanding the 'soil' out of which this research emerged. I was interested in learning how I could maximise the high-fidelity simulation experience for students as I had seen the powerful impact of this teaching tool at other institutions.

My curiosity around the negative opinions surrounding high-fidelity simulation motivated me to understand how this teaching tool was being used and what was tainting it negatively. I wanted to develop a living theory that would inform my own practice as an educator, and possibly assist others in their design and use of high-fidelity simulation.

This negative impression motivated me to begin this doctorate. I decided to begin the first action cycle with two focus groups involving students who had experienced high-fidelity simulation at our institution. I wanted to: (1) understand our current state in high-fidelity simulation; (2) hear student and educator ideas as to what was not working and what would improve the situation; (3) integrate these ideas into a revised high-fidelity simulation experience; (4) get student feedback as to whether the changes made a difference to their attitude toward high-fidelity simulation. Thus action cycle one began.

Purpose

The purpose of this first action cycle was to have a focused look at the current educational practice involving high-fidelity simulation with undergraduate nursing students at a university in New Zealand. The aims and objectives of the research were:

- To improve my understanding of pedagogical theories which underpin high-fidelity simulation; and
- To learn how to use these theories more effectively in the design and implementation of this teaching tool; and
- To share my developing living theory with others working in high-fidelity simulation.

Step One in the Action Cycle: Observation

Observation in this cycle involved spending time reflecting on what the students seemed to be communicating in the focus groups. Their thoughts were, at times, strongly expressed; while other moments were peppered with more tentative responses. While I was open to positive feedback in the focus groups about how high-fidelity simulation was occurring at the time, these positive comments did not emerge. The students were more interested in sharing their struggles and what they wanted to change in high-fidelity simulation. I spent time trying to untangle what the students said worked and what did not work in their simulation experience to this point. After

reading the focus group data several times themes began to emerge which I might implement in a revised simulation plan to be used with the focus group students.

The students recruited for the focus groups in this cycle, and in cycle three, were all Millennials (18-30 years of age at this writing). Ethnically, the 15 students in the focus groups consisted of two Asians, one Maori, and 12 students of European descent. The survey in cycle two was open to all students. The focus of my interpretations in this chapter relates to millennial students, accepting that there are limits to this view. The complexity of the student mix is such that to address the many possible learning characteristics students may bring, both within and outside the Millennial grouping, is beyond the scope of this study. Research suggests there is enough of a difference in the Millennial generation to warrant specific attention (Cahill & Sedrak, 2012; Earle & Myrick, 2009; Koeller, 2012).

Step Two in the Action Cycle: Reflection

Millennial anxiety may be mitigated with supportive learning environments.

After the coding was completed, I spent time reflecting on what was being said by the students and identifying themes in their comments. One of the most prominent themes in the focus groups was that of anxiety and how students' previous experience with high-fidelity simulation had made them anxious and eroded their confidence. While it is recognised that other generations besides Millennials might have felt anxiety, this was a prominent theme in the research data which was collected amongst Millennials. Millennials have been noted to be quite confident due to excessive support of hovering parents and guardians (Howe & Strauss, 2000), but these students were not showing this characteristic. I began to look more closely at the data to see if there was anything educators were doing which might have contributed to this response. There were several factors that were working together to erode student confidence. One student in focus group one stated:

I feel sick on the days I have to go into the SIM room — literally sick. I hate those SIM days. No confidence. I feel awkward the whole time. It is too quick, and the situations are complex which isn't really necessary. The first week in unit 3 and they have us doing something we haven't read anything on. They make me nervous and worried. They are not fun, they are awkward, and there are so many factors that make you want to run a mile from a SIM room. I thought the whole point was to set you up for failure.
(Rachel: FG1)

Students commented that their confidence was being eroded in the high-fidelity simulation, and there was a feeling that the simulation was meant to humiliate; thus disparaging them further in an already confidence-starved learning environment. Another student in the first focus group stated:

We do not want to take a risk if they are going to turn around and attack us for it and be like, "Why did you do this?" I'd rather do nothing than be made to feel like that. I'd rather do nothing than feel like I'd done the wrong thing — it was like I was in less trouble that way. I did not want them turning around and saying, "You just killed the patient."
(Samantha: FG1)

This feedback from the focus groups was disturbing to me, as an educator, as it sounded like the work that we were doing in high-fidelity simulation was not only creating an unsafe learning environment, but that the simulation was doing more harm than good.

Another theme in the focus group data was the feeling that the students were not supported in their learning. Students felt educators were often “laughing at them behind the glass.” There seemed to be a feeling of ‘us’ and ‘them’ amongst the focus groups as evidenced by the following:

There is an “us and them,” and we come for a learning day and we feel like we are trying to prove ourselves. We come to the SIM days, which are supposed to be a learning day, and we feel we have to prove ourselves. Before we go out to clinical we have our confidence knocked in the SIM room. It shouldn't be like that. I just feel so rubbish about it. (Chloe: FG1)

This comment highlights an expectation that the students will be supported in their learning, and successful. Yet, the comment seems to convey a lack of trust on the part of the students toward educators. The above student does not have confidence that the educator is concerned or committed to her learning. As a generational cohort, Millennials are used to feeling supported and they do not know how to respond when left in what they feel is an ‘unsupported’ learning environment to fend for themselves.

As the data reported that self-confidence was often negatively affected by high-fidelity simulation in this setting, I determined to better understand what students thought would help turn this situation around. Self-confidence is defined by the Merriam-Webster Online Dictionary (2013) as *confidence in oneself and in one's powers and abilities*. It encompasses a sense of one's power and ability to carry out a desired task or function. The literature indicates that simulation can have a positive effect on student confidence when it is viewed as experiential learning applied to real situations that deviate from expectations (Benner et al., 2010). The challenge is to help students recognise the deviation and know how to manage it. However, this knowledge is not pre-existing or ‘native’ in students. It must be acquired (Dewey, 1922).

It is this acquisition of meaning which becomes the aim of the educator. Dewey (1922) stated that, “In short, the meaning of native activities is not native; it is acquired. It depends upon interaction with a matured social medium” (p. 90). Students do not just ‘know’ what to do in working with real or simulated patients. Their learning depends upon interaction with the “matured social medium” in the form of a seasoned educator who knows how to facilitate their thinking around managing unexpected situations. It therefore becomes incumbent upon educators working in high-fidelity simulation to help students create meaning by showing them how to deal with the deviation. This can be achieved through *focused coaching* (Benner et al., 2010). This constructivist notion involves a process of facilitating the learner to construct new meaning as they interact with the environment (Schunk, 2014).

In working with simulation, it is helpful to guide students while giving them freedom to choose. In essence, the goal is to help them “pay attention to the right things” (Benner et al., 2010, p. 187). The focus should be on helping students develop safe and appropriate habits in their care of clients. Dewey (1922) explained that, “Habits may be profitably compared to physiological functions, like breathing, digesting. The latter are, to be sure, involuntary, while habits are

acquired” (p. 14). If habits for caring for unexpected clinical situations are acquired, their development and implementation must be embedded in the learning outcomes for simulation. Dewey stated that the formation of ideas, as well as their execution, depends upon habit. If it were possible to form a correct idea without a correct habit, we might be able to separate the two. However, a wish takes form only in connection with an idea. “The idea takes its shape and consistency directly from the habit in the back of it” (Dewey, 1922, p. 30).

In order to assist students learn and refine habits around their management of care, I needed to develop a dialogue which was both safe and collaborative. Constructivist theory states that learning is a socially mediated process, and that verbalisation can promote student achievement if it is relevant to the task (Schunk, 2014). As Millennials thrive on this kind of team work (Bassendowski, 2007), the potential for developing this quality of communication is good. I, as the facilitator, endeavoured to work with students in this manner by asking questions like, “Now, I’m not sure I understand your thinking here. What made you want to proceed like that?” I tried to allow space in the simulation for students to articulate tentative observations (habits) as this is the only way to discover the student’s sense of the situation.

While behaviourism places the teacher in a dominant position over the learner (Atherton, 2011), this is not a useful position when using high-fidelity simulation. The teacher must become more of a guide than a content transmitter. The goal is to allow students the freedom to explore new ideas, even if they are not entirely correct. It is the creation of new knowledge (habits) through exposure to experience which underpins the use of high-fidelity simulation. Constructivism holds that learners have some prior knowledge and experience, and are capable of building their own content in order to solve a particular problem (Haw, 2006). It is this process which must be encouraged in high-fidelity simulation.

Once I understood the student’s current ideas, I could begin to see the habits that underpinned these ideas. Dewey (1922) explained that, “...habits involve the support of envioning conditions...” (p. 16). In other words, habits are ways of using and incorporating the environment in which they exist. Because they are acquired, they have a beginning, a middle and an end, marking progress in dealing with the environment (Dewey, 1922). In my case, the environment is the simulation scenario and the habits are the acquired thinking processes which underpin student ideas. Part of coaching in simulation involves understanding the ideas and underpinning habits of the student, and being able to help the student understand whether their habits will assist them in achieving the desired end (i.e. safe management of a deteriorating patient).

In summary, in the context of the undergraduate nursing programme at our institution, student confidence was being eroded when other research had shown simulation to build student confidence (Alfes, 2011; Harris, 2011; McCaughey & Traynor, 2010). Focused coaching is one way of building student confidence through the development of habits which fuel ideas. However, when I looked more carefully, I found that there were multiple factors contributing to the students’ lack of confidence. Previous high-fidelity simulation did not encourage students to bring habits from earlier learning which would enable them to confidently engage in the current situation (i.e. scaffolding of simulation was not occurring). Furthermore, due to limited resources, such as time,

educators were not able to encourage students to think critically in order to embed new habits (i.e. focused coaching was not a priority). Focused coaching required too much time, which was simply not available in the current undergraduate nursing programme. To compound the situation, simulation was not a central feature of the programme. It was an add-on to an already packed curriculum. Therefore, learning outcomes were often unclear or missing in the simulation, causing confusion to educators and students as to what was to be achieved. These features combined to erode student confidence, causing students to 'flee' high-fidelity simulation rather than embrace it.

Millennials tend to prefer facilitator presence.

One thing that became clear early on in my research was that the students expected me to help them, engage with them, and be available to them during the entire simulation experience. I could not set the simulation running and walk away. I had heard other educators calling what I was trying to do in high-fidelity simulation a form of 'hand-holding.' But the Millennial students I was working with were asking for perfection in simulation design, seamless technology integration, and in essence a 'private tutor' to guide them in their journey. It sometimes felt like they were asking a lot, and at times I felt exhausted by their requests. This attitude on the part of students who demonstrate millennial characteristics can at times be exhausting for educators who are trying to navigate enormous cohorts of students who all want to be 'special.'

Sometimes the students seemed to express a lack of trust and/or safety around what they perceived educators were thinking; along with a demand for complete attention and support at all times. While this is understandable when one considers the power that educators have over students, I often wished students would focus more on *their learning* than on what they thought the educators were thinking. I started to wonder what was causing this lack of focus; which is evidenced by the focus group comment below in relation to teachers watching high-fidelity simulation from another room:

We wonder if they are laughing at us. You can't see and they could be going, "Oh my gosh, are they actually doing this right now?" (Chloe: FG1)

Millennials as a generational cohort want educators to be engaged and available to them, when they are, from their point of view, risking their reputations. They are accustomed to being catered for, tutored, and helped along their journey to success (Howe & Nadler, 2008). Their comments indicated they felt they had not been getting what they perceived as the right attention or instruction from educators. In theory, they have been regarded as 'special since birth,' and have been obsessed over at every age. Combining this group of potentially 'entitled' students with the often argumentative and value-laden Baby Boomer or Gen Xers can create challenges (Earle & Myrick, 2009). It is important to note that each generation brings its own values, worldview, and ideals to the classroom or clinical setting and thus, the promotion of awareness and understanding of intergenerational diversity is an important aspect of pedagogical practice in nursing education.

In many high-fidelity contexts there is a one-way glass that separates the students from technicians and educators, who are running the simulation and observing student performance.

The focus group data conveyed that students felt the educators behind the glass were not as attentive to their learning needs as they could be if in the room.

What I really hate about the simulation is the glass. I'd love the educator to be down on the floor with us. Even if it's one go with them and then one go behind the glass screen. It's intimidating when they are behind the glass. It makes you feel like them and us; we do not know what they're saying behind that glass. Sometimes one goes in and two come out and we're wondering what they're saying about us...I hate that glass. (Rachel: FG1)

The data indicated that this angst amongst students in high-fidelity simulation was often a direct result of feeling ignored or in some cases unfairly judged by educators who were disengaged from student learning. Furthermore, as I reviewed the data, this 'divide' between students and educators seemed to be growing out of a perceived attitude on the part of students that in using high-fidelity simulation, the educators were checking off a task they had been assigned to do. It was as if the educators had set the simulation in motion, and that was all that was required. They had done their job. The students desired more support and interaction from educators as they progressed through the high-fidelity simulation as evidenced in the focus group comment below:

It would have been more comfortable if one of the teachers was in there with you, rather than all of them just watching you. It's like a comforting thing. You want to do it alone, but not the first time. (Yongmei: FG1)

Students' perceived lack of interest by educators seemed to convey a disinterest on the part of the educators as to student learning. From the students' point of view, this disinterest was unsupportive and even offensive to them. Millennials are marked by character traits of being confident, optimistic, team and rule-oriented, and hard-working. However, these positive traits have arisen from a coddled upbringing, which may have a shadow side (Howe & Nadler, 2008). They want to be partners, not passive receptacles of transmitted knowledge.

As Millennials are used to being catered to, it is important to try to involve them as 'partners' in their educational process. Constructivists remind us that meaningful learning requires the learner to become an active participant in the learning process (Passmore, 2014). They want and desire their ideas to be heard. While not all Millennials are the same, they tend to require assurance that their ideas are valued, and that educators are willing and able to support them. Millennials tend not to prefer taking a spectator role, but a participatory one (Parker & Myrick, 2009). For the most part they prefer working in teams to working alone as they tend to have a collective approach to learning (Hutchinson et al., 2012; Tucker, 2006). With this in mind, it makes sense that they would not like the educator sitting 'behind the glass' seemingly uninvolved.

Millennials may be risk-averse.

Millennials as a generational cohort are not all the same, but the majority tend to be technically sophisticated multi-taskers who are accustomed to working in teams while relying on parents and educators for guidance as they struggle to make decisions independently (Hartman & McCambridge, 2011). These traits make high-fidelity simulation an exciting and engaging educational tool for them; if they perceive that they are being supported. They do view learning

as a collaborative process requiring support from educators as evidenced in the second focus group:

It might be helpful to have an educator in the room asking, "Is anyone checking oxygen saturations?" You do not want to be a leader as you do not want to get it wrong, but then you miss out. (Stephanie: FG2)

Along with a greater willingness to play by the rules, Millennials may show a hesitancy to think outside the box. Simulation as a learning tool forces this type of problem-solving which may work against the Millennials' tendency to be risk averse if failure is a possibility. It is therefore important to reassure them that the learning environment will be safe and support will be available. While other generational cohorts may also exhibit this need for safety, years of tutoring and parental support have tended to intensify this need for preparation and support in Millennials (Howe & Nadler, 2008).

To compound issues further, millennial desire to work in teams comes with a tendency toward conformity. If one student has a bad experience in a simulation and shares that information, others may soon conform to the 'it's not worth the risk' mind-set. Constructivists remind us that learning in teams encourages cooperation and linking of current knowledge with new knowledge as contributed by other team members (Schunk, 2014). Thus collaboration forms a constructivist underpinning in high-fidelity simulation which must be integrated. If simulation is designed and implemented well, millennial students have a higher potential of embracing it as a positive learning environment. It is therefore essential that educators get the design of high-fidelity simulation correct before involving millennial students. This requires focused training of educators in all aspects of simulation implementation.

Millennials desire supportive and twitter-sized communication.

As I continued to read and reflect on the data from the focus groups, it emerged that students were not feeling supported due to the type of communication they were receiving. As Millennials are accustomed to support which results in success, the type and manner of feedback is crucial when working with them — especially in high-fidelity simulation. Due to their immersion in technology from the womb, it has been argued that Millennials tend to suffer from shorter attention spans than other generational cohorts (Howe & Nadler, 2008). This trait can spill over into the educational setting to influence their 'preferred classrooms.' They prefer short, concise, timely, digestible and actionable advice (P. Brown, 2011; McGlynn, 2010). They tend to think in 'twitter-sized' chunks of information which they prefer, instead of long and detailed explanations (P. Brown, 2011, p. 43). Furthermore, they tend to pull back if communication is less than constructive as expressed in the second focus group:

I remember getting shouted at afterwards because when I called a CODE I did not give the correct information over the pretend phone. First, you know, all your buddies have watched you and you think, "I've just failed something." I felt very uncomfortable, like a failure, I shouldn't be a nurse because I couldn't even get that right. Humiliating, put on the spot, everyone judging you. A test situation rather than learning. It was humiliating to be put on the spot... (Lauren: FG2)

It is important that feedback be friendly and constructive, ensuring that a sense of value and respect is being conveyed. This is common sense, but needs to be emphasised as many Baby Boomer and Gen Xrs might not be accustomed to having to treat students so ‘carefully.’ Feedback from these older generational cohorts may feel blunt and need to be softened and made more constructive in order to maximise its effectiveness with Millennials. One student in the second focus group stated:

You feel like you're doing something wrong and it is your fault if you do something wrong, and they did not even explain it. They did not give us proper feedback in the end. They did not tell us what we did well — just what we did wrong. We need to know we did something right. (Janna: FG2)

This student is correct. Everyone needs to know that they can do something right. After reflecting on these comments, I started to wonder if we as educators were not communicating in a manner which could effectively ‘reach’ our students. Millennials crave, more than other generations, positive feedback and praise; which can be perceived as high maintenance by older generational cohorts (Hartman & McCambridge, 2011). They are purported to be overconfident, opinionated, and expect to be heard, which can be difficult when working with them in an educational setting (Earle & Myrick, 2009). Millennials often believe that they do not have to pay their dues when entering training or an organisation; and as stated earlier, they do not like to risk. Most importantly, they can become aggressive and even caustic if they feel disparaged (Hartman & McCambridge, 2011). Therefore, giving feedback (debriefing) after a simulation session must be carefully managed. One student in the second focus group emphasised this:

Yes, but you know that you are going to come out bloody, so you try not to make it worse. I figure I might not do anything as that sometimes makes it worse. I did not say anything because I was afraid of getting it wrong and making it worse for myself. We just want to get through it with the least amount of damage. If you do not take those risks, how will you learn? (Rani: FG2)

If the educators were making the students “come out bloody,” some changes in communication style needed to occur. Constructivist theory reminds us that students who are taught how to learn meaningfully by non-arbitrary assimilation of new information into the learner’s knowledge structure have been shown to be better critical thinkers and problem solvers (Passmore, 2014). It is the job of the simulation facilitator to guide students into the assimilation of this new knowledge in a friendly and constructive manner (Wotton, Davis, Button, & Kelton, 2010). This knowledge is part of my living theory for how to facilitate high-fidelity simulation.

The above student is showing evidence of a need for positive and supportive feedback as well as some risk aversion in her comment, “*I did not say anything because I was afraid of getting it wrong...*” Yet she tries to convince herself that the risk was worth it in the end by stating, “*If you do not take those risks, how will you learn?*” Millennials are high achievers which drives them to take the risk in the end — if they think there is a reasonable chance of success. They prefer clear rules, and dislike ambiguity (McGlynn, 2010). They want everything to be clearly outlined, both expectations and responsibilities, so that they have an increased chance of doing well (Hartman & McCambridge, 2011). These desires are highlighting behaviourist underpinnings which are helpful in high-fidelity simulation. The clear articulation of learning outcomes, the pre-briefing, and the voicing of expectations all tie the student to the environment in a stimulus-

response manner. Thus, behaviourist aspects of simulation include repetition, classroom supplementation and modular learning, as these describe concepts of drill and practice in skill acquisition (Parker & Myrick, 2009). These behaviourist characteristics are part of my living theory for maximising high-fidelity simulation teaching/learning encounters.

I was beginning to understand that the university's haphazard and somewhat last-minute approach to high-fidelity simulation was hitting all the wrong buttons for our students. Millennials prefer a 'risk-free' classroom which is organised with clear expectations, supportive feedback, and promotes a relatively good chance of success. This idea is encapsulated well in the first focus group:

I think it all just comes down to 3 words, "SUPPORTIVE LEARNING ENVIRONMENT." That is what this degree needs to be and it includes the SIM, the lectures and on clinical. You get a bad tutor and you know. (Rachel: FG1)

High-fidelity simulation requires a scaffolded plan.

The history of high-fidelity simulation development at our institution was somewhat sporadic and lacking in planning. We were informed that we needed to use high-fidelity simulation and then left to our own devices as to how. Training in the use of high-fidelity simulation was minimal, which resulted in many forms of high-fidelity simulation emerging; each educator doing what seemed right in his or her own eyes. This haphazard development influenced students' negative perceptions around high-fidelity simulation. Themes emerging from the focus groups included the idea that simulation needed to be more consistently integrated in the curriculum with opportunities to repeat the scenario after being given feedback. In other words, the simulation needed to be redeemable, and occur on a regular basis. This was not always happening as expressed by one member of the second focus group:

Secondly, being in the simulation knocked my confidence. When you're running around like headless chickens you think, "When this does happen in the hospital, am I going to know what to do?" I do not think we have enough opportunities. We should be doing one a week. (Lauren: FG2)

A second problem which featured in the focus group themes was a lack of understanding around the learning objectives that were to be achieved in the simulation. This confusion, coupled with a lack of positive feedback, seemed to demotivate students to engage in the simulation as evidenced in this focus group feedback:

The people took it as a joke, but I felt quite lost. If you asked the right questions it progressed. The teacher said, "If you want it to progress you need to ask the right questions." We got to a stage where we did not know what to do, so we called the pretend bell and she told us what we should have done. (Rani: FG2)

Another student made the following comment when asked what was not working in the simulation:

Knowing at the beginning what is expected of us would have been helpful, rather than being chucked as a group into the room. They just start the simulation and we wonder what it is we should be doing. (Stephanie: FG2)

These comments highlight several factors which are eroding student confidence and minimising the potentially positive effect of simulation in the undergraduate curriculum. Students

are unclear about what is meant to happen in the simulation and this confusion leads them to try to 'second guess' the educator. As stated above, these gaps could be filled with behaviourist contributions to the high-fidelity simulation design in the form of clearly outlined objectives, orientation to the environment and simulation equipment, and clearly explicated expectations (Chen, 2009; Skinner, 1985). Student performance is heavily influenced by facilitator feedback given to modify habits and improve competence (Clapper & Kardong-Edgren, 2012). This type of repetitive learning has behavioural tendencies which when mastered allow the student to focus on critical thinking and problem solving (Chen, 2009; Nehring & Lashley, 2010).

Energy is wasted and poor habits formed when lack of clarity around learning outcomes and goals prevails. This ambiguity leads to students not taking the simulation seriously, and not desiring to participate in further simulation. These characteristics reproduce a flippant attitude on the part of students as to the effectiveness of the current simulation programme. The comments may also indicate that educator training in the use of high-fidelity simulation needs to be a focus in the future. It is the role of the educator to design the simulation in a way that gives students opportunities which lead to growth (Dewey, 1938), and this is not happening in all instances involving high-fidelity simulation at this university.

In summary, students desired more consistent exposure to high-fidelity simulation if they were expected to perform in this context. They felt they should be doing one simulation a week so that they were more comfortable in this setting. Additionally, they desired an opportunity to correct their mistakes after receiving supportive and clear feedback. These Millennials were interested in forming improved habits which could be integrated into their professional practice. As I continued to read through the focus group data, this theme of "getting it right" came through repeatedly. It seemed that the students wanted to be able to move themselves forward from 'novice to expert' in a manner that showed definite progress in their skills and clinical reasoning. This meant that they desired additional opportunities to get their performance up to the expected standard. This repetition is a behaviourist theoretical underpinning which is important in high-fidelity simulation. In essence their desire was to form better habits which could be integrated into their professional portfolio. One focus group student articulated this habit formation by comparing it to learning to ride a bike:

If we go from the parenting thing, we know the educators can ride a bike. We need to have the training wheels on at first until we can gain the confidence to take the training wheels off. Our "training wheels" are to practice on well people. Then, we go into semester 3 and the wheels are taken off. It would be better to say, "Keep the wheels on until you can go to the end of the driveway by yourself." When I was learning to ride a bike, my dad would run beside me and say, "You're going too fast!" I need the educators to do the same thing. (Rani: FG2)

This student articulated well one Millennial's desire for support and repeated opportunities to perfect her habit formation. She wanted to, "...keep the wheels on until you can go to the end of the driveway by yourself." This comment shows both risk aversion, and a desire to perfect her habits in a systematic and supportive, and safe learning environment. Millennials see themselves as indispensable beings who desire to be highly sought after (Hartman & McCambridge, 2011). They are generally high-achievers due to the large amount of support and privilege they have received from parents and teachers (Howe & Nadler, 2008). This desire for repetition was the

primary driver for having two opportunities at the high-fidelity simulation in the second half of this cycle.

The above comments from the data reflect both a lack of knowledge of how high-fidelity simulation should be used, and a lack of integration of simulation in the undergraduate curriculum. For a simulation programme to be effective, educators need to be supported and trained as to its use and integration (Dowie & Phillips, 2011; McNeill et al., 2012). Those employing simulation must realise that it is more than the purchase of a manikin nicely situated in a newly painted room. There are many such manikins gathering dust in countries around the world (Leigh & Hurst, 2008). This is partly due to a lack of educators willing to learn how to use high-fidelity simulation effectively. Nursing educators need to plan and instigate an integrated simulation programme which builds in a scaffolded manner throughout the undergraduate curriculum (Parker & Myrick, 2009; Seropian et al., 2004a, 2004b).

Step Three in the Action Cycle: Action Plan

After considerable reflection on the student comments in the focus groups, I put together an action plan which involved running two high-fidelity scenarios in which were embedded student recommendations voiced in the focus groups. I asked the focus group students if they would be willing to participate in the revised high-fidelity scenario and eight students out of the original 15 focus group participants volunteered. These students were further divided into two simulation groups, each with four students.

I ran each group through one simulation involving a client with chronic obstructive respiratory disease (CORD). In the first attempt, the students were given no support or orientation to the simulator or the scenario. They ran the simulation 'cold,' as this was what they described as having experienced in previous high-fidelity simulation in the undergraduate programme. The students were then allowed to repeat the simulation in order to achieve an 'Oscar performance.' This term was chosen purposefully due to the expectation of high achievement subsequently rewarded with trophies of this generational cohort (Howe & Strauss, 2000). The Oscar is the top prize given at the American Academy Awards™ for achievement in the film industry (Kuhn & Westwell, 2014). Since simulation involves a sort of 'performance' often filmed, this label seemed appropriate. The students rallied to the designation of Oscar, and the use of the term resonated with their need to improve their performance and earn a trophy for it. The third action cycle saw me giving certificates of completion which proved to be a highly valued reward given for their participation.

In cycle one, the second performance was prefaced with an orientation to the simulator, a handover describing the patient and giving a brief history, and a debriefing after the simulation was completed. Both student simulation performances were recorded and compared for differences occurring between first and second attempts. I made specific changes to the high-fidelity simulation on the repeated opportunity based on focus group feedback. The following interventions were implemented in the second run of the high-fidelity simulation:

- *More time was allotted* (1.5 hours) for the simulation and debriefing (four students). This is a change from the 20-30 minutes that has been allowed in the past.
- *The students were oriented to the simulator* before any scenarios were run. This orientation included instruction as to where to find the pulse on the manikin, how and where to take the blood pressure, how to mix the medications for the nebuliser, how to work the oxygen tank, etc.
- *A pre-briefing* to the simulation was given, which included a clear statement of the learning outcomes, the handover (history) of this patient, along with the patient's reason for seeking care.
- As teacher, I *came out from behind the one-way glass and stayed in the room* with the students while they were participating in the simulation. I was available for queries and at times stopped the simulation to have participants reconsider their course of action.
- The expected student tasks were divided into *four roles*:
 - *Medication administration* (assess what the patient was taking and determine what if anything might be appropriate to administer, then administer it)
 - *Vital signs* (verbally calling these to the recorder) and communication with patient
 - *Respiratory assessment*: auscultate lung sounds, obtain pulse oximetry, determine patency of airway, respiratory rate, and assess accessory muscle use and positioning along with a reassessment after medication given
 - *Recording of data* and calling a physician using *I.S.B.A.R* format (Identify, Situation, Background, Assessment, Response)
- A choice was given in regards to which role the students wanted to perform.

After each group performed the high-fidelity simulation twice, the students were debriefed collectively. The debriefing consisted of asking the students what they thought went well, and what they thought could have been improved. They were also asked about the revisions that had been instigated in the second attempt; along with whether these helped or hampered their learning. Both debriefing sessions were recorded, transcribed into Word™ documents, and uploaded into NVivo™ where they were coded for themes.

A few days after the revised high-fidelity simulations were completed; all eight students were emailed individually and asked to fill out a questionnaire as to their feelings about the high-fidelity simulation and changes put into place after they had had time to reflect on the event. Only five students responded out of the eight involved. This feedback, along with the recorded and transcribed debriefings, and the recorded simulation clips were reviewed and evaluated multiple times. The documents and clips were uploaded into NVivo™ and coded for themes. The findings can be viewed in the evaluation section of this chapter. The recordings of each group performing the high-fidelity simulation were kept and reviewed in a reflective manner in order to note any themes in behaviour or response from the students after the changes were put into place.

Step Four in the Action Cycle: Evaluation (Findings)

Millennials tend to have high expectations for technology.

The data from the debriefing of the two high-fidelity simulations showed that Millennial students seemed to have definite expectations in regards to the technological aspects in educational environments. Some have noted that Millennials tend to see technology as a 'body part' (McGlynn, 2010). It is not something they adopt or try to integrate. It is already there, already connected, inseparable from who they are. Their preferred learning pathway will involve technology as they are the 'always connected generation' (McGlynn, 2010). They can become quite intolerant if technology is not working or is not used in a meaningful way as this is similar to having their right hand cut off. One student explained it this way:

It's important that the equipment is working — like the pulse wasn't working. Like, I put the pulse-ox on and we still weren't getting a reading. That is really important and I still wasn't getting a reading! It's like I can't move on from here because I do not have the information. (LeAnn: Debriefing Group 2).

Her statement, "...I can't move on from here because I do not have the information," sounds amazingly similar to, "my right hand does not work so I cannot write." High-fidelity simulators offer students anatomically correct human substitutes that can physiologically respond to nursing interventions (Gates et al., 2012; Seropian et al., 2004b). These simulators allow students to observe the trends and consequences of their interventions without causing actual harm to real patients. However, with the use of such highly-tuned technology comes the responsibility to make sure that the technology is responding in a manner which mimics that of the real clinical environment. Millennials desire a seamless integration of technology in simulation as they have grown accustomed to cutting edge technology seamlessly integrated into educational programmes (Bassendowski, 2007). Furthermore, they are highly adaptable and adept at multi-tasking, and are therefore inclined to bore easily (Hutchinson et al., 2012). They will actually disengage from the learning environment if the technology is not well integrated as evidenced in the debriefing for group two:

I've gone into SIMS before and they say, "Oh, just pretend because the equipment is not working." But when that happens, you just do not learn anything. (Kelsey: Debriefing Group 2)

This need for seamless integration goes beyond technology and extends to every detail. Millennials are not willing to overlook details that are not correct as evidenced in group one's debriefing:

Little things like they'd say they gave a drug at a certain time and what was written was entirely different so we were often left thinking, "Am I meant to think this is a mistake, or not to notice this detail?" It throws you off. (Rani: Debriefing Group 1)

Millennials have been noted to be impatient at times, and many do not have the persistence to work through lack of perfection in delivery. This impatience came out in the debriefing for group one:

It is equipment at the end of the day — and it sometimes breaks. But it helps us learn if things are working properly. We want it to work, and we want it now!
(Chloe: Debriefing Group 1)

Millennials are recognised as tech savvy and immersed in technology in a digital world (Bajt, 2011). Educators desiring to maximise communication with millennial students must be able to work with and fix broken technology in order to maximise learning environments (Aviles & Eastman, 2012). Furthermore, technology should not be used without a purpose. Technology must enhance learning and demonstrate connection to the learning objectives; and it must work as designed (Moore, 2007). These aspects must be embedded into simulation design. This careful attention to detail must extend to technology as well as to any ambiguous learning elements.

When I ran the two high-fidelity simulations embedded with suggestions from the focus groups, one of the interventions put into place was to make the learning outcomes clear from the beginning of the second high-fidelity simulation. As stated earlier in this chapter, Millennials can be somewhat risk-averse due to their need to succeed and become more desirable to their peers, educators, and potential employers. They therefore tend to desire clarity around both expectations and responsibilities, so that they have an increased chance of doing well (Hartman & McCambridge, 2011). When the students were asked about the effect of having clear learning outcomes and pre-briefing, one student stated in email feedback:

This was helpful as in my previous experiences of SIM labs many of the mistakes are made around not being able to use the equipment properly e.g. can't find the BP. This then makes the person or group as a whole start to panic and from there nothing seems to go right. By knowing how everything worked at the beginning and testing it out at the start e.g. feeling where the pulse was helpful because then I felt that I had a grip on how things worked and that I then wasn't going to be judged if I couldn't get the blood pressure or not doing something else due to technical problems with the SIM lab.
(Emily: email feedback)

The above student's comment that not having enough information or orientation to equipment which set off a, "...panic and from there nothing seems to go right," became a prominent theme in the data. As stated earlier, this characteristic of clearly communicating the orientation, expectations and pre-briefing information to students is a behavioural philosophical underpinning which helps to tie the student to the learning environment in a stimulus-response manner (Chen, 2009). The behavioural tendency to break down complex skills into simple tasks has the ability to improve the design of high-fidelity simulation by helping students move through the simulation in a stepped and regulated fashion (Chen, 2009; Parker & Myrick, 2009). This will help students feel safe in the learning environment, instead of feeling the need to panic or disengage entirely. Millennials have operated in what they feel as safe technologically supported environments and are used to the click-by-click operation of the internet. Therefore, high-fidelity simulation will feel safer if the same stepped characteristics are adhered to. Remember that it is not uncommon for millennial students to have spent 10,000 hours playing video games and 20,000 hours watching television (Koeller, 2012) before entering the tertiary setting.

Millennials are likely to be digital natives, while most of their teachers are digital immigrants (Koeller, 2012). Current educational practice with a focus on brick and mortar design of lecture theatres, frequent one-way delivery in the form of Power Point™, and a lack of educators

comfortable with using new and emerging technologies can result in a disconnect between students and educators. In order to create an immersive learning environment, educators need to come to a clear understanding of the theoretical underpinnings of high-fidelity simulation and how they can be integrated both educationally and technologically into undergraduate nursing curricula (Seropian et al., 2004a).

Millennials desire improvement through repetition.

As I continued to review the focus group data, I noticed that the students seemed to want both positive feedback and an opportunity to repeat the simulation putting feedback into action. This request has behaviourist underpinnings (Chen, 2009). The students did not want to just be told what they had done wrong, but to have a chance to make their performance right. I began to refer to them repeating the simulation in order to gain an 'Oscar performance,' which then built their confidence. Many students commented on this aspect of the simulation. When asked about the opportunity to repeat the simulation, one student stated in her email feedback:

Yes, this helped immensely. It gave me an opportunity to "right what was wrong." Doing this provided me the confidence to know that I was capable of implementing the proper nursing interventions in a scenario as such. Being told what went wrong, and then leaving it at that is not enough for me to know that I have learnt it properly. I am a strong believer in hands on practical learning, so being given the opportunity to actually practice and redo the simulation following feedback meant that I was able to implement and consolidate what I had been told from my tutor. (LeAnn: email feedback)

Cognitive Load theorists confirm that repetition has a positive influence on learning. In order for learning to 'stick' and be held in the working memory, it must be rehearsed. If it is not rehearsed, it is lost in between 15 and 30 seconds after it is learned (Driscoll, 2005). However, if the information or skill is rehearsed, it becomes automated. Automation occurs when information stored in schemas can be processed automatically and without conscious effort, thereby freeing up working memory resources (Artino, 2008). The concept of automation sounds amazingly close to what Dewey (1922) described as habit formation. Habits are, "active means that project themselves onto ways of acting" (p. 25). Habits form our effective desires and furnish us with our working capacities. This concept of habit formation has been reframed by cognitive load theorists as automation (Artino, 2008) over 80 years after Dewey originally coined his term.

Constructed schemas become automated (i.e. habits are formed) after extensive practice, and existing schemas will vary in their degree of automation (van Merriënboer & Sweller, 2005). With automation, familiar tasks are performed accurately and fluidly. Giving an injection or calling a handover can become like brushing one's teeth or combing one's hair. High-fidelity simulation must include a review and practice of required skills, before the actual simulation occurs. This allows for automation and storage of habits (schemas) in long-term memory, freeing up working memory for the learning of new elements.

Unlike working memory, the capacity of long-term memory is essentially limitless. Information held in long-term memory is organised and stored in the form of domain-specific knowledge structures known as schemas (van Merriënboer & Ayers, 2005). Schemas categorise elements of information according to how they will be used, thereby facilitating schema accessibility later when they are needed for related tasks (Sweller et al., 1998). Sweller (2004) believed that the

relationship between working memory and schemas stored in long-term memory may be even more important than the processing limitations of working memory. This is because schemas do more than just organise and store information; they also effectively augment working memory capacity. Although working memory can hold only a limited number of items at a time, the size and complexity of those elements are unlimited (Sweller et al., 1998). However, more complex elements do put a higher load on working memory.

These concepts have a profound impact on simulation design. It is imperative that students are given the opportunity to rehearse and automate skills (i.e. develop habits) required for the simulation activity before being asked to participate in the simulation. This helps to reduce the load on working memory before entering the simulation. As can be seen in Figure 7.2 (p. 142), this will allow them to be able to gain confidence as well as work with new information required in the simulation.



Figure 7.2 Nursing skill development and clinical judgment model.

From *Standard I: Terminology* (The INACSL Board of Directors, 2011). Reprinted with permission.

Without schema automation (i.e. habit formation), a previously encountered task might be completed, but the process will likely be slow and awkward. Furthermore, consistent with cognitive load theory, entirely new tasks may be impossible to complete until prerequisite skills have been automated because there simply may not be enough working memory capacity available for learning (van Merriënboer & Sweller, 2005). The data emerging from first action cycle showed a definite desire to repeat the scenario to ensure that effective habits were being retained in long-term memory as in the debriefing from group 2:

[Repeating] was helpful because you instantly get to correct what you've done wrong, and you get to do better what you've done right. There is no point in doing it just once.

You remember it more when you've done it a couple of times. I feel a lot more confident now that I've done it a few times. (Kelsey: Debriefing Group 2)

All three of the above students believed that repeating the scenario built their confidence, refined their practice, and helped them store necessary information for later usage. Figure 6.2 (p. 145) depicts the complexity of skill development necessary to progress from more basic skills to the higher-level clinical judgment and reasoning, which is required for safe, effective nursing practice. All levels of development are inter-related and affect each other (The INACSL Board of Directors, 2011, p. S4). Achieving competence in this model requires the individual properly perform a specific role using a combination of discrete and measurable knowledge, skills, and attitudes that are essential for patient safety and quality of care (The INACSL Board of Directors, 2011).

In order to achieve competency, an individual progresses through five stages of proficiency; novice, advanced beginner, competent, proficient, and finally expert (Benner, 1984; Benner, Tanner, & Chesla, 1992). Simulation has the potential to be a powerful teaching tool for the development of higher-level thinking and problem solving (Benner et al., 2010; Seropian et al., 2004b). However, simulation needs to be used with cognitive load and habit formation in mind. When used in tandem with the development of automated schema, in order to maximise available working memory, it has the potential to bolster student confidence and satisfaction (Alfes, 2011; D. Brown & Chronister, 2009), as well as enhance critical thinking and problem solving (Wotton et al., 2010).

Millennials require careful management of cognitive load.

Data from the focus groups at times indicated that the students felt overwhelmed in the simulation and desired some kind of intervention which would allow them to manage the complexity better. I began to suspect that students were feeling overwhelmed due to an overload of their working memory, which can only hold five to seven new pieces of information at a time (Kirschner, Sweller, & Clark, 2006). This theme emerged in two focus group comments:

You get exhausted because you do not stop thinking. Everything you do has a consequence. You go home and you think, "Oh, I should have done it this way." You are thinking the whole time about what you did wrong or could have been better. (Rani: FG2)

Wham! You hit semester three and you have all this equipment and you need to know everything, along with [how to deal with] unhealthy people. And you feel like overwhelmed, and shattered. Everything that is happening is overwhelming—time management, shifts. You're exhausted and you do not stop thinking! (Rani: FG2)

Clear learning outcomes stated at the beginning of the simulation is one way of ensuring that all participants understand what is expected, and how the simulation is to proceed. As the high-fidelity simulation unfolds, it is easy for students to become overwhelmed with what they are "supposed to be doing," and what skills/thinking they need to be accessing during the high-fidelity simulation. One option for reducing this feeling of being overwhelmed was to divide the students into roles. Each role is given boundaries and expectations, and the students are only required to perform one role. This strategy employed in the second run of the high-fidelity simulation proved

effective in reducing student overload and panic, increasing student confidence, and managing the load on working memory. The data showed that students preferred working in roles as evidenced in the debriefing for group two:

You could just focus on one thing and not think of everything else. You do it well because you think this is what I need to do and I know how to do it. You feel more confident in your team as well — you're not just standing there. (Lauren: Debriefing Group2)

The literature around cognitive load theory provides some explanation for why the current design of simulation may result in overload and confusion. The basic premise of cognitive load theory is that learners have a working memory with a very limited capacity (i.e. seven, plus or minus two new pieces of information) for dealing with new information (Sweller et al., 1998). However, learners have an effectively unlimited long-term memory which is capable of holding an unlimited number of cognitive schema (Artino, 2008). Therefore, instructional procedures should be designed so that the load on working memory is reduced and schema construction maximised (i.e. automation of required skills) in preparation for the simulated event. The result is that learning will be maximised and students' sense of being overwhelmed reduced. The student will be able to focus on clinical judgment and reasoning (i.e. what is going on with this patient) instead of, "How do I put this catheter in?" Design should allow students to focus on the patient, not the skill.

Load on working memory is further hampered when higher cognitive skills are required (e.g. organising, contrasting, comparing, analysis of situation). This must be factored into simulation design. Recalling information is much easier than processing information. When higher-level processing is required, humans are probably only able to manage two or three items of information simultaneously (Kirschner et al., 2006). The simulation environment, if used without regard to cognitive load on the working memory, has the potential to place an overwhelming load on the working memory which may result in students feeling 'paralysed and confused' in their ability to function. Simulation design must take into account these factors and their impact on working memory in novice students.

Millennials benefit from use of multiple sensory pathways.

Integration of both auditory and visual channels in simulation design.

It is helpful to understand that one of the characteristics of working memory is that its capacity is distributed over two, partially independent processors (Sweller et al., 1998). This dual processing feature operates in two separate channels for processing visual and auditory information (Artino, 2008). The implication of this dual-processing feature is that the limited working memory can be effectively expanded by using both visual and auditory channels. Simulation has the capacity to do this, and is, by its very nature, able to tap into both visual and auditory channels. This ability has important implications for the design of simulated scenarios as it allows students to process information across two channels (visual and auditory); thus maximising learning as expressed in the debriefing for group one:

Like when you're in the situation in real life, instead of just panicking, like, I'm a visual learner and I try to think back to what I did there and put it into the real situation. If they

tell you something you might not remember, but if you do it with your hands you remember it more. (Samantha: Debriefing Group 1)

Another student used the combination of auditory and visual channels in her assessment of the client's lungs as stated below:

On the second round you also reminded me that I should listen [auditory] to the chest again after the salbutamol was given [visual]. I had forgotten to do this and because of this reminder I also remembered to check the chest again in the third round. (Chloe: Debriefing Group1)

During the simulation for these two groups of students, both visual and auditory channels were used. The students were asked check vital signs and administer medication (visual channel) and then to call a verbal handover to a physician (auditory tie-in). The use of both channels maximised the capacity of the working memory by allowing both visual and auditory input into student learning. This concept is known as the *modality effect* (Mousavi, Low, & Sweller, 1995), and has important implications for simulation design.

Technician Group Interview: Supplementary Cycle

At this point a supplementary cycle was conducted, prompted by the fact that technicians had been involved in operating the manikins and recording the high-fidelity simulation. The technicians (n = 2) had many ideas about how things could be improved which they communicated to me during the above two revised high-fidelity simulations run with students. As an addendum in this action cycle, and after ethics approval, the technicians were interviewed as to how they thought simulation was working in the undergraduate nursing programme. Questions for this interview can be found in Appendix B11. This interview was recorded on two devices, transcribed into a Word™ document, uploaded into NVivo™, and coded for themes.

As the technicians are usually operating the manikin during the high-fidelity simulations, and were present during the data collection for this and subsequent action cycles, their comments were considered relevant to this discussion. Upon reflecting on their comments in the interview, the following themes emerged in the data.

Simulation use is appropriate in undergraduate curricula.

The technicians felt that the use of simulation with undergraduate nursing students was appropriate as it assisted students in their learning in a manner which protected the public. When asked about the benefits they saw simulation providing students, the technicians stated the following:

I think it is good because they are not practising on the public and they get to experience all types of scenarios that they might encounter in clinical. As a health user you feel more confident about what they are doing, as they do not practice on us.

For some time now it has been understood by both educators and researchers that students new to clinical settings need practice in the management of deteriorating patients (Cooper et al., 2012). This practice is best managed in high-fidelity simulation where patient safety is not compromised. Students have the opportunity to develop in clinical reasoning and clinical judgement when working in contextualised environments such as simulation. Thus the

technicians affirmed their opinion that simulation was beneficial to student learning, and on another level, protected the public from harm. From this stance they went on to describe their own experience of working with students and educators.

Effective simulation requires facilitator training.

After spending time reflecting on the technicians' comments, I began to understand that the technicians believed that many of the educators working in high-fidelity simulation simply did not have a clear understanding of how to use this tool. The technicians believed that many educators did not have the opportunity to learn how to develop, use, and debrief high-fidelity simulation in a meaningful manner. This is highlighted in the comment below:

It's like the other day when they said that the thing did not have a pulse and I wanted to jump in and say, "Actually, it does have a pulse." I do not know whether the educator focuses on that because the educator does not know what to focus on so they pick what they know?

One of the themes that came out in the technician interview was a perception that the educators did not know enough and needed further training in the implementation of high-fidelity simulation. The technicians believed that students were confused and unsure of what the learning outcomes were as below:

The student needs to be informed about what you want them to do. I always feel sorry for the educators that have to deliver it because they are told to go do it and they have no support, no training, and they do not know why they're even doing it.

The technicians were under the impression that the institution was not 'training the trainers' sufficiently to enable educators to work with high-fidelity simulation. Educators need to understand both the operation of the simulation equipment coupled with troubleshooting abilities if the equipment fails. Additionally, educators need to understand the pedagogy which underpins the use of high-fidelity simulation as a teaching tool. This would enable them to gain confidence and effectively orient, implement, and debrief students in simulation.

The technicians believed students needed an orientation to the manikin, and a skills lab to automate skill performance before entering high-fidelity simulation as below:

If you're going to do an asthma scenario, students need to know how to work the oxygen, and how to set it up. That way they will not come in and not know how to turn on the tanks.

The overwhelming opinion of the technicians was that what was occurring in the high-fidelity simulation should be revised before students begin. This concept also arose in focus group data from students.

Additionally, the technicians felt that the educators were not giving appropriate time to the design of the simulation, with all of its integral parts. From the technicians' point of view, educators seemed to be underprepared and often haphazard in their delivery of high-fidelity simulation. When asked what this preparation might involve, technicians stated:

Getting the scenarios in advance so the equipment is ready, moulage and props are there. Otherwise it is very haphazard. Do you want it recorded? Do not record? When

we do not have it in advance, we get stressed and then the educators get stressed. Especially if we have other classes and not just SIM room, we can't do it all last minute.

It seemed that the educators' lack of preparation and inability to prepare scenarios in advance was causing stress for the technicians and eroding their confidence and ability to do their jobs, which in turn created stress and a general sense of haphazardness. One technician stated the following after a particularly hectic morning:

It's all happening at the beginning of the day and I feel inadequate. We're trying to help everyone with no advanced warning of what is expected. Then, we could actually sit and talk about how it is going to run, which is what we want to be able to do. The students think we're all a bunch of idiots because we are all running around with our "heads cut off!" We look unprofessional, and they see that.

Simulation as a teaching tool requires advanced design and planning and is therefore very labour intensive (Gantt, 2010a). Due to resource implications, schools must carefully consider the design and implementation of an integrated simulation programme for their students. Educators must be trained as to the running of manikins, designing of scenarios, and thinking about how this high-fidelity simulation fits into the overall curriculum (Dowie & Phillips, 2011; Garrett et al., 2011). Educators must treat the use and implementation of simulation as a part of their professional work, and take it upon themselves to learn how to use the tool effectively (Lane & Mitchell, 2013). In summary, the technicians believed that appropriate professional behaviour around the implementation of simulation would necessitate educators becoming trained in the use of high-fidelity simulation, allowing adequate time to design and implement scenarios, and communicating their expectations and lesson plans to the technicians *well in advance* of the simulation being delivered.

Guiding Simulation through the Eyes of Dewey

Design must encourage students to think critically.

Dewey (1910b) considered critical thinking central to all aspects of education. He emphasised that genuine freedom rests in the trained power of thought and the ability to turn things over in one's mind and focus on concepts deliberately. He believed that if a person's actions were not guided by thoughtful conclusions, they were by default guided by inconsiderate impulse, imbalanced appetite, or the circumstances of the moment. Furthermore, Dewey alleged that to cultivate unhindered, unreflective activity is to foster enslavement. With these concepts foremost, he postulated that there is probably no more crucial task before teachers than to nurture critical thinking in their students. This is particularly important in what he saw as an anti-intellectual and overwhelming emphasis on simple recall which occurs in many educational environments today (Myrick, 2005).

For Dewey, the responsibility of determining subject matter and method ought to be in the hands of the teachers who do the work. The work of teachers is to create rich, educative experiences for students. Dewey defined the method of an educative experience as being critical thinking (Dewey, 1916). When teachers are thoughtful and creative in designing learning experiences for their students, students will consequently have a better opportunity to become creative and thoughtful members of the learning community and, eventually, society. Conversely,

when creativity and freedom are lacking in the design of educative experiences, the ability of students to think creatively and critically is stifled. I found these comments particularly motivating in the design of high-fidelity simulation.

Design must analyse how *means* contribute to *ends*.

The final result or performance in high-fidelity simulation is considered of paramount importance. The educator must consider what goals are to be accomplished in using simulation, along with what steps are required to scaffold students into an improved performance. This process must involve reflective thought as it alone is truly educative in value (Dewey, 1910a). The end of any educative process is the formation of careful, alert, and thorough habits of thinking. We may think of these *habits* as a means, waiting, like tools in a box, to be used by conscious resolve (Dewey, 1922). It is the formation of these habits of thinking to which we now turn our attention.

Dewey (1922) explained that there are *means* and *ends* which must be considered in the formation of habits. The *means* are acts to be performed prior to the *end*. The *end* is the last thought act; the *means* are acts performed prior to the *end*. "The *end* is a series of acts viewed at a remote stage while the *means* is a series of acts viewed at an earlier one" (p. 34). In relation to high-fidelity simulation, the *means* must be viewed with the intention of analysing how certain acts contribute to the *end*. When the proposed *end* involves a deviation from usual (e.g. the deteriorating patient), the goal becomes finding some act which is different from the usual one in order to achieve the deviated end (i.e. improvement of the patient's condition secondary to improved student performance).

Educators must observe the discovery and performance of an unaccustomed act by students. In doing so, this observed performance becomes the *end* (Dewey, 1922). In high-fidelity simulation, students are attempting through current habits to put a series of acts together at an early stage (*means*) in order to achieve an improvement in the condition of their client (*end*). To succeed, the student must find some line of action which will inhibit the deterioration and, by instituting this alternative course of action, bring about the desired end (i.e. improvement in patient condition). The discovery of this other course of action becomes at once the *means* and the *end*. Dewey emphasised that, "Until one takes intermediate acts seriously enough to treat them as ends, one wastes one's time in any effort at change of habits" (p. 35). The goal in learning how to use simulation is to do so in a manner which encourages the formation of new habits in students. This is done through the manipulation of *means* to create improved *ends*.

Design needs to encourage new *habit* formation.

The development of habits through coaching during simulation becomes paramount. Dewey (1922) explained that habits can become old and fail to keep up with changing times. This is continually happening in evidence-based practice which informs nursing. When habits become outdated, impulses are the pivots which turn students down a pathway of new habit formation (Dewey, 1922). Impulses have the ability to give new direction to old habits, and to change their

quality. They bring the possibility, but not the assurance, of a steady reorganisation of habits to meet new elements in new situations.

In high-fidelity simulation, recognition of the impulses students are employing may show evidence that their old habits no longer work. However, it is essential that educators working with students maintain a dialogue which allows them a window into the student's thoughts. Part of effective coaching involves recognition of impulses coupled with options which will provide new direction to outdated or ineffective habits. An example of this occurred when a student for whom English was a second language forgot to wear a watch, which she normally used to check patient respiratory rate. Her impulse was to try and use a watch pinned to another student's uniform. When the other student moved, the count was lost. This impulse became the pivot which motivated her to look for another time source. As the educator in the room, I was able to direct her to a wall clock, which formed the basis of a new habit when the old habit of looking at her friend's watch failed.

I did not realise there was a clock on the wall, so I could not effectively measure respiratory rate. It is very supportive that [the educator] told me the location of the clock. It is good that the educator was with me.

This kind of coaching (simple as it may be), becomes essential for students when they are attempting to form new habits or change their native tendencies. This student's native tendency was to use her own watch, and when it was not available, she was unable to complete the task required. In this case the impulse of looking for an alternative time source became the 'raw material' for the formation of a new habit.

This exploration of a different course of action in response to a concrete problem is a kind of intelligence (Dewey, 1922). The student is given the opportunity to do an old thing (i.e. take respiratory rate using her watch) in a new way (i.e. take a respiratory rate using wall clock). The student was effectively constructing *new means* to achieve the desired *end*. A "breach in the crust of the cake of custom releases impulses; but it is the work of intelligence to find ways of using them" (Dewey, 1922, p. 170). Intelligence plays a crucial role by refining the raw material of impulse into new habits. However, it is the collaborative effort of the coach interacting with the student which produces this change in habit. This is the kind of coaching which can enhance student confidence and maximise high-fidelity simulation.

Conclusion

The first action cycle involved reconnaissance (observation of current practice) in the form of two focus groups, reflection on themes from these groups, and the implementation of an action plan into two high-fidelity simulation events. Student themes which emerged from this cycle included a need for clear and concise learning outcomes to be stated before each high-fidelity simulation, a desire to repeat the high-fidelity simulation after receiving supportive feedback on ways to improve, and a need for educators to become available to students for questions and coaching as they proceed through the simulation. Students felt that the creation of roles helped them to manage the new elements required in the simulation. This was due to a reduced load on working memory through the use of roles, which limited new information each student was

required to manage. Student roles are an effective way of managing the load on working memory in high-fidelity simulation.

Technician feedback included requisite training for educators which would embrace becoming more familiar with how to use simulation. Training should encompass running and trouble-shooting manikins, learning how to support students in high-fidelity simulation, and how to effectively debrief. An expectation that lesson plans and scenario templates be complete and emailed to the technicians well in advance of the simulation day was also expressed. This was considered essential in order to ensure that all equipment was working and props were in place in advance of high-fidelity simulation days. The technicians felt that their ability to effectively work in their roles would be enhanced if the above steps were adhered to.

Student feedback from cycle one indicated that the action plan in this cycle one did help to improve their learning in high-fidelity simulation. Reflection on the emerging insights, together with reading of the related literature and the philosophical writing of Dewey, will inform rationale and “moving in new directions” for Action Cycle Two.

As I reflected on what had been learned in this cycle, the realisation that the interventions used in the revised high-fidelity simulation would need to be piloted on a larger cohort of students emerged. It was necessary to make sure that the requests were not just ‘individual’ or the ideas only held by a small group. I needed to know that these changes in high-fidelity simulation would work with the majority of students. Thus, cycle two began and I had the chance to put these changes into place with a larger cohort of students.

Chapter 8 will discuss how learning from cycle one influenced cycle two to move in new directions. The discussion will focus on the most valued aspects of the revised simulated environments along with how Dewey’s pragmatism underpins and supports the changes from a pragmatic perspective. The discussion concludes with key elements students’ desired if, “The world were perfect in high-fidelity simulation.” Educator feedback around the same theme is also presented.

Video clips generated from cycle one can be viewed at the link below:

https://autonline.aut.ac.nz/bbcswebdav/pid-3086599-dt-content-rid-5586372_4/institution/Papers/DHScGwenErlam/Publish/index.html

Go to the left-hand tabs and click on cycle one

Chapter 8 - Action Cycle Two: Consulting with wider group of students to further develop pedagogical practices

The belief that all genuine education comes about through experience does not mean that all experiences are educative.

Experience and Education (Dewey, 1938, p. 25)

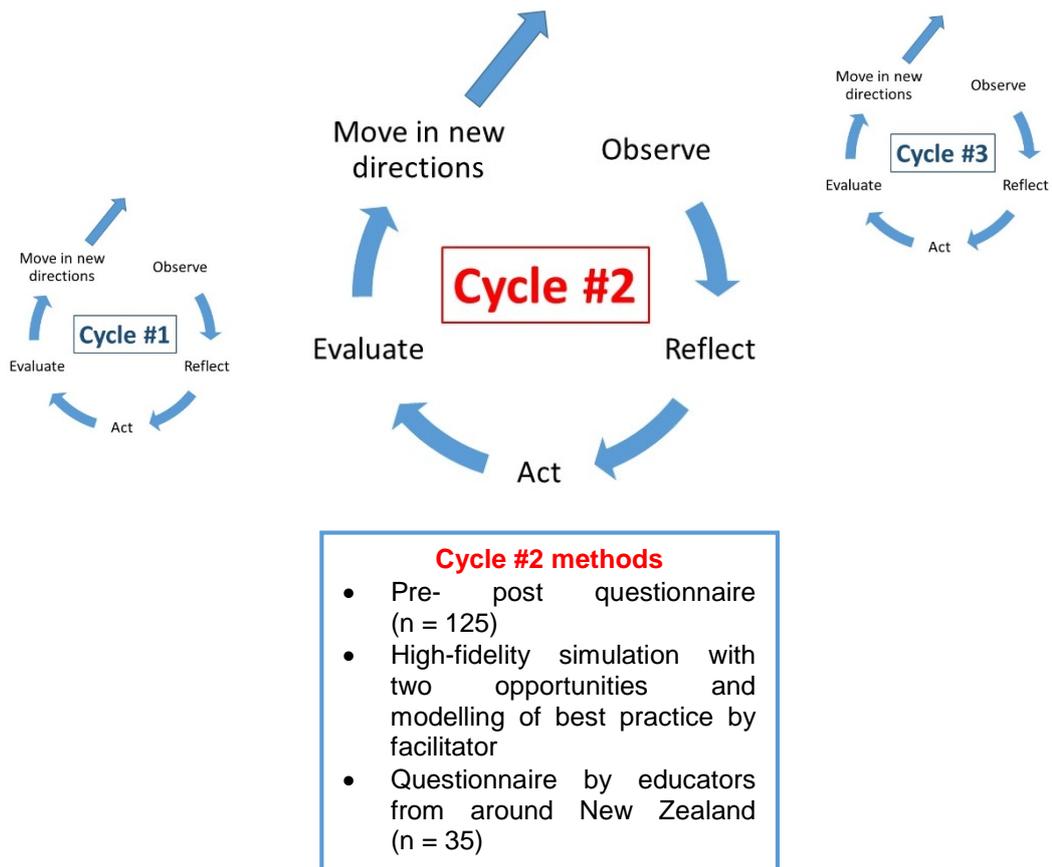


Figure 8.1 Action Cycle #2

From *All you need to know about action research* (McNiff & Whitehead, 2011, p. 9).

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Introduction

As stated in the conclusion from the previous cycle, student feedback around the revised high-fidelity simulation was positive in many respects. As can be seen in Figure 8.1, action research involves a cyclical process beginning with observation, and progressing through reflection, action, evaluation, and implementing findings in new directions the next cycle (McNiff & Whitehead, 2011). I had evaluated the revised simulation in cycle one and received positive feedback from students. However, only eight students were involved. As cycle two began, I was interested in implementing the changes I'd implemented in cycle one on a grander scale. I was focused on larger cohorts of students in semester five of a six semester undergraduate nursing

programme, leading a paper where high-fidelity simulation was an option if desired. In consultation with my supervisors I decided to elicit feedback from these students around the revised high-fidelity simulation from cycle one. I developed the high-fidelity simulation for semester five around a patient with chronic obstructive pulmonary disease and embedded interventions students valued from cycle one. The students were consented and asked to fill out a questionnaire as to the effectiveness of these changes in on their learning. Because all students received this questionnaire, feedback was given by students in all the generational cohorts. Nevertheless, in reflecting on their insights I maintained my interest in the millennial generation who make up the majority of the student group.

As stated above, the purpose of the second action cycle was to implement changes which proved positive for students when applied in the first action cycle, but on a larger scale. Remembering that action research is about improving practice, creating knowledge, and generating living theories of practice (McNiff & Whitehead, 2010, p. 27), I was determined that my own teaching practice be influenced by what the students were saying was effective. Changing professional practice would begin with changing my own thinking first, and having an open mind to what the students were saying. However, I was coming to realise that by changing existing conditions towards improvement, there would be consequences for others involved in high-fidelity simulation — both students and academics. This is one of the outcomes of action research (McNiff & Whitehead, 2011).

Modify and move in new directions

After reflecting on the evaluation comments from cycle one, I developed an action plan to inform the second action cycle. I found myself in an advantageous position as a course coordinator where I could directly influence simulation. The opportunity for modifying high-fidelity simulation in alignment with what students ($n = 125$) had stated as positive in cycle one arose.

As in the first action cycle, there was a small supplementary cycle which involved a questionnaire intended for those attending any conference or training in simulation at my institution. The need for this supplementary cycle arose out of requests for simulation training from both educators within my institution, and from colleagues at other institutions.

Step One in the Action Cycle: Observation

Managing the means.

Remembering the steps in action research (McNiff & Whitehead, 2011), I began the second action cycle by observing feedback from the first cycle. After reflecting on this feedback, an action plan was developed which involved revising the high-fidelity simulation for semester five students in an undergraduate nursing programme (six-semester programme). This was in effect making a focused effort to manage the means to achieve a desired end in the revised high-fidelity simulation.

These students (n = 125) were asked to form groups of three to four, and sign up for their preferred simulation time together. The high-fidelity simulation was revised as per feedback from action cycle one with the following changes put into place:

- *More time was allotted* (45 minutes) for the simulated event and debriefing (four students). This is a change from the 20-30 minutes in the past. This was to help students have time to develop effective habits thus increasing their confidence.
- The students were allowed to *self-select their groups and times* by using a Wiki™, maximising student flexibility and choice.
- I *oriented* the students to the simulator before any scenarios were run. This orientation included things like where to find the pulse on the manikin, how and where to take the blood pressure, how to mix the medications for the nebuliser, how to turn on and regulate the oxygen tank, etc. This was done to help students enter to simulation with more confidence and safety in this environment.
- A *pre-briefing* to the simulation was instigated which included a clear statement of the learning outcomes, the handover (history) of this patient along with their reason for seeking care. This was done with behaviourist theory in mind, providing content in modular format which would help scaffold students into the high-fidelity simulation by reminding them of key knowledge specific to the simulation which was essential to managing the clinical situation.
- I came out from behind the one-way glass and *stayed in the room* with the students while they were participating in the simulation. I was available for queries and at times stopped the simulation to have them reconsider their course of action. This was done to provide students with additional support which they said was lacking in previous high-fidelity simulation experiences.
- After their first attempt, I *acted out the simulation* playing all four roles so students could gain some concept of how the simulation might look in a *real* clinical setting. This was done with constructivist theory in mind. Modelling of expected performance assists students in changing outdated habits and refining their management of the clinical situation in order to be more effective. This new habit formation can be rehearsed and then stored in long-term memory (cognitivist underpinning).
- I involved the students in a *detailed debriefing* focusing on the learning outcomes stated at the beginning of the high-fidelity simulation. Debriefing, when done properly, bears constructivist tendencies as it assists students in constructing new meaning through interaction with what Dewey (1922) referred to as a matured social presence (the educator).
- I divided the expected student tasks into *four roles* in order to reduce the load on working memory and allow them to focus on one role at a time. This intervention was in line with cognitivist theoretical underpinnings (Fraser et al., 2012).
 - *Medication administration* (assess what the patient taking and determine what if anything might be appropriate to administer, then administer it)
 - *Vital signs* (verbally calling these to the recorder) and communication with patient

- *Respiratory assessment:* auscultate lung sounds, obtain pulse oximetry, determine patency of airway, respiratory rate, assess accessory muscle use, positioning, and complete reassessment after medication given
- *Recording of data* and calling a physician using *I.S.B.A.R* format (Introduction, Situation, Background, Assessment, and Response). Refer Appendix E1 for this tool.
- I gave the students the choice of which role they wanted to perform (maximising flexibility).

Step Two in the Action Cycle: Reflection

Managing pre-simulation anxiety.

Four prominent themes emerged in the pre-simulation section of the questionnaire for semester five students. The most prominent theme, noted by 56% of respondents to the first question, was that students felt anxious about coming to the simulation; often as a result of previous experiences in high-fidelity simulation. Anxiety is defined as painful or apprehensive uneasiness of mind usually over an impending or anticipated ill. It involves a state of apprehension, fear, foreboding, or disquiet about something with an uncertain outcome (Merriam-Webster Online Dictionary, 2013).

I did have some inkling that the students were feeling anxious, but did not realise the full extent of their anxiety; nor the full impact on their learning. Anxiety and its impact on nursing students are well known in the literature (Blazeck, 2011; Cooper et al., 2011; Melincavage, 2011). It is known that some student nurses experiencing anxiety may find it so unmanageable that they leave educational programmes, or worse, leave nursing after becoming qualified (Melincavage, 2011).

While this is very concerning, the fact that current research has shown student anxiety to *decrease* after high-fidelity simulation meant that we were doing something fundamentally wrong in our use of this teaching tool (Khalaila, 2014). If research has shown that simulation can actually decrease anxiety levels and increase performance and confidence (Khalaila, 2014; McCaughey & Traynor, 2010), why were similar confidence levels not being seen at this university? Why were these students running from high-fidelity simulation while other students worldwide were embracing it? What could I do about this problem?

When asked what hindered their learning, semester five students responded as below:

Nervous, scared from previous simulations where we did not know what we were walking in to.

Nervous, terrified, not going to do well, do not know enough knowledge to do well. Fail simulation; fail to help a person in respiratory distress.

My own emotions – nervousness sometimes hindered my behaviour and learning today.

All of the semester five students (n = 125) rated their previous experiences in high-fidelity simulation as a 1-2 on a Likert scale of 1-5 (1 = negative feelings and 5 = positive feelings). This low indicator in the data seemed to indicate they were not satisfied with their experiences in high-

fidelity simulation. I began to query what contributed to this dissatisfaction and again, the students were forthcoming in explaining their distress. Some semester five students believed they were thrown into the 'deep end' with no orientation or learning outcomes communicated beforehand as stated below:

As the simulation in semester three was the first time that we participated in a simulation, it seemed a complete disaster. We were not shown what the manikin is capable of doing beforehand. Therefore, we were clueless when we walked into the scenario.

Nervous, not prepared, needed more guidance thrown in the deep end, not confident, did not know what to expect.

Uncertain of what was expected of us as a group. As a result simulation felt "messy" and unorganised with each student looking at each other trying to figure out what to do next.

While some students seemed to be nervous or anxious with no rationale behind why they were feeling this way, others did cite factors that contributed to their anxiety. The themes coded within NVivo™ included; (1) too many students in the room, (2) a lack of opportunity to become acquainted with the simulation context thus far in the undergraduate programme, (3) and a lack of pre-briefing materials before the simulation commenced to assist in their preparation. Again these semester five students were keen to share how they were feeling:

Feeling nervous and not being able to think clearly, particularly the first time through the scenario. It was difficult with four students doing different assessments.

I could have had more scenarios to learn in. I would have liked to have less people [in the room] so it was more like real life.

We weren't given a scenario specific to any situation so we did not know what to expect or which area to be prepared for.

Nervous, not enough confidence in simulated settings. Allow us to do more high-fidelity simulation as it prepares us for our clinical placements.

These comments motivated me to revise the high-fidelity simulation for year three students as the year progressed. It was becoming apparent that while this undergraduate nursing programme did use high-fidelity simulation, there was not an integrated scaffolded plan in this programme. Upon reflection, the comment, "...not enough confidence in simulated settings," combined with, "I could have had more scenarios to learn in," highlighted the need for a more integrated plan for high-fidelity simulation. As educators, it is our responsibility to 'set the stage' for high-fidelity simulation at our institutions. This involves pre-simulation activities, laboratory practice in skills and communication techniques (e.g. ISBAR), and building a suite of scenarios that parallel lecture content (Burke & Mancuso, 2012).

'Setting the stage' in our situation would involve more than writing a few more random scenarios. The students had been clear about what was hindering their learning. They seemed to be asking for a bigger picture — an overall simulation plan that would be integrated throughout their three years of training. Linking high-fidelity simulation to classroom content has been shown to promote mastery of didactic content, heighten attentiveness, and improve test performance (Burke & Mancuso, 2012). Educators' attitudes set the stage for high-fidelity simulation, and they must be willing to be a part of the overall plan to ensure success. It has been argued that high-fidelity simulation in undergraduate nursing has the potential to create authentic and realistic

learning contexts which shift the learning laboratory to the background as the actuality of the clinical situation becomes paramount (Jeffries, 2010). This was the kind of preparation the students were asking for.

Managing the most valued aspects of high-fidelity simulation.

As stated above, students were asked to respond to the question, “What did you value most in today’s high-fidelity simulation?” These responses were coded in NVivo™ and the percentage of coding for the top four responses are shown in Figure 8.2 (p. 156). These aspects will be discussed further in relation to how they dovetail with current simulation research and Dewey’s notions around the educator’s responsibilities for designing effective classrooms.

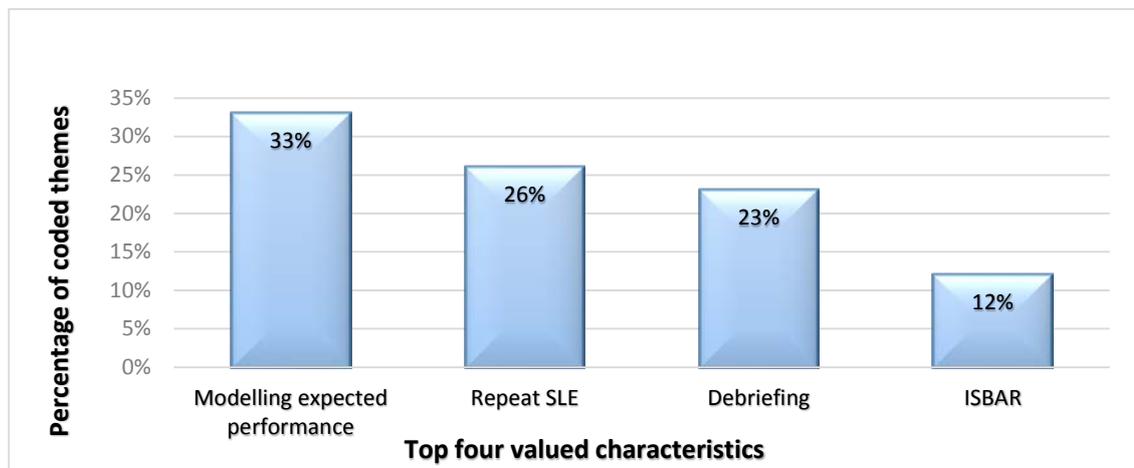


Figure 8.2 Most valued aspects of revised simulation cycle two

Role-modelling key to impulse formation.

With student anxiety elevated, I was keen to see and reflect on feedback from the next part of the questionnaire. Students were asked what they most valued in the revised high-fidelity simulation which had been embedded with changes from the first action cycle. The highest valued intervention (33% of coding for this question) was having the educator model (act out) the high-fidelity simulation showing how to perform each of the four roles. The students found this ‘picture’ of the goal before them both informative and inspiring. Employing this technique in high-fidelity simulation is a constructivist tendency.

Constructivist theorists espouse that the needed knowledge is not delivered to students from the educator; thus changing the role of the educator from content expert to facilitator (Boese et al., 2013). Constructivist learning supports creativity in problem solving as the student assimilates new information or concepts into their knowledge structure (Passmore, 2014). Modelling of expected performance assists students to assimilate new knowledge into their current performance in high-fidelity simulation. How the student organises and recalls current knowledge is key to meaningful learning, as the knowledge is bundled in concept packets and recalled from long-term memory (Artino, 2008; Merriënboer & Sweller, 2005). The learner moves from a

passive stance in behaviourism, to an active participant in the learning process guided by constructivism (Passmore, 2014).

Feedback from semester five students around the value of modelling are below:

The role play that the educator did in the middle was really helpful to show us all of the roles needed and assessments that needed to be done.

Understanding what it was that I was supposed to do. Having a demonstration of exactly what was expected was very helpful.

What I value from today's simulation is how the educator demonstrated it to us before the simulation started. That helps with our self-confidence. Also, giving us feedback afterwards was helpful as she told us to believe in ourselves.

[The educator] gave us a role play and how to react appropriately. If I did not have a chance to watch the role play by [the educator], I think I would still be confused.

The last comment in this set was encouraging as it was becoming clear that some of the interventions were bolstering student confidence. The students seemed to value facilitator modelling within the simulation so they could see what was expected of them. The literature shows that verbalisation of thinking by expert nurses is an important part of student learning (Benner et al., 2010). In pressing clinical situations, expert nurses may simply act out of trained expertise, and not express the thoughts behind their actions. In such situations, observing students are unable to grasp the clinical judgment decisions made by the expert (Johnson et al., 2012).

Observational learning and modelling are thought by educational psychologists to be important instructional design techniques for cognitive and behavioural learning (Anderson, Aylor, & Leonard, 2008). These methods, when combined with high-fidelity simulation as an educational strategy, may lead to better understanding of clinical judgments made by students (Johnson et al., 2012). This clinical judgment, recalling Dewey, involves the development of safe and appropriate habits.

Habits, in Dewey's (1922) way of thinking, are acquired. Part of this acquisition involves the formation of ideas. The formation of ideas as well as their execution depends upon habit. If we could form a correct idea without a correct habit, then possibly we could carry it out irrespective of habit. "A wish gets definite form only in connection with an idea, and an idea gets shape and consistency only when it has a habit behind it" (Dewey, 1922, p. 30). Therefore, we must give focused attention to the formation of correct habits when working with students in high-fidelity simulation.

The formation of habits requires a change in the conditions or context. Dewey (1922) stated that, "To change the working character or will of another we have to alter objective conditions which enter into the person's habits" (p. 19). These objective conditions in our context are the conditions existing in the high-fidelity simulation. By modelling the simulation for the students, I was altering the objective conditions and allowing students an opportunity to observe (i.e. access visual channel of cognitive working memory). Observation is pivotal in habit alteration, and modelling the expected performance to the students provided a pivot (impulse) upon which they could build a revised performance of their own.

As educators we should not be so controlling as to forbid students from taking responsibility for constructing their own revised habits. Dewey (1922) reminded us that “we cannot change habit directly: that notion is magic” (p. 20). However, we can change it indirectly by modifying conditions, by an intelligent selecting and weighting of the objects which engage attention and which influence student performance. In other words, educators must be quite deliberate in how they engage the attention of students in high-fidelity simulation. When educators have caught student attention, a concerted effort must be made to focus this attention in a manner which influences habit formation. By modelling the simulation for the students, I was in effect modifying the conditions which engaged the attention of the students. This influenced their learning by allowing them to form new impulses — the unlearned, spontaneous, natural actions which allow us to break old habits and form new ones (Dewey, 1922).

Constructivism is a philosophical underpinning which involves the learner, with guidance from the educator, using certain activities and experiences to construct new knowledge and integrate it into current knowledge base (Lynch, 2002). If constructivist notions are woven together with Dewey’s impulse formation, it could be stated that high-fidelity simulation allows construction of new knowledge through exposure to alternative performances. Dewey (1922) explained that, “Impulses are the pivots upon which the re-organization of activities turn; they are agencies of deviation for giving new directions to old habits and changing their quality” (p. 93). Experience is the key which unlocks impulse development resulting new habit formation.

Learning begins with an impulse or experience (Dewey, 1938). In order for learning to occur, the impulse must involve observation of the surrounding conditions. New knowledge is considered in conjunction with these observations. Judgment results when observation and knowledge intermingle, creating an interpretation of the significance of the experience. Judgment translates the meaning of the experience into the purpose — a desire to change or to create a plan of action for future similar experiences (Dewey, 1938). This intention for application of knowledge in future experiences is a desired outcome of the high-fidelity simulation. Students learn how to manage deterioration in one case, and this learning can be replicated when they encounter that type of deterioration in future settings.

Integration of new knowledge might happen as follows. Modelling the simulation allows for impulse formation, which paves the way for the integration of new habits. The observation of a new performance, combined with current knowledge, results in the formation of clinical judgment which can be used to interpret new clinical situations. Judgment translates the meaning of the experience into a purpose — a desire to learn how to manage deteriorating situations for other conditions not learned in this instance. Thus, learning continues to unfold as this desire is actualised.

Repetition key to habit formation.

The second most valued aspect in the revised high-fidelity simulation was the ability to repeat the simulation in order to cement learning and refine skills (26% of students stated this aspect was helpful). Repetition is a behaviourist theoretical underpinning which assists the learner by assisting with skill development. It is the path to learning in the stimulus-response cycle, as

repetition conditions the learner to respond to the presented stimuli. Individuals learn through the responses of others to behaviours that lead to satisfying results, and the repetition of these satisfying results produces learning (Cohen, 1999). Skill development of this type requires regular feedback in order for students to modify their performance and gain competence (Clapper & Kardong-Edgren, 2012). Repetition has behavioural tendencies which when mastered allow the student to focus on critical thinking and problem solving.

Repetition as a theme emerged in the following semester five student comments:

Having two chances enables you to learn and let it set in.

The twice assessing system works well, there is always something you can improve on and it helps your general practice to have different experiences.

It was real life situation that we will encounter when we are working as an RN. I was quite shocked that I do not actually know what to do. However, second session made me feel whole lot more confident.

Repetition is not a new concept in high-fidelity simulation. As stated in the previous chapter, there are reasons why repetition is good design. Cognitive load theorists confirm that repetition has a positive influence on learning (Sweller, 2004). In order for learning to ‘stick’ and be held in the working memory, it must be rehearsed. If it is not rehearsed, it is said to be lost in between 15 and 30 seconds after it is learned (Driscoll, 2005). However, if the information or skill is rehearsed, it becomes *automated*. As described in Chapter 7, automation occurs when information stored in schemas can be processed automatically and without conscious effort, thereby freeing up working memory resources (Artino, 2008).

Constructed schemas become, “automated after extensive practice and this automation can free working memory for other activities” (van Merriënboer & Ayers, 2005, p. 149). With automation, familiar tasks are performed accurately and fluidly. Giving an injection or calling a handover can become like brushing one’s teeth or combing one’s hair. The simulation must include a review and practice of the required skills expected before the actual simulation occurs to ensure habit formation. These habits (called schema by cognitive load theorists), stored in long-term memory, enable students to gain some fluidity and automaticity within that context. However, that simple repetition can become machine-like if old habits are not refined (Dewey, 1922).

Dewey’s (1922) thinking can usefully form an underpinning for high-fidelity simulation with his caution that forming habits alone is not always effective learning. His caution is that, “With habit alone there is a machine-like repetition, a duplicating recurrence of old acts” (p. 180). It is the formation of impulses which give direction to habits thus allowing change to occur in clinical judgment (Dewey, 1922). With conflict of habits and release of impulse there is conscious search. It is this conscious search which forms the backbone of clinical judgment — a trait we desperately need to develop in novice nurses (Tanner, 2006).

Clinical judgment is critical for the development of clinical knowledge and improvement in clinical reasoning. Clinical judgment has been defined as, “an interpretation or conclusion about a patient’s needs, concerns, or health problems coupled with the decision to take action” (Tanner, 2006, p. 204). Good clinical judgment requires a flexible and nuanced ability to recognise salient

aspects of an undefined clinical situation, interpret their meanings, and respond appropriately. Sound clinical judgment improves a student's ability to manage deterioration (Cooper et al., 2012).

The formation of impulse gives new direction to old habits, allowing and changing their quality (Dewey, 1922, p. 93). However, just telling students what to do will not embed new ways of thinking. There must be thought and intention, in essence clinical reasoning, behind new habit formation. Therefore, when designing high-fidelity simulation in which the educator expects to change ineffective habits, learners must be allowed the freedom to consciously search for new habits as impulses provide the pivot in new directions. In this way, the activities which are undertaken (means) can be re-organised, allowing for achievement of the proposed learning outcomes. Impulse becomes the seed from which habit-change emerges. Semester five students expressed the development of new habits in the following way:

[We learned] that the rules we had drummed into us for pass/fail in previous units are not appropriate in an acute setting. We need to be allowed to alter practice based on our own judgment.

Previous experiences [in simulation] I found a bit of a waste of time as it was very stressful and we were very inexperienced. I appreciate being given more opportunities to do this with more support.

In order to move from novice to expert, we must allow students to form impulses which pave the way for formation and integration of new habits. Impulses are the pivots which inspire new habit formation (Dewey, 1922). They are the agencies of deviation, and of new directions for old habits. With repetition, students are allowed the opportunity to see ineffective old habits. The path is paved for new impulses and subsequent fresh habit formation. "As organised habits are deployed and focused, the confused situation takes on form, it is 'cleared up.' This process is the essential function of intelligence. Without habit there is only irritation and confused hesitation" (Dewey, 1922, p. 180).

New habits allow for the clearing up of confused situations — which is often the case in high-fidelity simulation. Educators must strive for the formation of new and effective habits to replace old or outdated thinking. New habits help students manage their patients more effectively, which builds confidence. One student expressed it this way:

The first run through, I felt, "blocked." I knew what to do but the anxiety took over, leading to silence. However, after [the educator] showed us how she would approach the situation, it became clear and was a fantastic learning experience because we got to do the simulation a second time. (Anonymous questionnaire)

In order to achieve competency, the individual progresses through five stages of proficiency; novice, advanced beginner, competent, proficient, and finally expert (Benner et al., 2010). High-fidelity simulation has the potential to move students through these stages of development (Benner et al., 2010; Seropian et al., 2004b). However, high-fidelity simulation must be used with cognitive load, impulse, and habit formation in mind. When used in tandem with the development of impulses and habits, while maximising available working memory, simulation has the potential to bolster student confidence and satisfaction (Alfes, 2011; D. Brown & Chronister, 2009), as well as enhance critical thinking (Fero et al., 2010) and problem solving (Wotton et al., 2010). Considered repetition is integral to this process.

Supportive feedback key for educative simulation.

The third most valued aspect of high-fidelity simulation in semester five students was the presence of supportive feedback on the part of educators. Students were genuinely concerned that this happen, and that it occur in a helpful and 'friendly' manner as expressed in anonymous questionnaire responses below:

Feedback helped me ALOT! Having the experience of being a nurse in an emergency situation without the risk of doing harm built my confidence, even after just one session.

I felt that I learned lots from [the educator's] guidance. I felt that letting us do it ourselves with our knowledge and then giving us guidance gave us confidence.

[The educator's] exact input. Telling us exactly how to do it better. I feel better. The flow of what to do was great!

[It was helpful] that we were shown the correct way to perform nursing cares in emergency situations. [The educator] took the time to explain and demonstrated to us on the things that we did not do well so we could improve.

I think this learning experience is beneficial and guides us in the right direction, provided we have supportive educators. [The educator] was not only supportive of our learning but acknowledged that as student nurses we have limited exposure of patients in varying situations. She guided us through education, role play, and encouraged us to perform better.

These comments show both the gratefulness and necessity of providing students with supportive and informative feedback. Dewey (1938) believed that genuine education comes through experience, but that not all experiences were educative. He is quick to remind us that experience and education cannot be directly equated to each other. Some experiences are what Dewey terms mis-educative (Dewey, 1938). A mis-educative experience is defined as one that has the effect of arresting or distorting the growth of further experience. "When an experience engenders callousness; it may produce lack of sensitivity and of responsiveness" (Dewey, 1938, p. 37). Then the possibilities of having richer experiences in the future are restricted. This university may have been at risk of this type of mis-education in our initial attempts at high-fidelity simulation.

After reflecting on the student feedback in the questionnaires, it became evident that some of the high-fidelity simulation was not providing an educative experience for students. Questionnaire feedback in the Likert scales (previous and current high-fidelity simulation) showed that a predominantly mis-educative experience was causing students to want to avoid further high-fidelity simulation. Each of 125 students were asked to rate their high-fidelity simulation experience overall on a 1-5 Likert scale before they entered the revised simulation in cycle two of this research. At the end of their revised simulation another Likert score reflecting student rating of the revised high-fidelity simulation was obtained. This second score increased by an average of two points over the pre-simulation score. While this increase is a positive indicator, it must be remembered that these responses might have been influenced by social desirability and power influences exerted unconsciously by me. In other words, the students might have chosen a higher post-simulation score based on their awareness that this is what I was trying to achieve. Therefore, interpreting this two-point increase must be done carefully. Lessons gleaned from thematic coding of student questionnaire responses encompassed specific ways in which high-

fidelity simulation could be improved. Evaluation of these qualitative themes provided the backbone for modification of the third action cycle as I continued to move my living theory in new directions (McNiff & Whitehead, 2011).

Students reported that experiences in the revised high-fidelity simulation were educative when supportive feedback, repetition, and role modelling were in place. When these did not occur (as in previous high-fidelity simulation), engendered callousness coupled with lack of sensitivity and responsiveness had occurred, just as Dewey (1938) warned. This was evidenced in feedback from the focus groups in cycle one of this project as well as the first Likert pre-simulation score in cycle two.

Debriefing key for impulse formation.

One of the major premises underlying high fidelity simulation experiential learning is the philosophy of constructivism (Burke & Mancuso, 2012). Constructivism is grounded in the premise that students use prior understandings in tandem with current interactions to construct, elaborate, or reshape their knowledge (Neill & Wotton, 2011). Within the context of high-fidelity simulation, students require debriefing which weaves together the students' prior understandings with new knowledge in a manner which helps them, in Dewey's words, form new impulses which will clarify confusion (Dewey, 1922).

Dewey (1922) explains that our attention is always directed forward to bring to notice something which is imminent but which as yet escapes us. Impulse defines the peering, the search, and the inquiry. The development of impulse is, "the movement into the unknown; not into the immense inane of the unknown at large, but into that special unknown which when it is hit upon restores an ordered, unified action" (Dewey, 1922, p. 180). Impulse formation should be encouraged by designing learning environments which arouse the spirit of curiosity and investigation, and awaken the student's consciousness to the world in which he or she exists. The educator must train the student in the powers of observation. The educator must focus on instilling a practical sense of methods of inquiry, and gradually form in the mind of the student images of the typical moving forces and processes involved in all natural change (Dewey, 1966).

Utmost in Dewey's (1922) thinking is the fact that, "...the meaning of native activities is not native; it is acquired. Meaning develops when activities interact with a matured social medium" (p. 90). In the context of high-fidelity simulation, the *matured social medium* is the educator and possibly the student group working together in the debriefing. These individual elements all come together to encourage the formation of impulses which will progress to revised habits influencing student performance. The outcome, if all proceeds constructively, is a new understanding based on a combination of previous knowledge woven together with new habits.

The educator's role in this process is to support active, constructive dialogue to assist students to manipulate knowledge and to pose questions in order for students to reconstruct their knowledge and develop impulses which pave the way for new habit formation (Dewey, 1938). Debriefing promotes student interaction and use of prior knowledge, and encourages the development and consolidation of new habits in high-fidelity simulation. The educator who can

constructively manage debriefing will assist students in moving through the unknown, clarifying confusion, and restoring an ordered and unified action.

ISBAR key for effective communication.

The use of the ISBAR (Identify, Situation, Background, Assessment, Requirement) tool was the fourth most valued intervention identified by the semester five students working in the revised simulations for action cycle two. After reviewing several formats of this tool, I selected one that was simple and easy to use and that outlined the information for each category in a clear manner (Royal Melbourne Hospital, 2014).

The ISBAR tool is used to help structure communication in a number of settings. It was originally developed by the United States Navy to improve communication in that context. It provides a standardised structure of communication which helps both parties to prioritise information while decreasing the chances of omitting relevant information. It also helps to decrease assumptions by making the reason for the communication obvious at the outset and encouraging those involved to state the obvious. Anonymous questionnaire responses as to the use of the ISBAR tool were as below:

It was really good using the ISBAR tool. [It] was very good to learn as we have not learnt anything about this before.

I feel more confident as I now know effective communication skills. I mostly appreciated learning that in a live situation we must be fully prepared before calling doctors as being hung up on in reality would be extremely humiliating.

Teach us about ISBAR was most valuable. This is life-saving information yet we are not taught until year three?

Each [student should] have a turn at ISBAR!

As can be seen from the above comments, the students found the ISBAR communication tool extremely helpful and requested it be introduced earlier in their programme. These comments are aligned with the importance of clear and concise communication shown in the literature (Finnigan et al., 2010). Failures in communication have been estimated to be the major factor in 60-70% of serious incidents (Joint Commission on the Accreditation of Hospital Organizations, 2014) in the United States. In a large review of reportable adverse events that led to permanent disability in Australia, 11% were estimated to be attributable to communication issues (World Health Organisation, 2007). It is interesting to note that this is almost double that attributed to inadequate skill levels of clinicians.

The use of a structured methodology of communication employing a standardised tool can improve the quality of information exchange. The ISBAR tool has demonstrated the ability to improve communication as well as to increase practitioner confidence in getting other professionals to engage in a deteriorating situation (Finnigan et al., 2010). The acronym is able to be recalled correctly in most cases (i.e. Identify, Situation, Background, Assessment, Requirement), and the use of visual prompts is helpful in keeping the communication on track. The students felt that the tool kept them focused when stress and other compounding factors were producing anxiety and distraction. In essence, it enabled them to better manage the

complexity of the situation, and in educational terms it reduced the load on working memory (Artino, 2008).

Step Three in the Action Cycle: Action Plan

Key elements if the 'world were perfect'.

A range of simulation opportunities.

These semester five students were asked what they would like to see in high-fidelity simulation at this university "if the world were perfect." They had a lot of words to describe their perfect simulation plan as below:

A range of simulations including something for the maternity paper, MI, seizure, stroke, mental health, post-op. setting. I like having 2 attempts. Liked having information to read prior to the day. Liked having [the educator] in the room not behind the glass.

Multiple simulations with different scenarios that we should pass before graduating (some prior to clinical also). Simulations which are graded may be useful if the environment was still one of a relaxed and supportive nature and grades were assigned by group members and averaged (overseen by tutor).

More simulations throughout the programme to get you more ready for real-life situations (e.g. seizures, falls).

Simulation for mental health. At previous universities they've had tape recorders with voices and students had to go into scenarios with the tape recorder on. Various scenarios throughout the semester, scenarios as a basis of grading. Personally, I find essay writing subjective to the marker and often case studies and essays aren't a reflection of understanding. Rather, they are an assessment of who can write the best essay within the word limit.

I believe [our] nursing students MUST have simulations to be prepared for placement. Cardiac, diabetes, CORD, epilepsy; all experiences we will/may have in placement and should be prepared for using simulation as an assessment.

These comments seemed to reflect several suggestions for how to improve simulation at our institution. The request for, "A range of simulations..." along with "...multiple simulations with different scenarios that we should pass before graduating," seem to indicate a desire for an integrated and scaffolded simulation plan. This plan would need to include mental health (some suggested this occur in the form of hearing voices), as simulation is lacking in our current mental health undergraduate programme.

A range of habit-forming experiences.

Students were interested in using simulation in place of written assessments as seen in the above comment. The students seemed to be saying that the types of assessment we were using in the undergraduate programme were no longer valid or relevant and did not help them progress in professional development. In essence, these students are asking us as educators to provide them with an experience — not a lecture. Millennials prefer immersive learning environments (Parker & Myrick, 2009; Skiba, 2007) in which their experience is managed in a manner that helps them achieve the learning outcomes. Furthermore, they are not comfortable with failure as expressed by one student:

Feeling anxious if I was doing it correctly or not, worried of "not passing," do not want to look stupid/not competent.

As mentioned in earlier chapters, the Millennial generation is the largest, most catered for, ethnically diverse, team-oriented, confident, entitled, technologically savvy, sheltered generation to enter the tertiary setting (Howe & Nadler, 2008; Howe & Strauss, 2000). They have been called 'trophy children' due to their pressure to excel and their desire for trophies and certificates to showcase their achievements. This may put off educators, who are often Baby Boomers or Gen Xrs. The Millennial sense of entitlement coupled with their expectation that all support be given no matter what the cost, can seem excessive. Educating this generation requires a different kind of classroom, armed with immersive pedagogies woven seamlessly with innovative technology. These classrooms speak the millennial language.

It is the educator's job to manage the experience of high-fidelity simulation in a scaffolded yet interesting way that moves students into future experience with a desire for further learning. Dewey (1938) explained that the student experience must have, "...the consequence of forming habits which enable them to control future experiences" (p. 247). Learning within high-fidelity simulation must support 'self-control' coupled with a sense of progression.

Managing the sequence of experiences is important for maximising high-fidelity simulation. Educators must manage the experiences of students carefully so as to avoid experiences being so disconnected from one another that they are not linked (Dewey, 1938). These disconnected experiences cause the energy of learning to become dissipated and the person becomes in Dewey's words "scatter-brained" (p. 26). A set of disconnected experiences may artificially generate, "...dispersive, disintegrated and centrifugal habits which forbid the individual from controlling future experiences" (p. 26). This scatter-brained effect immobilises student learning.

Immobility and confusion are tensions which educators must keep in mind when designing high-fidelity simulation. The formation of disintegrated centrifugal habits, discussed by Dewey (1938), brings to mind pieces of dirt flying off a muddy wheel as it clomps along a road. The dirt is lost and only impedes progress. This is not the type of advancement we want to see in our students. The wheels of student learning should instead be free of mud with new and relevant habits embedded like studs in a snow tire. Traction should be good with these new habits, and movement forward and definite. The mountain of professional competency can then be summited with these new and effective habits in place.

Educators must be mindful to design high-fidelity simulation that supports relative and meaningful habit formation. These types of helpful simulation experiences will support new student habits with the final result being a progression from novice to expert in ability to manage deteriorating patient situations.

A range of immersive, technologically seamless assessment opportunities.

The literature indicates that Millennial preferences for technological tools, such as Web 3.0, online learning management systems and high-fidelity simulation are more effective in improving Millennial performance than paper-lecture-based assessments of the past (Aviles & Eastman,

2012). These tools can meet millennial preference for affiliation, low ambiguity, immediate feedback and a personalised learning experience. Some even propose that effective use of technology improves student engagement with a course, as well as developing communication skills (Aviles & Eastman, 2012).

The issue is a shift in delivery platforms used with Millennials in order to place them in their “preferred classrooms” (Wilson, 2004). Preferences with millennial students almost always involve the use of technology, as they have always learned and used it in some form or another (McGlynn, 2010). Pen and paper evaluation of their work or ability seems at best irrelevant, and at most — well, a waste of their time and ability as indicated by the student comment below:

No written case studies! Simulation [should] run instead as it is far more beneficial than writing or theory!

This student basically prefers high-fidelity simulation to pen and paper assessments. Dewey (1938) cautioned that the acquisition of isolated skills and techniques by drill or content transmission, often the focus of lectures, is less meaningful than the acquisition of them as a means of attaining *ends* which are relevant to the student. Dewey stated, “...preparation for a more or less remote future is less helpful than making the most of opportunities of present life, with its every-changing characteristics” (pp. 19-20). Dewey preferred that students be educated in a manner with direct relevance to current experiences — not an imagined or contrived future.

Let us remember that Dewey (1938) considered it the business of the educator to, “...arrange for the kind of experiences which do not repel the student, but rather engage his activities [in a manner which] promotes having desirable future experiences” (p. 26). If educators were to design a high-fidelity simulation which students enjoyed participating in, and aligned associated learning outcomes with overall curricular outcomes; the result could be a ‘classroom’ with which Millennial students would engage and enjoy. In essence, Dewey might have called this type of delivery “managing the means.”

Managing the ‘means’ — a scaffolded simulation plan.

The precursory steps in a learning process are called the “means” by Dewey (1922). The means are, “intermediates, the middle terms” (p. 34). The *end* is “...merely a series of acts viewed at a remote stage; and a means is merely the series of acts viewed at an earlier one” (p. 34). *Means* and *ends* are two names for the same reality. The terms denote not a division in reality but a distinction in judgment. Dewey explained that the *means* are the acts to be performed prior to the *end*. In high-fidelity simulation, it is these *means* that must be managed as a series of acts viewed at an earlier stage which are required to reach the *end* — the final act of managing a deteriorating patient. When the proposed end involves any deviation from usual action, or any rectification of it as in the case high-fidelity simulation, then the main goal becomes to find some impulse (pivot) which is different from the usual one. Upon this impulse, the potential for new habit formation is actualised. To attain a remote *end* means to treat the *end* as a series of *means* (Dewey, 1922). This is what the educator must do when designing high-fidelity simulation.

When designing high-fidelity simulation, the *end* (or final client condition) must be broken down into a series of *means* (acts viewed at earlier stages). The high-fidelity simulation provides

a 'motion picture' of the progression of a patient from a relatively stable condition to a relatively unstable one (Endacott et al., 2010). Each stage is essentially 'an act' in the simulation play. The simulated patient progresses through stages (or acts) which are in Dewey's language *means*, until the patient reaches the final stage — the *end*. Learning to manage these stages becomes the goal of the student (Cooper et al., 2011). This learning could be defined as an unfolding of habits on the part of the student, some of which will require revision. Habits are the students' tools which they are putting in place to manage the deteriorating condition of the client.

Dewey (1922) explained that, "...the thing which is closest to us, the *means* within our power, is a habit" (p. 37). It is the operation of habits in every act which results in our character. Without the continual operation of our habits, acting together in a bundle, we would simply be a confused conglomeration of isolated acts. If this occurred, conduct would lack unity, being only a juxtaposition of disconnected reactions to separated situations. In some ways, this is how students respond when first entering high-fidelity simulation. They are confused, unsure, and there is no unity of action. In fact, Dewey (1992) explained that there occurs a continuous modification of habits one by the other. A weak, unstable, vacillating character is one in which different habits alternate with one another rather than embody one another. The strength and solidity of a habit is not in its mere existence. Habit strength is due to reinforcement by collaboration with other habits which work synergistically (Dewey, 1922). This becomes the goal of simulation design.

It is the job of the educator, "...to facilitate a process of changing habits by modifying the conditions the student experiences" (Dewey, 1922, p. 20). It becomes the educator's task to select the objects which will engage the students' attention, and thus influence habit formation indirectly. As habits cannot be changed directly, the educator must change them indirectly by modifying the conditions and learning objects which engage student attention and influence student desires.

Education is an art rather than a science (Dewey, 1929). It is a process of discovering what values are worthwhile and are to be pursued as objectives. The simulation educator must continually revise the objectives with each emerging simulation in order to maximise the context and keep abreast of current research. This process will ensure the facilitator continues to grow in the art of simulation design and implementation.

Upon reflection, I feel both fear as to how high-fidelity simulation might be managed, and inspiration and excitement about getting started. High-fidelity simulation really does work with millennial students, and they like it! The job of modifying the conditions of the high-fidelity simulation in order to obtain the desired objectives is a continual process. The student comments around the changes instigated in high-fidelity simulation were overall positive. I found myself beginning to understand more about how to develop as a simulation educator. The direction and progression of professional development and living theory (McNiff & Whitehead, 2011) is becoming clearer.

Step Four in the Action Cycle: Evaluation

In the end, the job of educators is to manage learning experiences in such a way that students proceed in a scaffolded manner in their knowledge acquisition. It is not enough to simply *have* the experience. We as educators are responsible for managing the quality and progression of the experiences occurring in simulation. The quality of any experience has two aspects. There is an immediate aspect of agreeableness or disagreeableness, and there is its influence upon later experiences. The first is obvious and easy to judge. The second is harder to judge. The effect of an experience is not borne on its face. It sets a problem to the educator. It is the educator's business to arrange for the kind of experiences which, while they do not repel the student, rather engage his or her activities. The experience should be "more than immediately enjoyable since it is expected that it promote having desirable future experiences" (Dewey, 1938, p. 27).

In the end, the job of educators using high-fidelity simulation is one of providing students experiences which are 'agreeable' and have the potential to influence later simulation. This requires an alignment of curricular goals, lecture content, and simulation outcomes in a manner which leads the student gently through the curriculum with a resultant achievement of learning outcomes and curricular goals at the end.

Evaluation of educator feedback.

Training educators key to successful integration.

As mentioned earlier in this chapter, a total of 35 educators from across New Zealand who either attended a training session or conference offered at this institution filled out a questionnaire (see Appendix C5) which included questions such as what was most and least helpful. As with the Millennial students, these educators were asked to answer the question, "If the world was perfect, what would you design into a high-fidelity simulation experience in order to maximise this teaching tool?"

When asked what was most helpful in either the conferences or training, the most often quoted element was the ability to collaborate, meet as a group, and network around what was happening in high-fidelity simulation.

Listening to other's experience; what's working and way forward. Collaborating together, networking.

Hearing how far we have already moved forwards in our simulation teaching. Coming to the realisation that this is the way of the future!

The processes and structures on the development of simulation. Networking and sharing simulation information.

Through a process of meeting in groups and having discussions, the networking assisted educators across New Zealand to catch a vision for what they could do in their simulation programmes. There was also an interest in how to develop and implement the different aspects of simulation — the debriefing, the pre-briefing, how to write scenarios, and how to integrate simulation into the curriculum. It was the 'nuts and bolts' which were of interest as below:

I need to improve/study how to debrief.

Facilitate simulation in teaching and debriefing. Incorporate scenario and debrief.

Allow time for debrief, importance of allowing time to do repeat scenarios and pre-education to ensure practice skills good, importance of planning.

I need to hear more around facilitating scenarios. Realistic scenarios, use of actual emergencies that I have been involved with.

Affirmed to me the value of simulation as a tool. The value of simulation to millennial learners.

These comments seem to indicate that high-fidelity simulation is becoming a more accepted delivery platform for undergraduate nursing degrees in New Zealand. They also revealed that educators in New Zealand perceived they still had a lot to learn to master the use of this pedagogy. New Zealand educators are keen to learn more, and are eager to use simulation in an effective manner. There seems to be a movement towards integrating simulation into undergraduate nursing education in New Zealand.

Collaboration key to forward development.

Some conference attendees expressed the desire to develop some kind of collaboration or bank of scenarios which could be accessed by all needing simulation resources:

A similar user course and update opportunities. A scenario bank or personnel bank in North Island and a national body [might help us].

Many educators who want to start simulation programmes often lack business expertise, project planning abilities, and high-fidelity simulation expertise. In this setting there has been the emergence of collaborative simulation centres in order to manage the purchase of equipment, training of educators, and sharing of expertise (Jeffries & Battin, 2012; Lewis & Ciak, 2011; Metcalfe et al., 2007). A model which enhances relationships among institutions, by reducing competition and promoting collaboration, can have a positive impact on development (Halstead et al., 2011). While it is beyond the scope of this thesis to develop such collaborative relationships, it is acknowledged that some form of collaboration in New Zealand may assist in moving the use of high-fidelity simulation forward nationally.

Developing and supporting the expertise needed by nurse educators to design simulated scenarios, integrate high-fidelity simulation into the curriculum, and evaluate learner outcomes is another significant resource requested by educators attending our conferences. Instructional design abilities must also be applied to scenario planning (Guimond et al., 2011) in order to maximise the chances of achieving learning outcomes. Many institutions, both academic and practice, lack the resources and expertise needed to implement high-fidelity simulation into their educational curricula. One way to address these resource issues is to form partnerships between schools of nursing and health care agencies that allow for institutional collaboration to train educators in the use of high-fidelity simulation.

The creation of shared networks of simulation users desiring to make high-fidelity simulation available to large numbers of students in a cost-effective manner has emerged in other locations (Lane & Mitchell, 2013). The impetus behind such collaboration is that it enables stakeholders to share knowledge, financial and educational resources, and ideas in order to train large numbers of health professionals as well as to manage training of simulation educators (Jeffries & Battin,

2012). However, even within this model, the development of an integrated simulation plan continues to involve an enormous amount of energy and resources (McNeill et al., 2012).

Simulation key to curricular development.

When asked how they would change current practice in high-fidelity simulation if the world were perfect, the conference attendees made the following comments:

Go back a step and build a curriculum around simulation.

Design the curriculum around the simulated experiences.

These comments show congruence with thinking that is appearing in the literature. There are instances where other undergraduate nursing programmes are beginning to form their curricula around an integrated simulation plan which scaffolds learners as they progress through their training (Howard et al., 2011; S. Miller, 2010). Indeed, spiral curricula are appearing which utilise simulation as a spiral thread to frame and support curriculum delivery (Ross, Noone, Luce, & Sideras, 2009). Simulation is being used as an instructional strategy for animating clinical nursing frameworks (Lambton, 2010) as it provides a useful and appropriate framework for training millennial students (Parker & Myrick, 2009).

In summary, conference attendees showed a real interest in training and use of high-fidelity simulation, and in some sort of ongoing collaboration which could assist educators in managing the workload of this tool. They were also interested in ways in integrating simulation into curricula in a scaffolded manner. This knowledge will help to inform processes for action cycle three of this research project.

Conclusion

The second action cycle involved integrating insights from cycle one into educational practice on a grander scale involving large numbers of students. These insights included the need to manage anxiety and cognitive load issues amongst students by giving them specific roles to perform during the high-fidelity simulation. Their performance was enhanced by allowing them to repeat the simulation after being debriefed on their initial performance. Students appreciated 'user friendly' and specific feedback as to how their performance could be improved, and as the 'trophy generation' they wanted to know that they had indeed improved.

Millennial students tend to expect to have immediate and clear feedback individually catered to each participant. These students learned from having the high-fidelity simulation modelled to them after they had tried it by themselves. This role-modelling gave them a picture for how to perform each of the roles, and allowed them to revise their own performance to gain an 'Oscar performance.' When asked what they would change if the world were perfect in high-fidelity simulation, a predominant theme was a request for a scaffolded, integrated simulation plan that would align with lecture content and course learning outcomes resulting in better preparation for clinical placements.

Nursing educators in New Zealand realise that they have a lot to learn about the use of high-fidelity simulation in undergraduate curricula. They are keen to advance their learning in order to

maximise undergraduate nursing education and improve their own teaching processes. There is interest in building curricula around simulation as a core thread or spiral. There is also a growing awareness in creating some form of collaboration in regards to scenarios and debriefing templates so that each institution does not have to start from the beginning. This is due to the fact that simulation is both labour and time intensive and collaboration would assist institutions with the enormous workload involved.

With these insights gleaned from cycle two clearly in mind, I began to realise that the students and educators were saying something significant. In order for simulation to be maximised, it must be integrated into curricula in a manner which aligns with overall curricular learning outcomes, and scaffolded in a way which allows students to slowly, but surely progress in their development. To do this, curricula need to be *built around simulation* in a manner which allows simulation to be a central tendency, not a last-minute, ad hoc addition. In order for this to happen, more scenarios must be developed which directly align with curricular and course learning outcomes, and students must attend high-fidelity simulation experiences on a regular basis (i.e. bi-weekly or monthly) in order to scaffold their learning with this learning tool. Educators must have a simulation plan that runs through the undergraduate nursing curriculum like a thread or spiral theme. Educators have to start thinking more innovatively about how the undergraduate curriculum in nursing is delivered. The students were asking for a suite of scenarios to learn from. These realisations became part of my living theory.

Chapter 9 describes how the concepts gleaned from cycle two influence cycle three to move in new directions. These influences include the students' desire for a simulation suite in their final semester of undergraduate education. This cycle is embedded with a quantitative section which was added in order to add an objective component to the data. This cycle includes an evaluation of student performance using the Lasater Clinical Judgment Rubric (LCJR), along with pre- and post-tests. Millennial comments as to these additions are gleaned from focus groups adding a qualitative aspect to this cycle which parallels quantitative elements.

Video clips generated from cycle two can be viewed at the link below:

https://autonline.aut.ac.nz/bbcswebdav/pid-3086599-dt-content-rid-5586372_4/institution/Papers/DHScGwenErlam/Publish/index.html

Go to the left-hand tabs and click on cycle two

Chapter 9 - Action Cycle Three: Integrating improved pedagogical practices in a simulation suite for final semester students

It would not be a sign of health if such an important social interest as education were not also an arena of struggles, practical and theoretical.

Experience and Education (Dewey, 1938, p. 5)

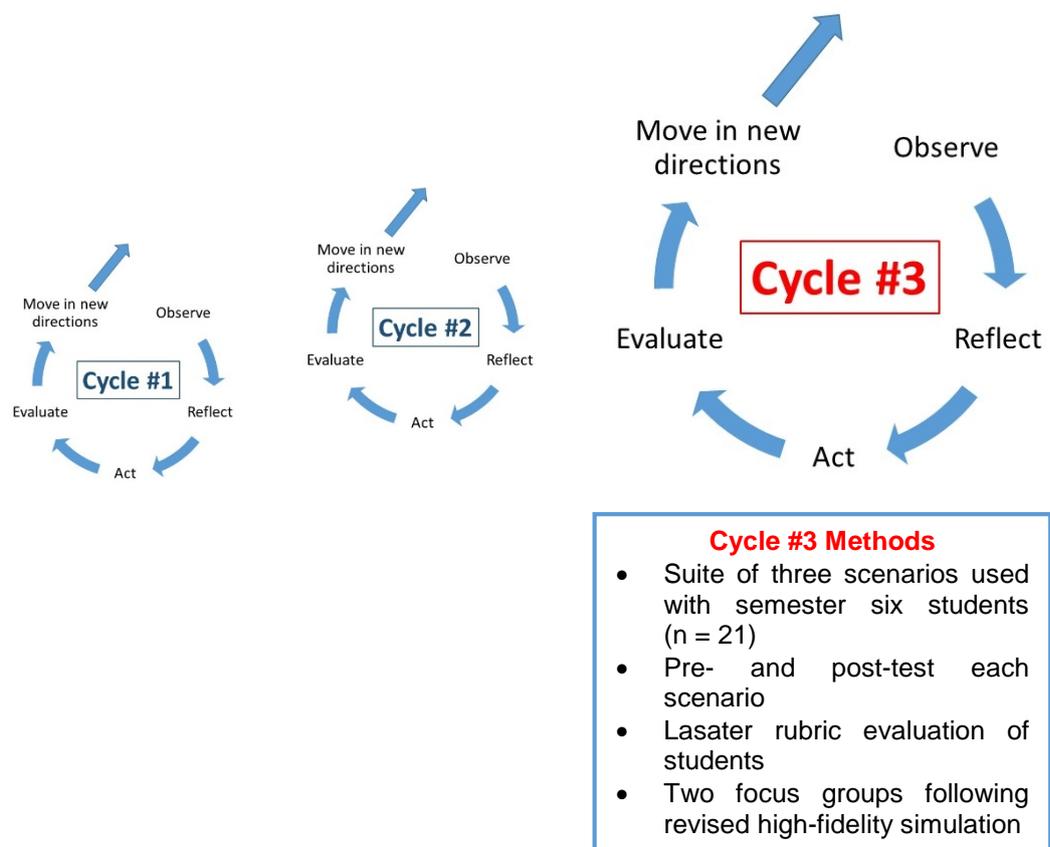


Figure 9.1 Action Cycle #3

From *All you need to know about action research* (McNiff & Whitehead, 2011, p. 9).

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Introduction

As this cycle began I was very interested in continuing to develop my living theory. As can be seen in Figure 9.1, action research involves a cyclical process beginning with observation, and progressing through reflection, action, evaluation, and implementing findings in new directions in subsequent cycles (McNiff & Whitehead, 2011). I began by recalling what the students and educators expressed as important from cycle two. Students in cycle two stated that simulation needed to happen more frequently, be more integrated into the curriculum, and occur in a manner which is central to progression, not merely an afterthought or add-on. With these thoughts in mind, I began to think through the creation of a simulation suite which would expose final semester

students to three different scenarios that they would probably encounter in their transition placement or in their first year of clinical practice. The goal was to be able to quantitatively and qualitatively evaluate student progression. Thus cycle three began.

The purpose of the third action cycle was to implement the changes requested in the first two cycles in a more encompassing manner and expose third-year, final semester students to these changes. The aim was to get both qualitative and quantitative feedback from participants as to the effectiveness, efficiency, and practical application of high-fidelity simulation as it has been influenced through the first and second cycles, now emerging in the third cycle. Remembering that the purpose of action research is to (1) generate new knowledge which (2) feeds into living theory (McNiff & Whitehead, 2011), ultimately informing new practice, I set out to both take action and do research.

Step one of the Action Cycle: Observation

Picking up threads from previous cycles.

I begin by recalling the themes that emerged from the first two action cycles. In the first action cycle the students commented on their avoidance of high-fidelity simulation as a teaching tool due to receiving harsh or critical feedback. They wanted simulation educators to come out from behind the glass and give them feedback that was helpful and supportive so that they might grow in confidence and ability. Students expressed the desire to be eased into simulation in a manner which supported incremental and consistent growth. They preferred two opportunities to perform the simulation so that they could have an opportunity to redeem a less than optimal performance.

The second action cycle saw me completing pre- and post-simulation questionnaires with semester five students (n = 125). These students also desired two opportunities to perform the scenario, but wanted to have an educator model the high-fidelity simulation for them so they could see how it could be done by 'a professional.' They valued this performance by the educator in order to assist them in their own practice. Another theme which emerged from this cycle was that of implementing roles within the high-fidelity simulation so that they could better manage the required tasks that needed to be performed (e.g. taking vital signs, performing required assessments and giving medications, recording sequence of events and calling the ISBAR report, and playing an anxious family member). The students in the second action cycle also requested a suite of simulated scenarios that they could be involved in during preparation for entering into professional practice.

Action research is intentional. When I identified the research issue and formulated the research question, I implied that I intend to do something about it (McNiff & Whitehead, 2010). With this intent in mind, I decided to design a suite of scenarios to be used by the final semester students in an undergraduate nursing programme as preparation for their entry into practice. It was my intention to integrate students' requests and feedback from the first two action cycles into this third cycle.

Students in the second cycle gave examples of types of high-fidelity simulation they thought would be most helpful. This feedback was used to inform cycle three. Students in cycle two stated that they had little or no paediatric experience and thus desired more learning around this type of client. Therefore a paediatric scenario was developed for the third cycle (i.e. croup in nine-month old baby). Students in the second cycle also identified that they needed more acute cardiac experience — especially in the form of an arrest. Therefore a second scenario of acute coronary syndrome was developed. Lastly, feedback from cycle two indicated that students wanted more information on the types of shock and how to manage this in a clinical setting. The third scenario of hypovolaemic shock was developed in response to this theme.

Step two in the Action Cycle: Reflection

Focus group feedback.

Two focus groups were run in this third action cycle (four students in each group). The feedback from each group was different. Group one seemed to give a more positive response to the simulation suite than the other groups. As I reflected on why this might have occurred, I recalled that the first group had only four participants so there was less opportunity for the equipment to malfunction. Additionally, I was very present for all of this group's simulated sessions. In other words, group one was highly resourced with researcher support more visible. The first group felt more 'nurtured' when I was not pulled between three different scenarios; all running concurrently. The nature and presence of feedback from a qualified person was a very important student value in this cycle due to the non-supportive feedback received by students in the past. Please see previous chapters for more detail on this topic.

After the first focus group for this action cycle was coded for themes, I had a sense of 'completion.' It was as if the journey travelled for these past two years in maximising high-fidelity simulation for undergraduate nurses was finally starting to gain traction. However, there were confounding factors influencing each group's performance. Group four did not have all members attend the simulation suite; leaving this group with the disadvantage of having to work with two instead of four members. The other difficulty was that some of the equipment malfunctioned on this day causing the students to be unable to access pulses and blood pressures as clearly as they would have liked. These difficulties tainted both the second focus group's perception of the simulation suite and the Lasater scoring.

The focus group data revealed positive comments about the model clips that had been produced — despite the fact that these clips had been created under tight timeframes and had been heavily edited in order to show best practice. I had explained the less than optimal parts of certain clips to the students in hopes that they would look beyond the imperfections and see the overall picture. Their comments were very accepting of what had been done. Telling comments from the students in the first focus group included:

We really thought the clips were great! We did not think they were bad. I thought, "She can do it, so can I." In some ways we were competing with you. We saw you and I thought, "I want to do better than them." (Marina: FG1)

I was exhilarated with this concept. By accepting the less than perfect performance and trying to 'outperform' the educators, the students were granting the educators the grace to be human, and also enjoying the challenge of trying to do it better. It had a similar feeling to watching a teenager learn to drive or go on a first date. The students were able to watch educator attempts at modelling expected behaviour. They then tried to act in a similar manner putting some form of new thinking into place in their own minds.

This kind of interaction and immersion in a simulation was unique as both educators and students were learning together, in parallel. Action research allows this type of informed educational intent which involves participants in the research process (McNiff & Whitehead, 2010). I, as a researcher and educator, was committed to educational improvement and the research question had educational intent. I was researching how I could improve my pedagogical practices working with undergraduate students in the high-fidelity simulation environment. The students were reflecting that something that was happening in the simulation suite was helping. They were learning from this process — they were engaged and learning. My living theory was also developing as the action process unfolded.

Creating educative environments.

Model clips key to habit formation.

Reflection on the simulation suite brings to mind the action research premise that improvement does not imply an end point where everything will be perfect (McNiff & Whitehead, 2010). This is an assumption of traditional research. Instead, action research embodies a generative transformational view of change which sees everything in process of coming into being (ontological premise). Each component at any point in time holds its potentials already latent within itself. All components can move in any direction as influenced by its context. By changing the context (e.g. giving model clips, pre-briefing, pre- and post-tests, filming students in process) I was allowing movement in different directions than previously experienced in high-fidelity simulation. I was acting intentionally in the 'now' in a way that may influence the future. This action carries with it the responsibility of ensuring that I act well, so that a desirable kind of future is created (McNiff & Whitehead, 2010). This is the nature of processes of improvement in action research.

Some experiences are mis-educative and therefore have an effect of arresting or distorting the growth of further experience (Dewey, 1922). In this action cycle there were some experiences provided which students stated spurred them on to further growth. The model clips were in this category. Students wanted to improve their performance after viewing the model clips; to see if they could out-perform the educators. This learning object (i.e. the model clips) reportedly inspired students to further growth and thus was an educative experience.

I watched you acting it out and I thought, 'Yeah, I haven't done that and I should have done that.' (Dasha: FG1)

You doing it was setting a standard, a role model. (LeAnn: FG1)

These comments were encouraging as I could see that students viewed the model clips with the intention of changing their habits in order to maximise their management of a deteriorating

situation. Recalling that the formation of ideas, as well as their execution, depends upon habit formation (Dewey, 1922), I saw the transformational influence of the model clips on habit formation. This was a way to influence future conduct in deteriorating clinical situations.

Order of learning objects key to managing the means.

Another theme which emerged from the first focus group involved the effectiveness of showing the pre-briefing podcast and immediately following this with the first attempt at the simulation. The order/process used in this instance seemed to work well to re-enforce theoretical content with its immediate use in a real-world setting as stated by one student in focus group one:

I really liked how we got to do things right after hearing the lecture. Usually we get the theory and it takes a lot of time before we get to practice the theory. It does not stick to us this way. Getting the theory and then getting to practice it straight after helps us to remember it better. (Dasha: FG1)

The students explained that the order of learning objects worked well for them. Seeing the theoretical concepts in a pre-briefing format followed immediately by involvement in a scenario where they could implement what they had seen was helpful. Dewey (1938) explained that, "...experiences may be so disconnected from one another that, while each is agreeable or even exciting in itself, they are not linked cumulatively to one another" (p. 26). By linking the lecture closely with the high-fidelity simulation, with very little time between them, the connection was preserved and the students' ability to bridge the gap between theoretical and practical components was enhanced. This ordering of the learning objects was in essence a way of managing the means — the middle experiences, in order to achieve the desired end — the final act/thought (Dewey, 1922).

This sequence of events (e.g. pre-test, new knowledge in pre-briefing, simulation, model clip, redo simulation, post-test, debriefing) seemed to be effective in enhancing student engagement with theoretical components related to their practice as well as helping to embed skills and thought processes (e.g. ISBAR) into current frameworks. These modular components have a behaviourist theoretical underpinning (Chen, 2009). Behaviourists believe that the environment shapes behaviour, that factors external to the individual determine behaviour, that it is independent of the individual, and that it can be manipulated to produce desirable actions (Parker & Myrick, 2009). Managing these modular components of the high-fidelity simulation produces a predictable learning environment which unfolds in a sequential manner.

In past high-fidelity simulation, students reported an experience of being exposed to a new clinical situation, not knowing how to respond, and then being told the simulation was over. One student in focus group one stated:

Last year they gave us the scenario on the spot. You got told what you did wrong and then you left. Sometimes they did not even tell us what was wrong, and sometimes it was not very in depth so we did not know how to fix it. (LeAnn: FG1)

I was learning that the means (intermediate steps) were as important as the end (the final result). These intermediate steps allowed students to move in a scaffolded manner from knowledge acquisition (pre- and post-tests) to problem solving (Lasater scores) in a sequenced

manner. Part of my job as a simulation facilitator was to carefully manage these means in order to guide students to the desired end (i.e. ability to manage deterioration safely).

Simulation design key to student confidence and developing sense of salience.

It seems that simulation experiences at my institution did not always engender confidence in students. In fact, as stated in the first two action cycles, student confidence was, at times, eroded by the use of simulation. This was exactly counter to what the literature showed was achievable on the international stage (Alfes, 2011; McCaughey & Traynor, 2010). Yet, in this third action cycle the students' confidence seemed to be on the rise. When asked how they felt about the acute coronary simulation, focus group participants stated:

I loved that one! The second that patient went into cardiac arrest and we all had our roles, and we all jumped on that patient was great! We felt so good about that one! (Marina: FG1)

Seeing the progress is what is satisfying to us. Seeing ourselves get better really satisfies us personally — because we know we can improve. (Dasha: FG1)

I liked the pre- and post-tests because I could see my improvement. Especially in the paediatric one. (Marina: FG1)

Hearing these stories and how much students' confidence improved as they progressed through the simulation suite was not only satisfying to them, but added to my living theory of how to facilitate high-fidelity simulation. A clearer understanding of how to improve this teaching tool was emerging, and the students were confirming that the changes were influencing their learning in a positive direction. One student's comments helped me to understand that it was more than just confidence that was improving here:

It was about being able to hold a space in an emergency situation which improved. Even my knowledge and interventions grew and we learned more as we progressed. (Sara: FG2)

This student was expressing more than just developing confidence. Being able to “hold a space” is what Benner (2010) called “a sense of salience” (p. 94). As a student uses knowledge in situations of practice, she gains new understanding of, and access to, that knowledge which involves knowing how, when, and why it is relevant in particular situations. The student learns how to use knowledge by increasing her understanding of what practical clinical situations involve, thus increasing her ability for situated cognition and thinking-in-action (Kolb, 1984). This means that the student increases her cognitive capacities to think in relation to the particular demands of a situation. One student's comments highlighted this sense of developing salience:

With the paediatric simulation I noticed when [my partner] and I did it the first time we went for the IM injection first. When we watched the model clip we noticed you did the nebuliser first. That made sense as it [the adrenaline nebuliser] acts faster in the lungs than the IM injection. So we changed that order of medications for our Oscar simulation because that made sense. (Lani: FG2)

This student had learned by watching a model clip that the order of medication administration mattered in the croup scenario. In essence, the student had developed a sense of salience for clinical situations involving respiratory compromise. Teaching for a sense of salience requires that the educator present experiential learning opportunities using a strategy called *situated*

teaching (Benner et al., 2010). This teaching involves coaching the student through what is salient (most notable and significant) about a specific clinical situation. The educator must guide students to apply their knowledge in order to refine their actions. Ultimately, if this process is occurring regularly and in a safe environment, students will begin to develop clinical imagination and the skills of clinical reasoning (Ashcraft et al., 2013; Lapkin et al., 2010). This ability to, in essence, translate their knowledge from pathophysiological, pharmacological, and skills silos, into concerns and actions for a particular patient, is the gold nugget of clinical education (Passmore, 2014).

What is essential for nursing educators is helping students make connections between acquiring and using knowledge. This is termed “teaching for a sense of salience” (Benner et al., 2010, pp. 114-115). Having a sense of salience involves being able to recognise what is more or less important. This salience is the beginning point for the development of clinical reasoning in that situation. Novice students require development around how to prioritise their thinking. This type of thinking is not native, but acquired (Dewey, 1922). Critical thinking is dependent upon habit formation, which then influences actions. This process of experiential learning over time creates a sense of salience about familiar clinical situations and the student no longer has to deliberate on all priorities (Benner et al., 2010). This kind of repeated clinical experience (which can be simulated) is required in order to develop a growing differentiated sense of priorities in delivering nursing care.

An example of how to facilitate this process might emerge when working with a student caring for a client with congestive heart failure. Instead of asking the student, “What’s the difference between right and left-sided heart failure?” it would be better to ask the student, “What are your concerns for your client?” It would be expected that the student know that care would be designed primarily around respiratory and fluid volume issues. Questioning and engaging students in dialogue are effective ways of integrating and developing students’ knowledge, skilled know-how, and ethical comportment, while guiding students to grasp the salience of a clinical situation (Benner et al., 2010). One student’s perception of a change of position shows this developing sense of salience:

I learned something about putting a patient into trendelenburg. I did not know that it would actually help. There are ways to deal with situations, but in this case I was impressed with how quickly the blood pressure would change. (Rani: FG2)

This type of questioning can occur within the debriefing component of high-fidelity simulation. As students develop a sense of salience and skill, teachers can modify these strategies so that the students can increasingly rely on their own clinical imagination and developing clinical reasoning. Simulation provides an excellent platform for assisting students in making these connections. However, the mere presence of simulation in a curriculum is not enough.

Many institutions across New Zealand, and worldwide, began using high-fidelity simulation with great fervour around 2005. However, ticking the box with the inclusion of high-fidelity simulation in undergraduate nursing programmes is not enough. The students seemed to be echoing Dewey’s (1938) sentiments that this high-fidelity simulation was “defective and wrong in character” (p. 27). The university was not providing an experience which could ensure the

students connection with future experiences. They were avoiding high-fidelity simulation because their previous experience had shown it to be mis-educative. Furthermore, educators were not teaching for a sense of salience around various clinical situations. High-fidelity simulation's effect at this university was one of arresting and distorting the growth of further experience. Such experience may engender callousness and produce a lack of sensitivity and responsiveness on the part of the student (Dewey, 1938). The result is that the possibility of having a richer experience in the future is restricted.

It is not enough to insist upon the presence of simulation by governing boards. Everything depends upon the quality of the students' high-fidelity simulation learning experience. The quality of any experience has two aspects. There is an, "... immediate aspect of agreeableness or disagreeableness, and there is its influence upon later experiences" (Dewey, 1938, p. 27). It is the job of educators to arrange for the kind of experiences which engage student involvement. By giving harsh and/or unhelpful feedback in a diminutive manner, asking the wrong kinds of questions, poorly organising the high-fidelity simulation, and forcing too many students through at one time, this institution had in one instance made the high-fidelity simulation experience disagreeable; which discouraged students from participating in future experiences. Educators must learn to manage the quality of the experience better, and this involves implementing a principle of order and organisation which follows from understanding what an educative experience signifies (Dewey, 1938).

Step three of the Action Cycle: Action plan

Embedded quantitative section.

Significance of the model used in cycle three.

The third action cycle in this project included an embedded quantitative section which was added in order to add an objective component to the data. This is common in technical action research projects and involves the researcher staying outside the research field to maintain objectivity (McNiff & Whitehead, 2011). This process is known as 'mixing' and has been defined as the explicit interrelating of the study's quantitative and qualitative strands (Creswell & Plano-Clark, 2011). In this research, the point of interface or mixing began at the design stage, and extended into the data collection, interpretation and analysis stages as quantitative (i.e. pre- and post-tests, LCJR scores) and qualitative strands (i.e. focus groups and qualitative survey at end of post-tests) were analysed. There was a cause and effect relationship throughout with a triangulation of data involving pre- and post-test scores, LCJR results, and focus group data. Results in the quantitative section were generated through statistical analysis, and remain true for all time. With the growing use of high-fidelity simulation in nursing education, it has become necessary to provide both quantitative and qualitative data to objectively determine the value of simulation and its concrete effects on learning outcomes. The results can be applied and generalised to other people's practices, and are replicable in similar situations.

An embedded design occurs when the researcher collects and analyses both quantitative and qualitative data within a traditional design (Creswell & Plano-Clark, 2011). In this case a

quantitative strand was embedded within an overall qualitative design. The supplemental strand was added to enhance the overall design. The qualitative themes from the first two cycles were used to develop a relevant intervention (i.e. pre- and post-tests and Lasater scores) which were then analysed with *Statistical Analysis Software* (SAS). Both sets of data were related to each other in order to facilitate comparisons and interpretations.

Due to time constraints, involving both students and technicians, a cross-over design was not practical for this section of the study. A repeated measures design was thus chosen which involved moving all students through the three-scenario simulation suite in the same order, while students maintained one of four roles. All students took a pre- and post-test and their performances in the high-fidelity simulations were evaluated using the LCJR. The design of this research model was inputted into *Statistical Analysis Software* (SAS) with Table 9.1 showing the resultant general linear model.

Table 9.1 Overall Significance of Model Showing True Effects

Source	F	Sum of Squares	Mean Square	F Value	Pr > F
Model	82	1507.255719	18.381167	23.00	<.0001
Error	21	96.680556	0.799013		
Corrected Total	203	1603.936275			
R-Square		0.939723			
Coeff Var		14.01618			
Root MSE		0.893875			

Table 9.1 shows that the model used in this research significantly explains the majority of the variation in results. The R-square (coefficient of determination) indicates that 94% of variance can be explained by the model. The components of the model which evidenced statistically significant differences in scores were the role the students played, the group they participated in, the scenario type (i.e. shock, croup, acute coronary syndrome), and the LCJR dimensions (noticing, interpreting, responding, reflecting). Each of these four main effects was found to have a statistically significant and true effect (p -value <.05). P -value is defined as the probability of obtaining a result equal to or more extreme than what was actually observed ("P value," 2011). The results of this general linear model can be seen in Table 9.2.

Table 9.2 Results of General Linear Model

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Role Within Group	11	47.4861111	4.3169192	5.40	<.0001
Group (1-6)	5	185.5334967	37.1066993	46.44	<.0001
LCJR Dimensions	3	891.0032051	297.0010684	371.71	<.0001
Scenario Type	2	233.7521368	116.8760684	146.28	<.0001
Group Scenario	15	37.6985294	2.5132353	3.15	0.0002
Group Type	10	27.6993464	2.7699346	3.47	0.0005
Scenario Type	6	16.5384615	2.7564103	3.45	0.0035
Group Scenario Type	30	30.1960784	1.0065359	1.26	0.1912

The null hypothesis that the predictor has no effect on the outcome variable is evaluated with regard to p -value. In this case, the statistically significant p -values for group, scenario, role, and LCJR components mean that the null hypothesis is rejected and these predictors do have a significant effect on overall LCJR scores. Table 9.2 shows the interaction between various components of the model were all statistically significant (p -value <.05). Additionally, all two-way interactions were statistically significant (p -value <.05). However, the three-way interactions were not statistically significant (p -value >.05). In summary, the model used in this research is a trustworthy model with significant differences across all the main effects and two way interactions.

Methods for data collection action cycle three

As stated earlier in this chapter, 21 students were involved in this cycle. They were all part of the final semester in a three-year undergraduate nursing course. The design of this cycle involved students progressing through three high-fidelity simulation events in the same order (repeated measures design) while maintaining the same role. The design was simplified for practical reasons which resulted in an inability to disentangle certain elements. However, I was interested in noticing the effect of role, group, and scenario type on LCJR scores. Those performing the family role could not be assessed with the LCJR due to their inability to influence the management of care. Their purpose was to provide a realistic clinical environment. The progression and roles can be seen in Figure 9.2

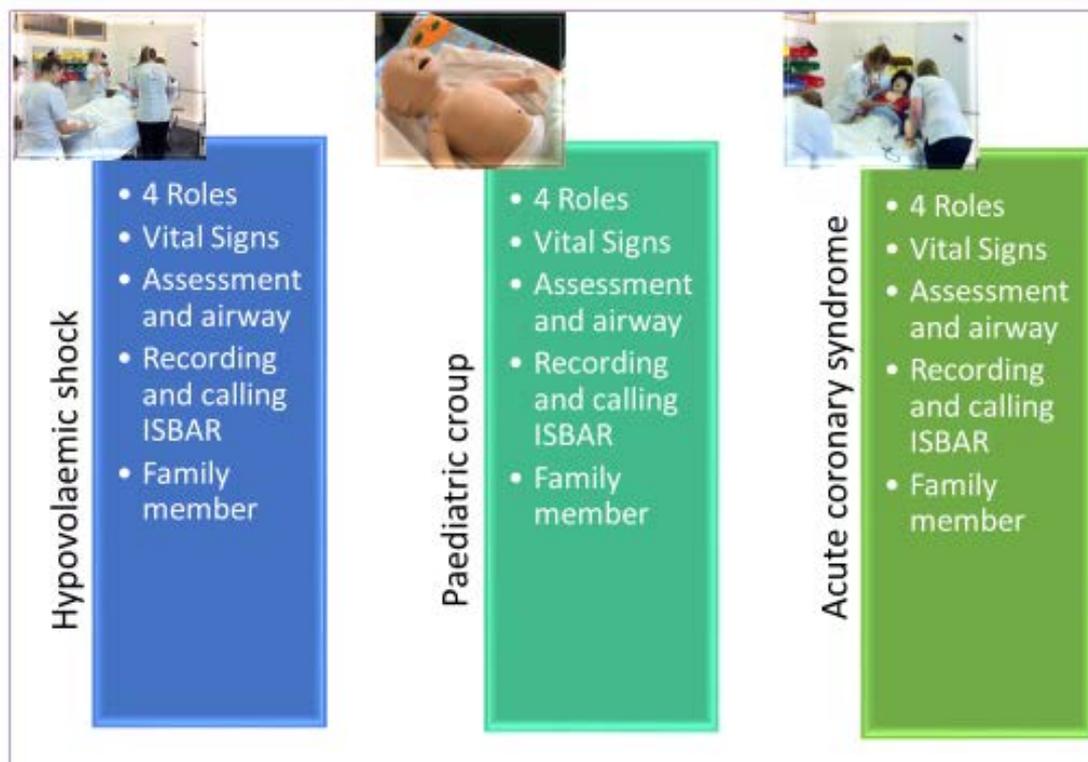


Figure 9.2 Scenario progression cycle #3

As stated earlier in this chapter, the students all progressed through the above scenarios with a particular sequence of learning objects. Recalling that the four most valued themes from cycle two were modelling of expected performance, ability to repeat the scenario, debriefing, and use of ISBAR tool, I sought to embed these themes into the learning objects for cycle three. The learning objects with ties to themes from cycles one and two are below:

- *pre-test* for that particular scenario (to scaffold and help with anxiety); followed by
- *pre-briefing video podcast* (to provide modular content knowledge and decrease anxiety); followed by
- performing *first (cold) simulation* scenario employing ISBAR tool (beginning of meaning construction using current knowledge); followed by
- watching the *model clip* of how this scenario was performed by educators including use of ISBAR tool (theme valued in cycle two and constructivist means of creating and refining meaning by employing visual channels of learners); followed by
- performing *second (Oscar) simulation* scenario and ISBAR (repetition valued from cycle two, used to enhance formation of automated schema in long-term memory, and construct new meaning from overall experience); followed by a
- *post-test* which was identical to the pre-test (to give visual indication of student progress, boost confidence, and allow for friendly feedback and dialogue), and finally
- *debriefing* with learning outcomes used as a framework (to give constructive feedback in fulfilment of themes from cycles one and two).

This sequence was noted to be meaningful and enhance learning experience by the students in cycles two and three.

The third action cycle involved a triangulation of data collection with (1) pre- and post-test scores, (2) LCJR evaluation scores, and (3) focus group data. These data threads formed the data streams for this action cycle. This triangulation of methods for collecting the data is done purposefully to establish authenticity of the data in the study. This authenticity is important for establishing the validity of the evidence in this research (McNiff & Whitehead, 2011).

Step four in the Action Cycle: Evaluation

Pre- and post-test data.

Students took a pre- and post- test for each scenario in this cycle. The design was unidirectional meaning that a crossover design was not employed. The students progressed through the suite in one order (shock, croup, and acute coronary syndrome). The pre- and post-tests provided some valuable insights into what was and was not working in the high-fidelity simulation suite. The average test scores for each pre- and post-test can be seen in Figure 9.2 (p. 187).

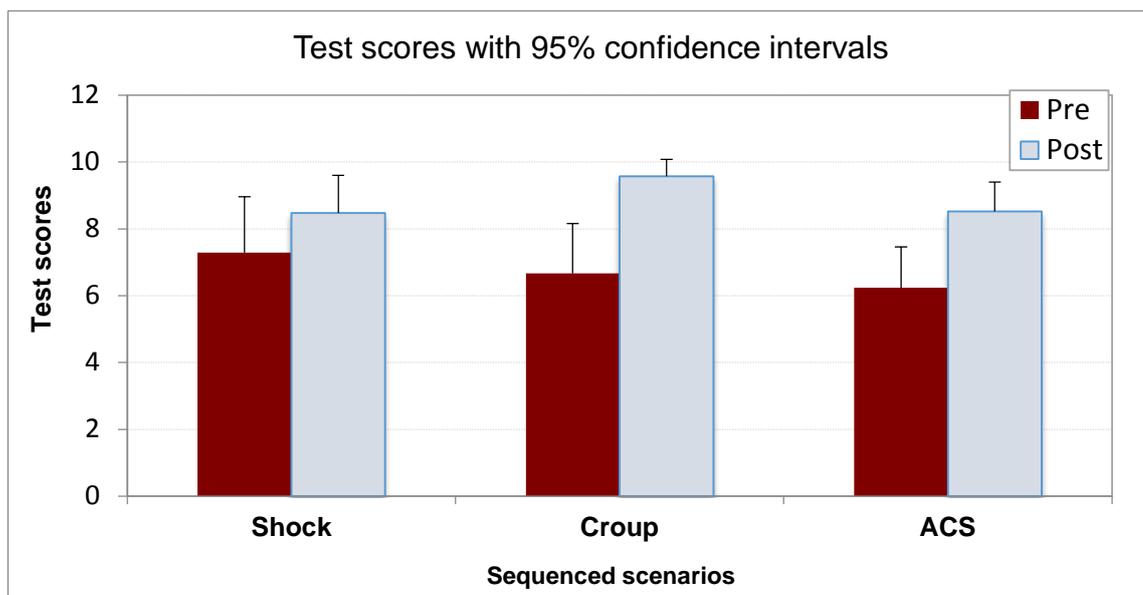


Figure 9.3 Average pre- and post-scores by scenario

As can be seen in Figure 9.3, within each scenario the post-tests improved overall. However, there were a few exceptions on an individual basis. The hypovolaemic shock test results improved for all students except three who scored lower on the post-test than the pre-test. This negative effect could have been the result of over-confidence in the post-test. These particular students were relatively passé in the pre-test, and assumed they already knew the answers on the post-test. All of the students who participated in this cycle were in their final semester of the undergraduate programme and had been out in the clinical setting for five weeks (out of a required nine weeks). They were feeling good about their performance overall, and had the end in sight. Their comments seemed to indicate that they felt they knew what was required to enter professional practice, and were really just participating in the simulation suite to help the

researcher. The focus group data hinted at this level of confidence (often displayed in Millennials) when students were asked about the model clips: One student stated:

I thought, "She can do it, so can I!" (Marina: FG1)

The same student commented:

If they can do it, we're almost nurses and we can do it too! (Marina: FG1)

This potentially over-confident assessment of their own abilities may have operated in an adverse manner for these three students — a way that influenced their focus due to thinking they already knew the answers. This artificially inflated self-assessment is very characteristic of millennial learners who have been tutored and hand-held throughout their childhood and early adulthood (Wieck, 2008). They expect to do well because they always have due to the hovering, 'helicopter parents' that watched over them with the meticulousness of a mother bear tending to her cubs. This potential over-confidence must be carefully managed by educators. The aim is to give feedback in such a way as not to "crush" these students, but steer them in a manner which becomes educative and leads to further growth (Dewey, 1938).

Improvement in mean test scores across scenarios.

The second interesting point that the pre- and post-tests highlighted was the marked improvement of students in the second of the three scenarios (i.e. croup). The overall improvement in scores of pre- and post-tests across the three scenarios was as follows:

- *Hypovolaemic shock*: Average improvement of 1.2 points between tests
- *Croup*: Average improvement of 2.9 points between tests
- *Acute coronary syndrome*: Average improvement of 2.3 points between tests

As can be seen, the croup scenario saw an increase of nearly three points in the pre- and post-tests. This was much more than either of the other scenarios. I wondered if the improved performance in the second scenario was due to the fact that the students have had very little content around paediatric conditions and management up to this point in their programme. They did hint at this in their qualitative comments in the focus groups and final page of pre- and post-tests as below:

[I would have liked] a bit more overview on how to perform vitals on infants before having to do them. (LeAnn: FG1)

We do not learn enough at university about paediatrics and as my pre post-tests show I knew nothing but now I feel much more confident. (Dasha: FG1)

[I would have liked] more learning situations involving paediatrics and a 'rehash' on paediatric drug calculations. (Ben: FG2)

These comments resonated with what I already knew about the undergraduate programme at this institution. Educators have done a fine job in some areas, but content around paediatrics is limited due to the restriction of three years to complete the undergraduate nursing degree. The students agreed with this assessment, and it is something the school will need to consider as progression is made in high-fidelity simulation at this institution.

Research has shown that it is possible to enhance student performance by warming them up to tasks in the educational environment (Estalkhbijari & Khodareza, 2012). This is known as the *warm-up effect*. Thus, an alternative influence on these higher scores in the croup scenario might be attributed to the *warm up effect* causing an increase in the second set of scores by nearly three points. The degree of improvement in the third scenario was not as great as the second, possibly due to the *fatigue effect* (Czajkowski, Giergiczny, & Greene, 2014) influencing student performance after two previous hours of simulation.

By the time the students had completed two scenarios (one hour each), it is possible fatigue began to influence their performance in the final scenario. Research has shown that with progressive multiple choice testing, there is a point where fatigue or boredom can influence test results in the opposite direction, and thus increase the variance and errors in test results (Czajkowski et al., 2014). This fatigue effect may have influenced the test scores in the third scenario explaining why the overall improvement in scores dropped from the second to the third scenario.

Standard deviation by scenario.

A third interesting point that I took from the pre- and post-test data involved a measure of variability called the standard deviation. Standard deviation is a descriptive statistic which indicates the variation or dispersion from the average (Mills, 2014). It is the most important measure of variability for action research purposes. Standard deviation helps us to understand approximately how much a particular score deviates from the average score. This becomes important in educational research for determining the mastery of subject matter. A higher mean and a smaller standard deviation would be a desirable outcome indicating a greater degree of mastery over the subject.

The standard deviation for the three scenario test results were (1) Hypovolaemic shock SD = 1.94; (2) Croup SD = 1.63; and (3) Acute coronary syndrome SD = 1.23. As can be seen, the standard deviation decreased as the students progressed through the scenarios. This indicates that the students were showing progression in their ability to master the subject matter; recalling that these quizzes tested content knowledge only. The students were showing less variability in their scores as they progressed. The encouraging aspect was that this progression was mirrored in focus group comments:

I liked the pre- and post-test because I could see my improvement. It makes you aware of what you do not know also. I thought, "Oh my, I should know this." (Marina: FG1)

Seeing the progress is what is satisfying to us. Seeing ourselves get better really satisfies us personally. Because we know we can improve. (Dasha: FG1)

I was all over the show to start with. My notes were everywhere and I did not know how to say it. By the time I got to the end I knew what to say, and I was more organised. (Skye: FG1)

I told everybody about it! I called my mom and I said, "Mom, you should have seen us in that cardiac one! We did so well. It was so cool! We were on a roll!" (Marina: FG1)

I was encouraged to see that, as an educator, I was doing my job more efficiently. My living theory was continuing to develop. The students felt they were learning, they were excited about

that, and they wanted to learn more. Action research is increasingly workplace-based and is generally for practitioner-researchers (McNiff & Whitehead, 2011); the aim is consistently to improve practice through improving learning. When researchers develop these theories of practice, which help to clarify what is involved in understanding the learning context with which they are involved, they create what McNiff and Whitehead (2011) called *living theories*. These theories are explanations for how researchers have helped people to grow in ways that are right for them. Through the action research process, I was creating my own living educational theory for high-fidelity simulation. I was learning how to improve my pedagogical practices working with undergraduate students in the high-fidelity simulation environment, and am grateful to the students who have chosen to journey with me.

Lasater rubric: Reliability and validity.

The LCJR was used to evaluate the performance of students in the three clinical roles. This rubric is built on the *Tanner Model of Clinical Judgment* (Tanner, 2006) and uses this framework to inform its rubric categories. In Tanner's (2006) model there are four aspects which contribute to clinical judgment: noticing, interpreting, responding, and reflection. The LCJR takes each of these themes and develops indicators of performance. This rubric has been tested for validity and reliability (Adamson et al., 2013; Dillard et al., 2009; Lasater, 2007).

Reliability has been achieved through the use of specific training in the implementation of the rubric (Adamson et al., 2012). In one case educators attended a half-day workshop on the use of the rubric. This was necessary to assist scorers in developing a mental map of the constructs and criteria that the rubric aims to assess (Redder, 2003). Statistical analysis by Adamson (2012) using SPSS confirmed that Lasater rubric was internally consistent with an alpha coefficient of 0.87. Other researchers report an interrater reliability of 0.889 with an internal consistency of 0.974 (Victor-Chmil & Larew, 2013). The LCJR has thus been shown to have a sufficient measure of consistency when evaluating the ability of learners to respond to a clinical problem that is presented in a high-fidelity simulation.

It must be noted that one of the limitations of this study was the absence of training as to the use of the LCJR. This training was not given to the educator who randomly checked my Lasater scores or to myself. This lack of training was a result of the short timeframes involved between ethics approval and data collection for this cycle. If the LCJR were to be used in the undergraduate programme at my institution, raters would have to be up-skilled and trained in its use. This would increase the inter-rater reliability necessary to ensure fair and equitable treatment of students.

The validity of the LCJR has been evaluated by three different approaches which are described by Adamson (2012). Validity refers to the degree to which something measures what it is supposed to measure (Pallant, 2007). The main types of validity are — construct, convergent, and content validity (Seltzer & Rose, 2011). Construct validity evaluates the extent to which the LCJR operationalises the construct of Tanner's Model of Clinical Judgment in Nursing (Tanner, 2006). The LCJR has been shown to have good to very good construct validity (Victor-Chmil &

Larew, 2013) with research suggesting expansion of the rubric by two dimensions to include patient safety and sentinel events (Ashcraft & Opton, 2009).

Convergent validity evaluates the degree to which the measurement of clinical judgment is correlated with other measures to which it is theoretically predicted to correlate (Waltz, Strickland, & Lenz, 2010). An experimental pre-test, post-test, mixed method design by Mann (Mann, 2010) used a convenience sample of baccalaureate nursing students from a nursing programme in the United States to evaluate the strength of the relationship between critical thinking and clinical judgment with no significant correlation found between the two. More research therefore needs to be conducted on this aspect of the validity of the LCJR.

Content validity evaluates evidence involving the degree to which the content of the measurement tool matches the content domain associated with the construct (Waltz et al., 2010). The associated domains of knowledge and learning, critical thinking, and confidence have been evaluated in support of the LCJR's content validity (Victor-Chmil & Larew, 2013). The LCJR is one of three evaluation tools meeting the criteria for measuring learning in all three domains (Kardong-Edgren et al., 2010). It can, therefore, be stated that the content validity of the LCJR as a tool for assessing clinical judgment development is well established. Further research is needed to evaluate the convergent validity of the tool.

Lasater rubric scores by scenario type.

The LCJR was used to evaluate each student as they progressed through the three scenarios (while maintaining the same role). It encompasses cognitive, psychomotor, and affective domains of learning. There are 11 total dimensions of each four phases of clinical judgment that are scored as exemplary, accomplished, developing, or beginning (Lasater, 2007). The noticing dimension focuses on observation, recognition of deviation, and information seeking by students. The interpreting dimension includes prioritising data and interpreting data. The responding dimension focuses on mannerisms, communication skills, interventions, flexibility, and use of nursing skills. The reflecting dimension includes evaluation and plan for improvement. The assigned scores ranged from five to 33, with a possible maximum of 44 indicating exemplary performance.

Another educator checked 10 of these scores in order to determine interrater reliability. Due to her absence from the debriefing, she could not evaluate the reflecting dimension. Additionally, no extensive training was delivered as to how to use the LCJR due to tight timeframes and staff availability. These confounding factors threaten the reliability of data produced from this instrument as the results determined by the independent evaluator and myself showed high variability.

One of the greatest threats to the reliability of data produced from observation-based performance evaluation instruments is perception or human judgment. One rater may perceive a performance differently than another rater and subsequently rate it differently (Adamson et al., 2012). It is therefore essential to train inter-raters in order to establish higher inter-rater reliability. This was a limitation in this cycle which would need to be considered for any rubric chosen for use in future evaluation of high-fidelity simulation. The rubric would need to be agreed upon by educators, and then training as to its usage and scoring would need to be implemented. This

process could improve interrater reliability to a level required for the evaluation instrument to be used as an assessment tool. However, some preliminary notions are discussed in the following sections.

As can be seen from Figure 9.4 (p. 196), the students improved overall in their Lasater scores as they progressed through the scenarios. This would support the idea that simulation as a teaching tool can indeed affect clinical judgment in a positive manner. All students proceeded through the scenarios in the same order (directional test) to simplify data interpretation. The working hypothesis was that there would be improvement in clinical judgment and skill performance regardless of the topic of the high-fidelity simulation. The Lasater scores seemed to support this hypothesis.

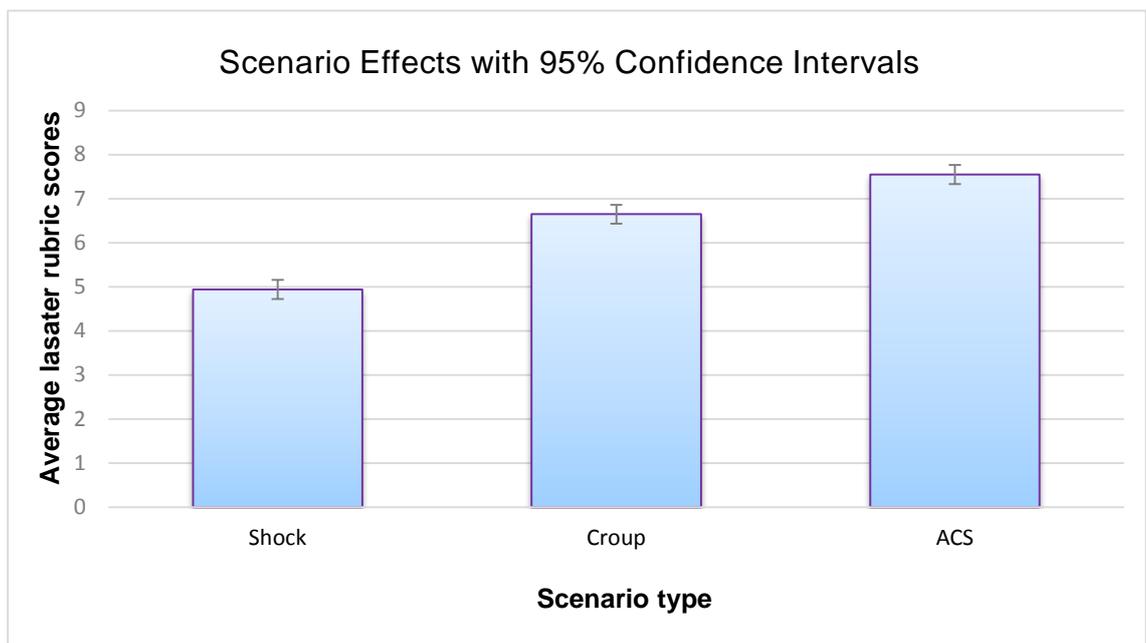


Figure 9.4 Overall scenario main effects

After looking at the data for overall LCJR scores by scenario, I became interested in how the individual groups performed in LCJR scores. These two dimensions of the model (LCJR and group) are reflected in Figure 9.5 (p. 197). As can be seen in this figure, group three performed the poorest across LCJR scores of all the groups, even though they did improve with each scenario. As I reflected on this, I recalled individuals in this group and reflected on whether there were any group characteristics which might have impeded their progress. The only thing that could be recalled that may have been significant was that they had a somewhat argumentative and critical attitude. This showed itself in their continual questioning of what I was trying to accomplish, along with what seemed to be an over-confidence in their own ability to manage the situation. This attitude meant that they could not reflect well on their overall performance as they thought they were performing to an acceptable level. They saw no need for improvement and tended to view the day as optional. While this general attitude could not be verified quantitatively, its effect could be repeatedly seen in the overall LCJR scores for this group. This attitude impeded their performance and in essence impeded their clinical reasoning and ability to make clinical judgments in all three deteriorating situations.

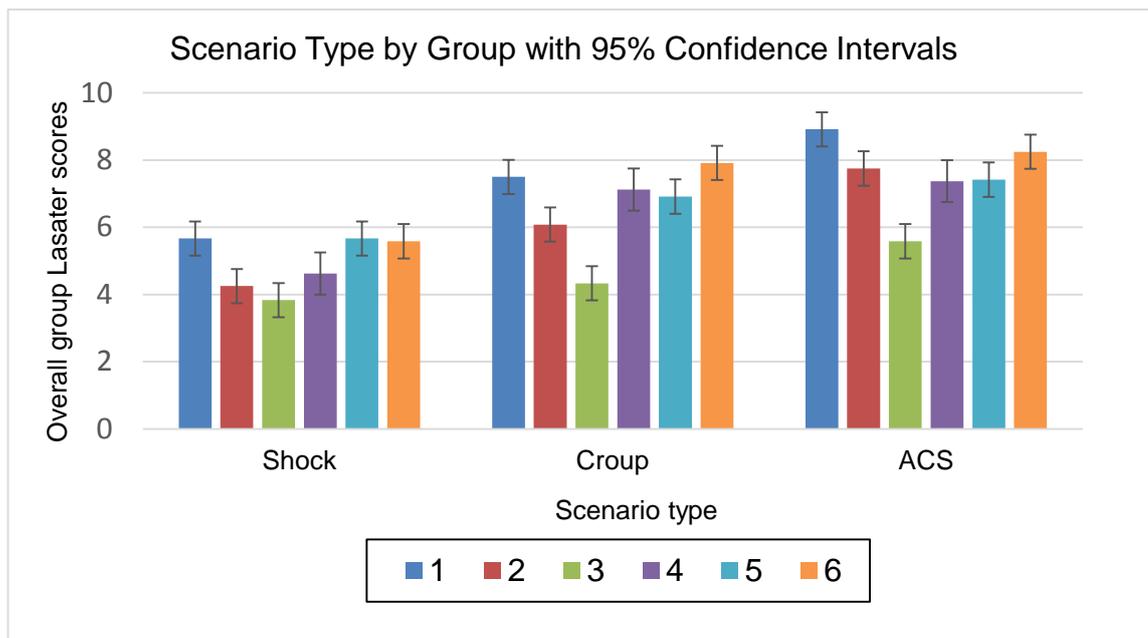


Figure 9.5 Overall Lasater scores for each group by scenario type effects

One of the three students in group three attended the second focus group and made the comment:

...you rise until you fall and then you quit. That came up yesterday because the “muscle memory” we’ve [the students] built only takes us so far. Then we’re told, “You’re only student nurses so you can’t go any further.” So, we’ve [the students] been told that there is an RN present so you cannot do anything, so this is a whole new experience where we [the students] do not want to risk. (Ben: FG2)

This comment shows not only the risk-aversion of one millennial student, but also reflects an argumentative attitude that can have an inhibitory effect on the group’s overall performance. This comment helped me gain a clearer picture for how certain attitudes can hinder group performance. High-fidelity simulation requires learners to take some risk and be willing to receive feedback in order to improve. It also requires the ability to reflect on one’s performance with an open attitude that is willing to receive and integrate comments in a helpful manner. Group three struggled with this in each simulation with resultant negative effect on their LCJR scores.

Lasater rubric scores by category type.

Some interesting tendencies became apparent when looking at the individual categories of the LCJR. Recalling that the four categories that students were scored on were (1) noticing, (2) interpreting, (3) responding, and (4) reflecting, I noticed that the first two categories and the fourth were significantly lower than the third when looking at overall Lasater scores. This can be seen in Figure 9.6 (p. 198).

Upon evaluating the LCJR scores, a mirroring of what I observed in the simulation suites came to the fore. As the students worked their way through the deterioration of their patient (a common thread in each scenario), they were often confused and not sure what to notice — i.e. what was expected of them. This confusion seemed to dominate initial thinking processes for many students. After I endeavoured to focus their attention on important information (first

category LCJR), the real struggle ensued as they tried to make sense of the information they were directed to focus on. This corresponded to the interpreting phase of the LCJR. This was the most difficult stage of the high-fidelity simulation as it involved gaining a sense of salience for the situation. Many did not have this sense.

Student ability to make the links between the objective and subjective data and the overall clinical situation has been called a “sense of salience” by some researchers (Benner et al., 2010, p. 83). Once this sense of salience has developed in relation to the particular context, clinical reasoning is clearer and students are able to respond by making a clinical judgment (which often produces an audible sigh of relief in the simulation classroom). This is the responding phase of the LCJR where their scores are highest. Rubric scores then drop to near interpreting level as students attempt to reflect on what they have learned. As this learning is new knowledge and is not yet automated in their cognitive framework, it is more difficult to recall thus inhibiting the reflective process. This is mirrored in the lower reflecting scores of the LCJR.

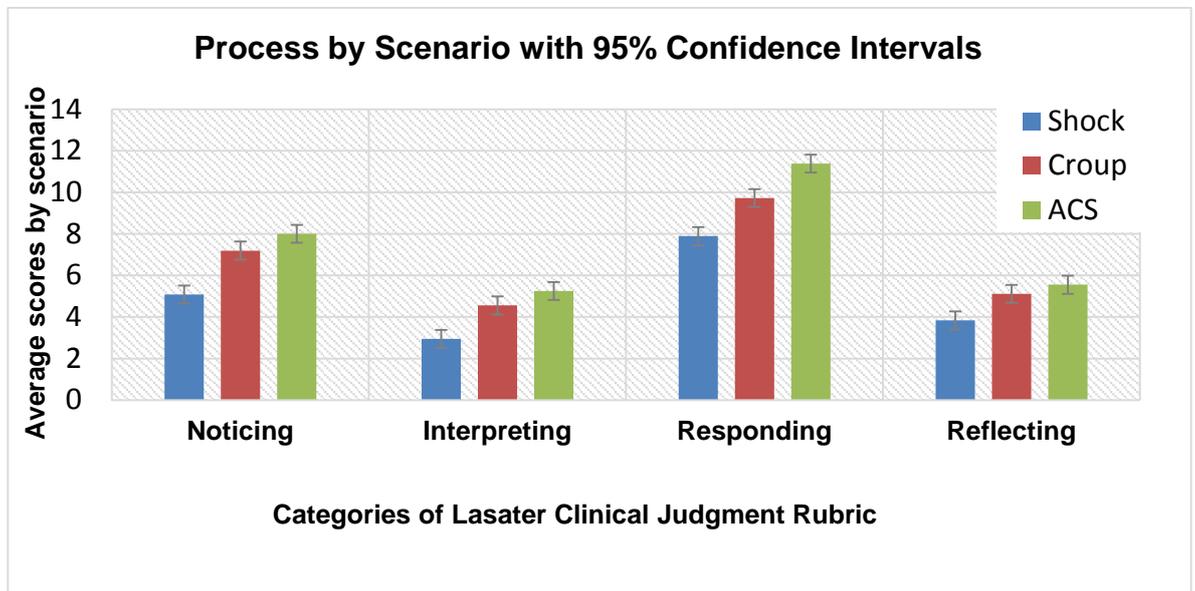


Figure 9.6 Lasater scores in each category by scenario effects

The heart of practical reasoning in clinical situations requires an understanding of the nature of the situation coupled with knowledge around how to manage the deterioration occurring with that particular client. Nurses working in complex, relatively unstructured situations must quickly learn to recognise and assess what is least and most important. Because practice situations are undetermined and often open-ended, it is difficult to prepare students for every eventuality. High fidelity simulation offers the ability to provide all students with the same complex situations and teach them to develop a sense of salience for that situation with opportunity to move from a novice in that situation to a more experienced practitioner.

Focus group comments mirrored this sense of salience when asked if they were more prepared to deal with a crisis:

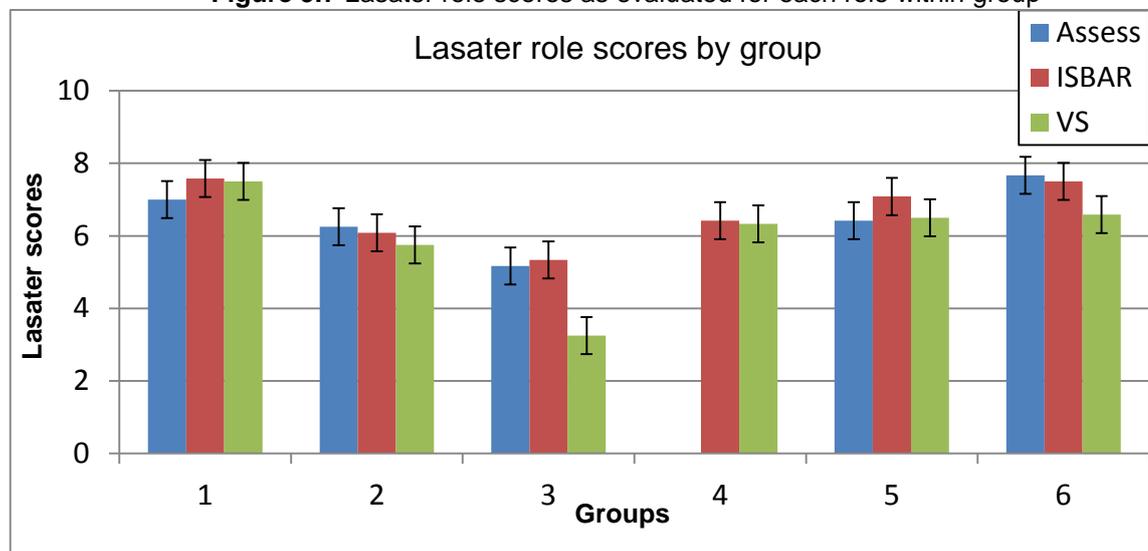
...just being able to hold a space in an emergency situation has improved. Even my knowledge and interventions grew and we learned more as we progressed. (Sara: FG2)

This student's comment about being able to, "hold a space," is part of her developing sense of salience. This is the silver bullet of high-fidelity simulation, and when it occurs students are developing in their clinical reasoning which can then inform their ability to make clinical judgments which can be used in future deteriorating situations. Simulation as a learning tool is particularly suited to develop a sense of salience in students preparing for healthcare careers.

Lasater rubric scores by role effect.

The effect of the three roles of; (1) vital signs, (2) assessment and airway/respiratory management, and (3) recording and calling ISBAR, were analysed by entering data into SAS software. It was found that no role performed consistently better than another. Additionally, each group showed variability in role performance so that there was no group that consistently performed higher in one role. The confidence limit for this data were 95%. These LCJR scores by role can be seen in Figure 9.7 (p. 199).

Figure 9.7 Lasater role scores as evaluated for each role within group



This data indicates that all of the roles were equally difficult to master, and that different individuals performed differently in the roles based on previous experience coupled with individual strengths and weaknesses. It is interesting to note that group three continued to lag behind other groups in their assigned roles. The focus group data indicated that whatever role the students were placed, they felt improvement in that role as they progressed through the scenarios. One student performing in the vital sign role had the following to say:

The main thing I learned in the hypovolaemic shock scenario was that we had to keep checking the blood pressure every two minutes. It was a massive indicator and I did not know how important it was. As soon as we tilted the bed and put the fluids up, it did change—not by a lot but it did change. We could do something to help! I wrote about six different sets of vital signs on my Oscar run! I learnt how important that was. (Rani: FG2)

Part of what the students learned was the simple idea that being assigned roles would help their ability to work as a team. One student in the focus groups stated it this way:

I learnt heaps! I learnt about the importance of having roles. That is important to the flow and the degree of care given. (Sara: FG2)

Performing within a role helps students to begin to develop confidence working on a team. They might feel intimidated with managing the entire situation alone, but working within a role is in a sense safer as no one individual bears the entire weight of the situation alone. They do learn to “hold a space,” as previously quoted by a focus group student. The simulation suite helped to develop learning around professional behaviours as stated by a focus group participant:

No matter what your role, you learned the process of how to act in these simulations.
(Ben: FG 2)

This idea reflects Benner’s (2010) *sense of salience* which was discussed in depth earlier in this chapter. Role development seems to be a positive way to contribute to this sense of salience in a manner which helps students progress from a novice, focussing on one thing at a time, to an expert who is able to implement problem-solving in a way which improves patient outcomes. This requires the educator to present the student with experiential opportunities which allow for the development of a sense of salience — a strategy called *situated teaching* (Benner et al., 2010). The simulation facilitator must coach students towards what is salient (most notable or significant) in a specific clinical situation. This type of facilitation develops students’ ability to think around a problem and develop sound clinical reasoning upon which they can make safe clinical judgments.

Lasater rubric scores by group effect.

Clinical judgment involves more than a good knowledge base.

Upon analysing the group effect using SAS analysis software, I found that the overall group performance did have an effect on LCJR scores. Some groups performed well (groups one and six), while others struggled to perform to a similar level. The average LCJR performance by group can be seen in Figure 9.8 (p. 192).

As can be seen, group three continued to perform poorly overall. I continued to reflect on what might have influenced this performance level. There were three individuals in group three (no family member), whereas some of the other groups (i.e. group four) had to engage in the scenarios with only two members due to students not turning up at the last minute. However, group three consistently performed the poorest in all three scenarios (LCJR scores). Group four performed better than group three despite have one less member (i.e. only two group members to manage all roles).

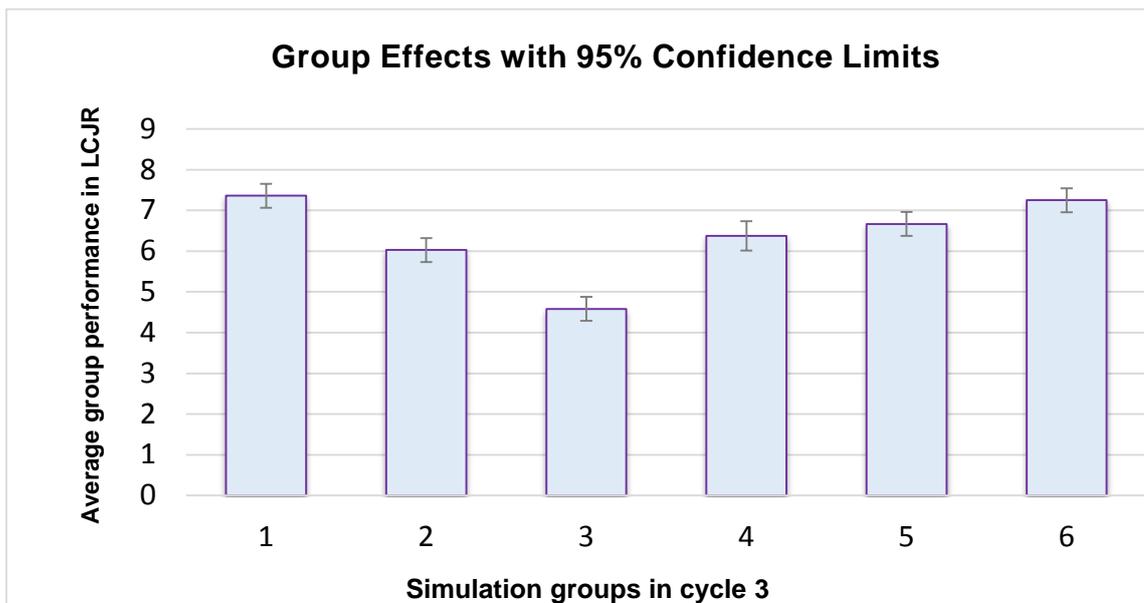


Figure 9.8 Overall group main effects

As I reflected on this data, I revisited the pre- and post-test scores for group three. One student performed extremely well on the pre- and post-tests, while the other two were average in their performance. This told me that their knowledge in each of the content areas was acceptable, but this did not translate into sound clinical judgment in the LCJR. This is an interesting finding as students' performance in clinical settings is of paramount importance to their professional progression in nursing. Educators sometimes send students out into clinical areas based on test score achievement, and have not evaluated their ability to make clinical judgments. This might need to be re-evaluated in light of these findings. The question that needs to be asked is, "Are educators maximising student preparation for clinical settings?" High-fidelity simulation may prove to be a more effective way of achieving this preparation than lectures or writing case studies.

A student's ability to perform in multiple-choice testing does not necessarily translate into sound clinical judgment and reasoning. This is an important concept to keep in mind when designing curricula and integrating high-fidelity simulation. The students might be able to perform well on a standardised test, but this does not ensure that they will make sound judgments or employ sound clinical reasoning when confronted with a deteriorating patient in the complex clinical settings for which they are destined. This reasoning may be significant when thinking of replacing clinical hours with some high-fidelity simulation hours.

Educators must make a conscious effort to ensure that facilitation of both the simulated experience and the debriefing results in improved clinical reasoning and judgment necessary to ensure safe practice. Educators must be willing to move beyond the teaching of psychomotor skills in order to ensure that students are able to clinically reason their way through deteriorating situations (Ashcraft et al., 2013). Educators must aim to achieve a sense of salience (Benner et al., 2010) for the situations the students are involved with. Evaluating student performance using the LCJR or a similar instrument would help educators to track their progress in this type of facilitation. I also became aware that there were other influences at play in regards to group performance.

Lack of resources negatively influenced learning outcomes.

The resources in terms of personnel and working equipment were different for each of the three days of the simulation suite. The first day was the best staffed and there were no equipment failures. As can be seen by the overall scores, group one (who attended the first day) scored the highest overall, followed by group six. As I reflected on what may have influenced this result, it occurred to me that group one had the luxury of having my full attention for the entire day as only four students were recruited at that point. Therefore, I was able to give the students almost continuous feedback in their 'cold run' of the scenario, answer any questions that they might have had, and even allow them to view their filmed performances in the focus group (which they all attended).

The other groups all occurred on days with multiple groups progressing through the scenarios concurrently. Due to a lack of resources and equipment breakdown, I was pulled between filming (not enough photographers), trying to fix broken manikins, and trying to give feedback both in the 'cold run' of each scenario, and in debriefing after their 'Oscar performance.' This meant that I was entirely exhausted by the end of the day, and in the end I did not meet all student expectations as I had with group one. While students had been recruited to run the cameras and manikins, they were not skilled in giving the participating students feedback or in debriefing them. All of this added to my inability to be entirely 'present' with these latter groups of students.

All of these challenges highlighted the fact that using high-fidelity simulation is a complex and labour-intensive process which requires both advanced training, coupled with proficient personnel and working equipment. In the end, there were no other educators at the institution with the time or space to assist with this cycle. I understood their unavailability as the school was undergoing a curriculum revision and a season of change. This new teaching tool of high-fidelity simulation was adding yet another layer of complexity to already overwhelmed schedules. However, high-fidelity simulation is maximised when there are facilitators trained in simulated design and implementation, coupled with a strong knowledge of educational theory and recent clinical experience. All of these requirements mean that not all educators can or should participate in facilitating high-fidelity simulation. Targeted training and updating should be a part of requirements for those desiring to work in high-fidelity simulation.

Equipment failures negatively influenced learning outcomes.

As previously noted, the best Lasater scores were achieved by group one, followed by group six. Upon reflection, I started to wonder if the manikin failures and lack of sufficient support (i.e. educator present instead of student support) in the middle groups might have impaired student performance in the Lasater indicators. Unfortunately, students involved in the second and third simulation days experienced breakdown of manikins in both the hypovolaemic shock and croup scenarios. The croup scenario suffered the worst equipment failures when the breathing and pulses were compromised resulting in the inability of students to assess lung sounds or obtain vital signs (e.g. pulse rates, respiratory rates, and blood pressure). This was both disappointing and frustrating for all involved. It also had the potential effect of lowering Lasater rubric scores as these students tried to navigate the management of deteriorating conditions with equipment failures giving them misinformation about the condition of their patient.

The students were very vocal about these equipment failures in the focus groups and qualitative sections of their pre- and post-tests. They felt, and were probably correct, that malfunctioning equipment impedes their performance. When asked the least valuable aspect of the day, students replied:

Having equipment that did not work put us off. The blood pressure wasn't working when it was supposed to. (Lani: FG2)

Having the machines stop working unfortunately was the least valuable aspect of our learning that day. (Ben: FG2)

Perfect equipment. Whenever something doesn't work it distracts you as you need to think what other aspects aren't working properly. (Sara: FG2)

These comments highlighted to me the importance of having all manikins and equipment working properly. While we set up for the scenarios the night before and tested all the equipment (which was working), we were still dealing with ten-year old manikins which are prone to malfunction. Unfortunately, the technicians were unable to find the problem until after the simulation day was completed which was a disappointment and weakness in this action cycle. If high-fidelity simulation is to become an integral part of the undergraduate programme, we will need to update our current suite of manikins and associated equipment in order to avoid these difficulties in the future. We will also need to up-skill educators working with this equipment so that trouble-shooting and programming of the manikins can be done more confidently and efficiently.

Lessons Learned from Cycle Three

After reflecting on the data from this the third action cycle — the focus groups, the pre- and post-tests, and the filmed evidence of student performance, my living theory included the fact that educators must be more intentional about how they run high-fidelity simulation at this university. There must be a concerted effort to make experiences educative, teach for a sense of salience, and continue to learn more effective ways of managing the intermediate steps (means) when designing high-fidelity simulation. These are constructivist pedagogical underpinnings which may enhance learning environments employing high-fidelity simulation.

However, it would be naïve to expect educational development of this nature not to be an arena of struggles, both practical and theoretical. These struggles, as Dewey (1938) so poignantly reminded, are a sign of health. Education must never be viewed as having 'arrived.' It is an evolving and ever emerging entity which will continue to improve as educators struggle to understand. As part of professional development, educators wanting to be involved in high-fidelity simulation cannot help but be immersed in this process.

It is the business of educators to arrange for the kind of experiences which, while they do not repel the student, rather engage him or her in a manner which is more than immediately enjoyable since this promotes desiring future experiences (Dewey, 1938). Educators have the responsibility for designing these experiences. Just as no person lives or dies to him or herself, no experience lives or dies to itself. Every experience lives on in future experiences. The central challenge when designing a learning environment based on experience is to select the kind of present

experiences that can live fruitfully and creatively in subsequent experiences. In essence, a philosophy of experience is required.

It is the responsibility of the educator to arrange the objective conditions that form an experience (Dewey, 1938). However, the educator's ability to influence directly the experience of others places upon him or her the duty of determining that environment which will interact with the existing capacities and needs of those taught to create a worthwhile experience. But it is not always the provision of the environment, in this case high-fidelity simulation, which poses problems in education. The trouble is that educators do not consider the other factor in creating an experience; the powers and purposes of those being taught.

Educators were being influenced by these powers as they worked with high-fidelity simulation at this university before this research. They were assuming that a certain set of conditions were intrinsically desirable to those being taught. In this case, the assumption was made that a certain set of conditions was able to evoke a certain quality of response in students (a behaviourist tendency which was not explicated). Before this research project, there was no consultation with students to ensure that current pedagogical assumptions were correct. This lack of mutual adaptation in high-fidelity simulation made the use of this learning platform accidental and at times haphazard. While some students got on as best as they could, others preferred to avoid this teaching environment due to feelings of inadequacy and a general lack of confidence. The responsibility for selecting the objective conditions of the high-fidelity simulation carries with it the responsibility for understanding the needs and capacities of the individuals who are learning at a given time (Dewey, 1938). It also requires a clear understanding of the pedagogical theories which underpin high-fidelity simulation.

Conclusion

Millennial students do find high-fidelity simulation a helpful and even preferred 'classroom' in which to prepare for professional careers. Focus group feedback from this cycle yielded themes which expressed student appreciation of the order and alignment of events in the simulation suite. They preferred having pre- and post-tests so that they could see their progression in content knowledge acquisition. They also sensed (and this was evidenced in the Lasater scores) their progression in the ability to make sound clinical judgments after clinical reasoning had been put into place.

Millennials are 'risk averse' due to being considered 'special' in their upbringing by Boomer and Gen X parents who determined to give their children a better life than they had experienced. This trait meant that these millennial students preferred to have the expected performance modelled in the simulated event, and they wanted to refine their performance to an 'Oscar level' by being given the option to repeat the simulation after feedback was given. Students wanted feedback to be helpful, friendly, and in short 'twitter-sized' chunks. Additionally, students were intolerant of equipment failures as this meant that they did not perform at their best. Millennials can often be intolerant when Boomer educators struggle with technology, as it is like 'breathing' to them. They do not understand where all the confusion and resistance arises when technology becomes a part of the educational environment.

A need for training on the part of educators in educational theory, scenario design, and manikin operation and maintenance has been highlighted in this cycle. There is also a need for an integrated, scaffolded simulation plan within the undergraduate nursing programme. Learning outcomes for high-fidelity simulation need to be directly tied to individual learning outcomes within courses so that alignment is maintained. Simulation has the ability to 'animate' the curriculum in a manner which will enable students to move from novice to expert in their professional management of deteriorating patients.

While not all Millennials embody the traits described in this thesis, there are definite tendencies which may be apparent (Howe & Nadler, 2008; McGlynn, 2010). Refining high-fidelity simulation to assist in millennial education is currently one of the most challenging issues nursing educators face. Dewey (1938) is correct to remind us that it is our job as educators to ensure that all experiences are educative, and that these experiences inspire students to go on to further educative experiences. This remains the task of the simulation educator. Dewey assures us that if these educational struggles were to ensue, it would be a sign of health in undergraduate nursing in New Zealand.

Chapter 10 will discuss the overall findings of each action cycle culminating in an action plan emerging from this research project. This plan is presented in an executive summary and in the content of Chapter 10. A brief discussion around how this research dovetails with simulation research around the globe is included. Simulation as a means of developing interprofessional competency forms the final reflections.

Video clips generated from this cycle three can be viewed at the link below:

https://autonline.aut.ac.nz/bbcswebdav/pid-3086599-dt-content-rid-5586372_4/institution/Papers/DHScGwenErlam/Publish/index.html

Go to the left-hand tabs and click on cycle three

Chapter 10 - Conclusions and Recommendations

As stated in chapter one, I chose the route of a professional doctorate to support my quest to take research insights 'from' practice and invest them back 'into' practice as part of what it means to be doing research (Rolfe & Davies, 2009). With the end of this action research project in sight, there is a body of knowledge which I can see is appropriate to invest back into the wider practice of simulation. Recalling that the aim of action research is to improve practice through improving learning (McNiff & Whitehead, 2011), there was a sense of having achieved that aim. I took responsibility for developing my own learning by listening to students explain what does and does not work in high-fidelity simulation. The process of using research to improve educator design of high-fidelity simulation is generative and transformational because the end of one cycle becomes the beginning of the next. Operating in this *living system* has been both inspirational and empowering. The direction was never pre-determined from one cycle to the next, and this was an enjoyable surprise. The privilege of being 'inside the heads' of millennial students has been a delight. They have so much to impart to educators, and they are so willing to explain how they learn.

Traditional research involves an external researcher making judgments on research data, and producing what has been termed Mode 1 knowledge-production (Rolfe & Davies, 2009) which resides in the University and is guarded by an academic elite. In contrast Mode 2 knowledge production is characterised by a constant flow of knowledge and technique back and forth between the fundamental and the applied, between the theoretical and the practical (Rolfe & Davies, 2009). Discovery in Mode 2 knowledge occurs in contexts where knowledge is developed and also put to use. The results of Mode 2 knowledge production have traditionally been characterised as applied, thus fuelling further theoretical advances. It is this type of knowledge which has been the focus of this action research study. Action research in the frame of McNiff and Whitehead (2011) is a form of self-study where the researcher evaluates her/his own work. It is the 'I' that makes judgments about what the 'I' is doing. The potential benefits of looking with a more critical eye at current practice is to encourage the generation of personal, living theories (McNiff & Whitehead, 2011), which are a form of Mode 2 knowledge production (Rolfe & Davies, 2009). The following encapsulates my developing *living theory* around what was learned from undergraduate nursing students' experiences in high fidelity simulation. Its value, however, goes beyond 'me'. The articulation of a personal 'living theory' is such that it is able to be offered to relevant scholarly and practice communities to enable the insights to be invested into their own pedagogical practices that involve high fidelity simulation.

Recalling the start of this research four years ago, I was pondering how I could maximise high-fidelity simulation for undergraduate nursing students by addressing the research question:

How can I improve my pedagogical practices working with undergraduate students in the high-fidelity simulation environment?

Work in high-fidelity simulation had been occurring for a few years, but there seemed to be a feeling of angst and avoidance amongst both students and educators. I could see the enormous potential of high-fidelity simulation, but could not visualise a path forward. My nursing school did

not work from any explicated pedagogy, and there was seemingly little interest by my educator colleagues in developing yet another teaching/learning platform using technology. Therefore, I took a consultative rather than a collaborative approach. Thus began the first action cycle.

Cycle One

The aim of the first action cycle was to gain a better understanding of what was currently occurring in high-fidelity simulation in the undergraduate nursing programme. Two focus groups yielded themes which indicated that educators using high-fidelity simulation needed, from the students' perspective, to up-skill in understanding how to design and implement this teaching tool. There was a need to consider what pedagogies underpinned simulation and how these could be used to maximise this teaching tool. The high-fidelity simulation environments needed to then be designed so that they were educative (Dewey, 1910a). The end of any educative process is the formation of careful, alert, and thorough *habits* of thinking. However, there were several steps in the area of philosophical underpinnings which we were missing in the past design of high-fidelity simulation at this University.

First, we, as educators, were not considering the behaviourist underpinnings which could help to scaffold students into the simulation environment. In behaviourist theory, learning is confirmed by behavioural responses to specific stimuli (Passmore, 2014). The benefits of this theoretical underpinning are the focus on skill development which improves responses in pre-determined situations. In order to maximise high-fidelity simulation design, we would need to develop skills in the lab and then embed these into the simulation in order to ensure that they became automated and part of a more complex set of actions that students would store in long-term memory when managing a particular type of deteriorating patient situation (Fraser et al., 2012). Furthermore, orienting students to the high-fidelity simulation equipment and giving them a content-oriented pre-briefing are some of the behaviourist modular underpinnings which would assist students in feeling more at ease in a new learning environment.

Dewey (1922) explained that the discovery and performance of an unaccustomed act becomes the *end* to which we, as human beings, must devote all our attention. In high-fidelity simulation, students are attempting, through current habits, to put a series of acts together at an early stage (*means*) in order to achieve an improvement in the condition of their client (*end*). To succeed, the student must find some line of action which will inhibit the deterioration and, by instituting this alternative course of action, bring the desired end (improvement in patient condition). This reconstruction of knowledge involves the integration of new habits into each student's current cognitive framework. This thinking is constructivist in its theoretical underpinning. Constructivist knowledge develops by a process of active construction and reconstruction of theory and practice by those involved (Foreman-Peck & Murray, 2008). Constructivists view knowledge as something that is actively constructed in a learning environment comprised of meaningful experiences and interaction with others (Morphew, 2009).

Cycle one was focused on the management of *means and ends* in order to achieve a reconstruction of student knowledge and ability to manage patient deterioration. The development of *habits* through coaching during simulation became paramount. Dewey (1922)

explained that *habits* can become old and fail to keep up with changing times. This is continually happening in evidence-based practice which informs nursing. When this happens, *impulses* are the “pivots upon which the re-organization of activities turn” (Dewey, 1922, p. 93). Facilitation in high-fidelity simulation gives direction to old habits with the possibility, but not the assurance, of a steady reorganisation of *habits* to meet new elements in new situations.

Thus cycle one unfolded and moved in the direction of cycle two. Key discoveries around the formation of habits were implemented as the action plan for moving in new directions. Cycle two involved implementing these changes on a grander scale with final year nursing students.

Cycle Two

Cycle two involved a pre- and post-simulation questionnaire (n = 125) for students in the third year of an undergraduate nursing programme. I began to ‘unpack’ what it meant for the high-fidelity simulation to become truly ‘educative’ for the students. I was reminded that not all experiences are educative, and that it was my job to ensure the high-fidelity simulation was educative at my university. With this end in mind, and remembering the anxiety that students were reporting in current settings, a series of changes (interventions) were put into place. Students were then asked to give feedback on the effectiveness of these interventions on their learning.

The formation of new habits requires a change in the conditions or context of the high-fidelity simulation. Cycle two involved understanding the profound impact of changing the conditions of high-fidelity simulation by modelling of expected behaviours, allowing repeat performances, giving meaningful feedback, and putting into place a usable communication rubric (i.e. ISBAR). By modelling expected behaviour, I was able to come alongside my students, in essence ‘becoming’ one of them. The students appeared thrilled that an educator would put herself in a similar position to what they were required to do. I learned that modelling the expected performance allows for impulse formation, which paves the way for the integration of new habits. This is a constructivist philosophical underpinning. To the constructivist, learning is a result of the learner building their own set of content to solve a particular problem (Haw, 2006) regardless of previous knowledge. The content is not delivered, but constructed in a learner-centric, team-based, collaborative learning environment. Through modelling, I provided new information which the students could use to construct their own revised performance.

Repetition, the second most-valued aspect in cycle two, is a cognitivist theoretical underpinning. An assumption within cognitivism is that existing knowledge structures must be present to process new information (McLeod, 2003). This existing knowledge structure is called a schema (McLeod, 2003). Cognitivists believe that learners develop through receiving, storing, and retrieving information from cognitive schemata. It is the job of the instructional designer to choose tasks which will assist students to retrieve and work with knowledge as they reorganise experiences in cognitive schemata. The result is the development of perceptions and insight, with subsequent changes in thought patterns and actions (Bradshaw, 2014).

Repetition ensures that habits are formed (i.e. automated schema) which will be embedded into long-term memory (Artino, 2008). Dewey's (1922) thinking can usefully form an underpinning for the teaching strategy of high-fidelity simulation with his caution that repeating behaviours alone is not always effective learning. The observation of the new performance, combined with current knowledge (in the form of debriefing), results in the formation of clinical judgment which can be used to interpret new clinical situations. Judgment translates the meaning of the experience into a purpose; a change in plan of action for future situations.

As indicated in the literature review, there is a definite move towards the need to develop a skill set for those involved in simulation facilitation, along with the opportunity for educators to become in some way accredited as simulation facilitators. If New Zealand is going to replace any of the 1100-1500 clinical hours with simulation, a differently trained workforce of educators will be required. These simulation facilitators will have to understand the pedagogies which underpin simulation, and be able to design and implement simulation in a manner which maximises the potential of this relatively new learning environment. The recently completed longitudinal, multi-site study investigating replacing 10%, 25%, and 50% of clinical hours with simulation (National Council of State Boards of Nursing, 2011) has revealed that up to 50% of clinical hours in undergraduate programmes can be replaced with simulation (Hayden, Keegan, et al., 2014). If this recommendation were to extend to New Zealand, this could constitute from 500-700 clinical hours being replaced with some form of simulation. Currently, the educator workforce in New Zealand is not prepared or adequately resourced to offer this amount of simulation. However, it might be more realistic to start with say 2% of the current clinical hours (i.e. 30 hours of simulation). Currently, my university is only doing around 10 hours of simulation per student and this is not in replacement of clinical hours. Any small step would be an improvement over the current situation, but this change must be managed with institutional and national support in place.

While the results from the United States study suggest that the amount of simulation used in a programme is not a factor in that programme's success, their results state that a culture of institutional support, feedback, and ongoing faculty training is required (Hayden, Smiley, et al., 2014). This culture must be cultivated by administrators in order for simulation in all of its forms to flourish. This support must become a part of my university's culture in order to foster the use of simulation in all of its forms. The process would involve recruiting key individuals who would be trained to design and implement simulation well. Further research around how to maximise this teaching tool would assist in this process. The Nursing Council might then formally recognise the revised simulations and their positive contribution to teaching and learning in undergraduate nursing curricula. Once this confidence is gained, it may be possible to begin to replace small amounts (e.g. 2%) of clinical hours with some form of simulation.

When surveying educators from around New Zealand, in cycle two of this research, there was a theme which emerged indicating a desire to actually 'take a step back' and rebuild national curricula around simulation. This would require collaboration and buy-in from the majority of institutions delivering undergraduate nursing in New Zealand; as well as a vested interest from governing bodies influencing nursing (i.e. Nursing Council of New Zealand). This amount of

coordination does not currently have a strong foothold in the tapestry of New Zealand healthcare education. Yet, New Zealand is not alone in this struggle.

While many nurse educators around the globe are warming to using high-fidelity simulation, real integration is more elusive. The longitudinal study completed in 2014 (Hayden, Smiley, et al., 2014) in the USA provides substantial evidence that up to 50% simulation can be effectively substituted for traditional clinical experience in all prelicensure core nursing courses under conditions comparable to those described in the study. These conditions include faculty members who are formally trained in simulation, an adequate number of faculty members to support the student learners, subject matter experts who conduct theory-based debriefing, and equipment and supplies to create a realistic environment. This evidence is encouraging in regards to using simulation more proactively in New Zealand.

Cycle Three

The third action cycle involved both qualitative and quantitative themes. A suite of three scenarios was created and data were collected around three elements; (1) pre- and post-tests, (2) Lasater simulation rubric scores, and (3) two optional focus groups. Students progressed through the scenarios in a particular order (i.e. shock, croup, acute coronary syndrome) while maintaining one of three roles; (1) vital signs, (2) assessment and airway management, and (3) recording all data and calling ISBAR report. Each student was scored on the pre- and post-tests, but those who role-played family members were not scored in the Lasater rubric as they were not performing in a professional role. This was a limitation in this study.

Throughout the third action cycle, changes were implemented that maximised the high-fidelity simulation increasing both student knowledge acquisition (i.e. pre- and post-tests, pre-briefing podcasts), ability to develop in clinical reasoning and judgment (LCJR scores), and student satisfaction (model clips, ISBAR communication tool, and opportunity to repeat simulation). This cycle clearly demonstrated that high-fidelity simulation has the potential to increase both the scope and effectiveness of student preparation in undergraduate nursing.

Action Plan Developed from this Research

This action plan was developed from the accumulation of findings from the three action cycles. It forms a type of Mode 2 knowledge which is meant to be knowledge which has particular application to practice settings (Rolfe & Davies, 2009). Each cycle contributed to a body of knowledge around current practices in simulation design, and changes which would improve the design, integration, and effectiveness of simulation in the undergraduate school of nursing. The following action points are the crystallisation of this process.

1. Appoint a leader/coordinator for simulation

Currently there is not a person to spearhead the development and research around high-fidelity simulation at this university. This fact has resulted in the fragmented and ad hoc approach in high-fidelity simulation development. This fragmentation has stalled the development of simulation, with some schools not allowed to be involved at all. Other schools have dominated

the use of simulation, and this has meant access to equipment is reduced for those who would like an opportunity to use it. As the organisation is constantly undergoing change, a new type of leadership is required. This transformational leadership is described in section 2.1 of the literature review in this thesis. A simulation coordinator who is empowered to affect change, inspire, and motivate educators from all healthcare schools is essential at this stage in the university's development. A coordinator would provide leadership, definition, and direction at a point where all are needed in order to progress the integration and effectiveness of high-fidelity simulation at the university.

2. Work collaboratively with educators and students and across disciplines

Interprofessional education has been identified as a necessary precursor to effective team functioning in clinical environments (Disch, 2013). Simulation could be employed in a collaborative manner involving multiple schools on my campus. High-fidelity simulation requiring interprofessional communication and collaboration has the potential to enhance student teamwork in oral health, nursing, midwifery, podiatry, physiotherapy, and paramedicine. Educators need to make a more conscious effort to develop these connections across professional lines as we, as educators within our respective disciplines, prepare the next generation of health professionals. Schools cannot continue to educate health professionals in silos, and expect them to work together in an effective manner upon qualifying. Collaboration in the form of a high-fidelity simulation activity involving multiple schools would be a first step in bridging this interprofessional divide, and modelling teamwork and collaboration amongst various professional groups.

3. Review curriculum to align and scaffold high-fidelity simulation

Alignment and scaffolding are different, but both are key to simulation's success in undergraduate curricula. Alignment refers to an *agreement between learning outcomes* in the curriculum, the individual courses, the assessments, and the simulation scenarios. When this agreement is part of curricular design, the result has been termed the 'magic bullet' by educational planners (Biggs, 2003, p. 27). This type of alignment allows all involved (i.e. students and educators) to see the overall plan, and individual contribution of each assessment, each simulation activity, and each clinical placement. All learning objectives should be working toward the same curricular aims. This alignment has not been occurring in simulation at this university to date, thus relegating simulation to a devalued and last minute add-on activity. Alignment is essential in order for simulation to move from a curricular 'add on,' to a central and contributing factor in the curriculum.

Scaffolding is an educational term which means to design a learning activity in a manner which assists the student in achieving the learning outcomes (Benson, 1997). In scaffolding, the educator is seeking to boost student self-esteem and maximise student opportunity to assume responsibility for their own learning. Scaffolding acts as a bridge, building on what students already know to take them to what they do not know. This process is constructive and an integral

part of high-fidelity simulation. Students learn best when they take responsibility for their own learning, and this requires that they start with something they know. The educator then designs the simulation to extend the student to a point where they do not know everything required. At this point, the student is required to scaffold from what they know into the unknown. This process is found in both cycles two and three of this research. Scaffolding provides the opportunity for an “ah ha” moment which makes the simulation, in Dewey’s (1938) words, “educative” (p. 37); and makes simulation a powerful educational tool. However, achieving this moment and bridging from students’ known knowledge to the unknown cannot be done without careful design. The curriculum in undergraduate nursing at this university requires a review in order to re-integrate simulation in a scaffolded and aligned manner.

4. Clarify pedagogical approach

While the use of task trainers and models dates back several hundred years, the use of high-fidelity simulation in its current form is still in its infancy. High-fidelity simulation as it is currently being defined has only been in use for about 15 years (Nehring & Lashley, 2010), and approximately 10 years at this university. As a result, there have been many different approaches as to how to integrate it into healthcare curricula. Some approaches have worked and developed student confidence, knowledge, and clinical judgment. Other approaches have done more harm than good. It is of utmost importance that research be done which helps clarify how to use high-fidelity simulation in ways that improve students’: (1) knowledge development; (2) confidence; (3) ability to clinically reason through deteriorating patient situations; (4) ability to communicate within teams; and (5) ability to call for assistance from other professionals. The integration of behaviourist, cognitivist, and constructivist philosophical underpinnings is an imperative aspect of simulation design which must be developed in order to maximise simulation effectiveness. Evidence of this development can be found in cycles one, two, and three of this research. In order to achieve excellent design, those using simulation must be trained to maximise its use for undergraduate healthcare students.

5. Train the trainers

Data around the need for concentrated training is found in section 2.1 of the literature review of this thesis, and is an emerging need in all three action cycles. The use of simulation is not intuitive. High-fidelity simulation in all of its forms requires careful and considered design in order to include all required learning objects, and ensure that they are in the most effective order. Only when this careful attention is paid does simulation result in positive student outcomes. Simulation facilitators should desire to work in simulation development, and then be willing to be trained in the planning and implementation of simulation within their particular context (i.e. nursing, midwifery, physiotherapy, occupational therapy, etc.). This process requires administrative support in the area of financial resources, and a careful selection as to ‘who’ should be involved. It is also necessary to train simulation facilitators in the design, choice of topics, and how to integrate simulation in all of its forms into undergraduate curricula. The timing of any form of simulation within the overall curricular plan is also vital in order to ensure students have required knowledge and habits before attending clinical placements. All of these concepts should be

included in the training of those wishing to work in high-fidelity simulation. This training would need to, initially, be done by a simulation coordinator, as there are no formal or informal training programmes currently available in New Zealand. It could be that this university could be part of the development and instigation of a certificate in simulation facilitation.

6. Ensure resources are adequate in number and function

The importance of proper resourcing was initially outlined initially in section 2.3 of the literature review, and continued to emerge in all three action cycles in this research. Organisational change within this university has significantly impacted high-fidelity simulation resources. With paramedicine and midwifery moving to a geographically-separated campus, significant simulation equipment and manikins have moved from the simulation centre which was the site for this study. This equipment has not been replaced. This fact, coupled with the aging equipment remaining, has resulted in resource deficiencies on this campus. In many instances during the third action cycle, the current equipment function was less than optimal or did not function at all. This had a dramatic effect on student ability to manage simulated deteriorating clinical situations. Coupled with this lack of working equipment is the lack of human resources to run the manikins. With only two technicians to serve all of nursing, midwifery, and paramedicine, availability to run the manikins was severely compromised. Additional resourcing in the form of personnel will need to be added to the current staffing complement in order to ensure that resources are sufficient to plan, design, and implement simulation effectively across the university.

7. Consider simulation performance a professional assessment of competency

This action point was originally raised in section 2.3 of the literature review of this thesis. The availability and training of personnel was an issue that arose in each of the action cycles. While there are still gaps reported in the research around the effectiveness of simulation as an evaluation tool (Harder & Nicole, 2010), this topic is quickly rising to the forefront of conversations around professional competence. Stakeholders are calling for curricula which produce students capable of meeting the complex clinical environments for which they are destined (Krichbaum et al., 2007). With the lack of quality clinical sites to accommodate students equitably, many schools are looking for more transparent means to provide an evaluation of student competence (Gallagher, Smith, & Ousey, 2012). Simulation is being touted as one such means of assessing competence (Liaw et al., 2010; Oldenburg, Maney, & Plonczynski, 2013). As nursing programmes increasingly integrate simulation throughout their curricula, reliable and valid evaluation instruments, designed specifically to measure learning outcomes and the effectiveness of the simulation as a teaching strategy, are needed (Adamson et al., 2012; Adamson et al., 2013; Patton, 2013). As such evaluation instruments emerge, professional assessment of competency may well become the benchmark for professional qualification. It might be prudent to begin to trial and use one or more of the already developed evaluation instruments and prepare educators in their use at the same time.

All of the above recommendations were shared with the Head of Schools of Rehabilitation and Occupation Studies and Health Care Practice (now the School of Clinical Sciences) in the form of an executive summary and a face-to-face meeting. This step is part of the action research process where researchers produce in written text, oral, and visual formats, a summary of research findings (McNiff & Whitehead, 2011; Mills, 2014) with the aim of bringing about organisational change.

Impact of this Research

The Head of School's response to the presentation of results from this research can be found in Appendix H. In essence, the outcome of this research project is that the potential of simulation has been heightened and the importance of embedding simulation into the curriculum of clinical disciplines at this university intensified. The findings provide evidence of the value of simulation within an undergraduate curriculum. As a result of a meeting with the Head of Schools of Rehabilitation and Occupation studies and Health Care Practice, a business case will be developed for expanding simulation across the clinical areas. Subsequently, the opportunity for my University to become a 'Simulation Centre of Excellence' in New Zealand has arisen. Furthermore, I have been assured of being involved in the development and planning of the new simulation centre. This opportunity is both a privilege and an exciting next step in the development of excellent disciplinary and interdisciplinary high-fidelity simulation at this University.

Findings related to other research.

Learning how to best implement high-fidelity simulation in graduate entry health professional programmes is of interest in many different countries and contexts around the globe. Simulation has been used to enhance knowledge while coupled with pre- and post-tests (Lewis & Ciak, 2011) with a resultant positive effect in a similar manner to this research. High-fidelity simulation is being used to develop clinical judgment by undergraduate nurses (Lasater, 2007) while helping students act on clinical cues of deterioration (Cooper et al., 2012; Endacott et al., 2010). While it has long been known that high-fidelity simulation can enhance student confidence and reduce anxiety in clinical settings (Khalaila, 2014; Smith & Roehrs, 2009), this university is still growing and learning how to maximise this aspect of simulation design. Student confidence increased after participating in the high-fidelity simulation within this study, and there is interest in exploring ways to refine this teaching tool further to create a scaffolded simulation plan in the undergraduate nursing curriculum.

The alarming rise in morbidity and mortality among hospitalised patients throughout the world heightens concerns about professional competency (Abe et al., 2013; Ashcraft et al., 2013). Nurses and other health care professionals are under increased scrutiny to provide safe, effective care. Nursing education programmes are faced with increased pressure to produce graduates who are capable of providing safe patient care. With this in mind, nursing education programmes must focus on developing curricula, hiring qualified nursing educators, and selecting learning experiences which maximise the potential of creating competent, effective graduate nurses. The

instructional strategies utilised in both didactic and clinical components of nursing education courses are highly influential in helping students develop both a sense of salience, and an ability to make sound clinical judgments in deteriorating situations (Benner et al., 2010). It is also critical to produce students capable of interdisciplinary communication.

This research found that the use of the ISBAR tool for communication was highly valued by students. Students reported that ISBAR increased their confidence in communicating with other professionals in deteriorating situations. Teaching communication skills/competencies is an essential component in engaging other professionals in the practice context. Each discipline has its own terminology, expectations, and idiosyncrasies relative to communication, all of which can impact the effectiveness of communication across disciplines. Because health care involves multiple disciplines, a means of standardised interdisciplinary communication is needed to enhance quality of care and promote patient safety (Durham & Alden, 2008). Additionally, it is acknowledged that primary healthcare settings may have fewer readily available resources for managing deteriorating patients, and communication and referral processes are less well established (Cooper et al., 2012). In these situations, the use of a communication rubric such as ISBAR works to decrease response times and improve patient outcomes. The ability to involve other professionals in the response-team is a critical skill in today's complex clinical environments.

Students involved in this research project voiced a desire to learn and work in teams. They valued working in high-fidelity simulation while in teams and stated that this enhanced their learning of how to manage deteriorating patients. This trait is common for many Millennials, who make up 67% of undergraduate nursing students at this university, and who value teamwork as an effective and essential learning tool (Howe & Nadler, 2008). With careful design, simulation has the ability to enhance teamwork and improve role performance in deteriorating situations (Cooper et al., 2013).

Simulation is increasingly being used as a significant thread in undergraduate nursing curricula (Harris, 2011; Howard et al., 2011; Mann, 2010; Wotton et al., 2010). As a teaching tool, high-fidelity simulation has been described as having the potential to animate a curriculum by challenging students at both the bedside and microsystem levels (Lambton, 2010). It has the ability to embed and teach psychomotor skills prior to patient contact (Lewis & Ciak, 2011), coupled with an ability to enhance communication and management of deteriorating situations while building teamwork (Cooper et al., 2013). Nursing schools are seeing the potential of this tool to prepare students for complex clinical settings like no other teaching method currently available (Halstead et al., 2011). This research produced evidence in agreement with the above concepts of animation, ability to teach psychomotor skills, and improved communication and teamwork amongst students. Simulation as a teaching tool would produce a powerful and effective thread in this school's curriculum if used in a considered manner with appropriate resources available (i.e. both equipment and people).

My Living Theory

While this research was focused on my own development towards enhancing practice within the school in which I work, nevertheless the living theory which has emerged throughout this

thesis has value to other researchers and facilitators of simulation. The insights that I believe are generic and would be useful for an educator involved in education using high-fidelity simulation are:

- Only experiential learning can yield the complex, open-ended, skilled knowledge required for learning. Such a learning experience enables students to recognise the nature of the particular resources and constraints in equally open-ended and underdetermined clinical situations (Cant & Cooper, 2010; Cheng et al., 2012). Simulation is one way to provide this nonlinear complex, immersive learning opportunity (Benner et al., 2010; Nehring, 2010). This research shows how students, including Millennials, can benefit from simulation.
- High-fidelity simulation is not a pedagogy (Parker & Myrick, 2009). It is a teaching tool or technique which can be used in education in order to enhance student construction of knowledge required to manage deteriorating clinical situations (Fisher & King, 2013). This research revealed how readily pedagogy is taken for granted; educators need to 'stop' and examine their pedagogical practices and then make deliberate choices about which are likely to work best. Simulation as a teaching tool requires the considered underpinnings of relevant philosophical theories in order to maximise its design (e.g. behaviourism, cognitivism, and constructivism).
- There are aspects of high-fidelity simulation which appeal to the newest generation to enter the educational setting (Earle & Myrick, 2009). Technology is a common aspect of many millennial students' lives, and high-fidelity simulation is a teaching technique which integrates technology into the 'classroom' (Aviles & Eastman, 2012; McGlynn, 2010). High-fidelity simulation incorporates teamwork, technology, engagement, communication, skills automation, and management of deteriorating situations in ways that traditional delivery platforms disregard. This research highlights the manner in which simulation can engage students, especially the millennial cohort, in ways which go beyond traditional classrooms.
- Experiential learning environments that include high-fidelity simulation must be designed with proper philosophical underpinnings in mind (e.g. behaviourist, cognitivist, and constructivist theories). This requires attention to habit formation (Dewey, 1922), learning objectives (Watson, 1925), students' previous experiences in high-fidelity simulation (Stewart et al., 2011), and expected outcomes after completing the high-fidelity simulation (Dewey, 1938). This study demonstrated ways to maximise the best of each of these philosophical underpinnings as they converge to influence high-fidelity simulation. Students need to first be confident in the skills they will be required to use before they can be expected to engage in an urgent, problem-solving clinical scenario.
- Facilitators working with high-fidelity simulation must be trained in the use of this teaching tool (Dowie & Phillips, 2011; Richardson & Claman, 2014). They need to show a desire to work with simulation, and have an ability to up-skill in their abilities through further study and attendance at training opportunities and conferences

(Boese et al., 2013). This study highlighted the importance of facilitator training in design and implementation of high-fidelity simulation in order to maximise students' sense of salience and knowledge construction without overwhelming working memory capabilities. Further, educators themselves need to feel confident that they will not appear foolish in front of technology-savvy students. They need time to first be students themselves.

- A simulation programme should not be developed without a plan (Lane & Mitchell, 2013). Furthermore, success is dependent upon continued support and resourcing from management in the form of resources, personnel, and equipment (Gantt, 2010a; Hayden, Smiley, et al., 2014). This culture must be cultivated by administrators in order for simulation in all of its forms to flourish. My experience within this study emphasised the importance of administrative and institutional support across staffing, training, and equipment in order to allow simulation programmes to exist and flourish. The amount of simulation in individual programmes is first dependent on buy in from both educators and administrators.
- High-fidelity simulation should not be an 'add-on' to an already content-laden curriculum. Instead, it should be used as a sort of 'hanger' which supports curricular delivery in an integrated and scaffolded manner (Kardong-Edgren et al., 2012). Simulation should be used as a learning activity that spirals and increases in complexity while building on previously acquired skills (Ross et al., 2009). Careful integration and planning of particular scenarios along with timing of these experiences must be considered in undergraduate nursing curricula (Schlairet, 2011). This research highlighted the significance of developing a regular simulation sequence for undergraduate nurses that develops around carefully chosen themes with a mind to scaffold students in an incremental manner to an ultimate goal which is in alignment with overall curricular objectives.
- With the noted weaknesses of traditional clinical hours spent performing "routine care tasks repeatedly" (Institute of Medicine, 2011, p. 109); and with simulation providing the means to satisfy a new demand for professional education opportunities, simulation use will continue to grow (Kardong-Edgren et al., 2012). This research highlighted the fact that simulation can be used in place of some clinical hours in order to ensure that all students have equal opportunities to be exposed to certain pre-determined essential experiences, and to develop particular skills which currently may only be experienced haphazardly in clinical settings. However, growth should be step by step, in concert with resources, staff training and student feedback of effectiveness.

All of the above gathers together into an educational pedagogy specific to using high-fidelity simulation. Much of this has been discussed in the literature of other researchers. The uniqueness of the theory that has emerged from this study is that it draws on the philosophical notions of Dewey and thus deepens insight about pedagogical practices.

John Dewey (1910b) reminded us, as educators, that the result of any educative experience is considered of paramount importance, yet at the same time is the means to whatever comes next. Thus each experience of learning in a high-fidelity simulation context, while complete in itself, is the means by which the student is ready for a later simulation class, or for real world practice as a student or, one day, as a graduate nurse. Each result is influenced by habit formation which occurs as the students interact with the matured social medium of the simulation educator and with the various learning objects designed into the simulation experience. It is the job of the simulation educator to encourage the formation of careful, alert, and thorough habits of thinking and action (Dewey, 1910b) which ensure that the high-fidelity simulation is what Dewey calls “educative” (Dewey, 1938, p. 37). An educative learning environment is one which encourages the formation of effective habits of reasoning and action, and entices the student to pursue further learning experiences (Dewey, 1938). It is incumbent upon the simulation educators to give careful consideration to the design of high-fidelity simulation in order to maximise students’ ability to form effective habits for managing the deteriorating client situations they will encounter in professional practice.

In viewing the video clips taken in cycle three it was clear that some students responded with ready-made habits, moving quickly to the appropriate action, while others appeared more cumbersome. Their scores on the Lasater scale reflected this lack of responsiveness. Such is the embodied nature of competent practice (Benner et al., 2010). I argue that no student should be considered ‘ready’ for graduate-entry practice until they demonstrate such habit-embodied practice that can respond to a given situation in a specifically relevant manner. When educators are mindful of the pedagogy that underpins their practice they are likely to become more explicit about both means and ends; the means to help students grow confidence and competence, and the measures by which they can assess such ends. Until academics within a nursing programme collectively develop such a commitment to quality pedagogical practices, simulation is simply a tool within the tool box. My own insights into pedagogy, especially those informed by Dewey, have greatly enhanced my vision and commitment to quality education and helped me understand what I must do to engage millennial students in a manner that is likely to be educative. At the same time I have come to recognise that robust pedagogical principles are likely to be beneficial to learners within any cohort. When teachers ‘stop’ to consider what it is they are trying to achieve, and how best they might achieve that; when they seek feedback from the students who experience their teaching, then the foundation is laid for quality educative experiences.

Original contribution to knowledge

Viewed alone, many aspects within my living theory are congruent with the existing literature. What is original about the contribution this action research study is my interpretation and application of Dewey’s philosophical notions of what makes an educative environment. To this end, this study’s findings suggest an educative framework, integrating a coherent suite of pedagogical practices designed to engage students in the learning moment. The findings evidenced, when the education framework was implemented this way in the high-fidelity simulation setting, the students gained confidence, demonstrated practice competence, and

expressed a desire to engage in further such learning experiences. Thus, in summary, this study evidences six educative strategies within the proposed educative framework:

- *Strategy one: highlight what is known, and then what is unknown for the student.* I used pre- and post-tests to do this as it allowed students to observe their progression in content knowledge acquisition. Allowing students to experience uncertainty of the 'right answer,' within a safe context, opened them up to wanting to learn. However, caution must be exercised when using content knowledge as a predictor of safe clinical practice. The two do not always align. Some students did well on post-tests but performed poorly in clinical reasoning and judgment.
- *Strategy two: Work with novice students in the room.* Being alongside the student participants in this study, enabled them to develop of a sense of salience through what Benner (2010) calls "situated teaching." The students in this study were resolute in their thinking that having the educator alongside, and not behind the observation screen, contributed positively to learning and willingness to pursue further learning opportunities. Designing the learning encounter this way provided a "mature social medium" (Dewey, 1922, 1938) in the form of the educator. The experiences assisted the students to develop new habits.
- *Strategy three: Model the expected behaviour.* This encourages what Dewey (1922) describes as "impulse formation." Impulses are new ways of behaving which pave the way for the integration of new habits. In this research I modelled expected performance, or filmed clips of other educators acting out roles in various simulations. Students in the paediatric scenario observed in the model clip that the nebuliser was given before the injection and changed their performance to match. In this way new habits were 'caught' rather than 'taught.' The aim is to provide feedback in such a way as not to 'crush' students, but steer them in a manner which becomes educative and leads to further growth (Dewey, 1938). Modelling assists with new knowledge construction on the part of the learner.
- *Strategy four: Allow for repetition of the simulation.* This assists students with 'cementing' new knowledge into cognitive schema for subsequent storage in long-term memory. In order for learning to 'stick' and be held in the working memory, it must be rehearsed. If it is not rehearsed, it is lost in between 15 and 30 seconds after it is learned (Driscoll, 2005; Johnson et al., 2012). In this study students were required to use the ISBAR communication tool to recruit assistance for their deteriorating patient. Most students could not perform this skill the first time requiring a second attempt in order to master the use of ISBAR. Repetition assists with the development of automated schema thus allowing the student to manage more complex tasks more confidently and competently.
- *Strategy five: Create roles for each student.* This helps to reduce cognitive load, the amount of processing required to integrate new information by the working memory (Reedy, 2015), during the simulation. Creating roles helps students to manage the complex clinical situation more effectively. Roles restrict what is required by the working

memory, helping students to manage the new information more efficiently resulting in renewed confidence and competence. Simulation should be designed so that the load on working memory is reduced and schema construction maximised in preparation for the simulation (Sweller et al., 2011). The result is that learning will be maximised and students' sense of being overwhelmed reduced. The student will be able to focus on, "Why is the blood pressure dropping?" rather than "where is that pulse found?" Simulation design should encourage the student to focus on the patient, not the skill.

- *Strategy six: Debrief students following the simulation.* Debriefing allows the students to reflect with the facilitator and other peers as to ways they might improve their performance. This strategy helps them construct new answers to the problems posed. Debriefing weaves together the students' prior understandings with new knowledge in a manner which helps them form new impulses which will clarify confusion (Dewey, 1922). It was often in debriefing where students were able to step back and consider what they had learned. One student discussed her ability to "hold a space" in emergency situations as a result of reflecting on her simulation performance. Taking time to stop and reflect on learning brings insights for the students and their peers as to the significance of new thinking and action that became a part of practice. In such a way new habits are formed.

These six strategies, each of which is part of an integrated whole, offers a new and valuable guide to educators who teach using high-fidelity simulation. Gates (2012) discusses content knowledge acquisition in simulation, Benner (2010) discusses situated teaching and working in the room with students, Johnson (2012) discusses the importance of modelling, Abe (2013) discusses the importance of repetition, Lambton (2010) discusses the importance of roles, and Neill (2011) the importance of debriefing. However, no author brings together all of the six strategies outlined above into one framework for simulation design and implementation. Thus, the contribution of this thesis in the form of the strategies above is unique.

The uniqueness comes from drawing on the philosophy of Dewey as opposed to staying solely within the more current writings of pedagogical authors such as Benner (2010) and Jefferies (2012), and by using an action research approach which translated the findings of a wide range of authors, including these listed above, into the real life experience of teaching students. The research was about 'no one thing' but rather drew from students insights of the 'whole' experience. Thus a holistic package emerged.

Recommendations for Future Research

Simulation as a replacement for some clinical hours.

The ever-pressing question of how many clinical hours can legitimately be replaced with simulation is a very pertinent area for further research, and of keen interest to the Nursing Council of New Zealand. There is currently a window of opportunity for a comparative study looking at competence between two groups of graduating nursing students — one which had only completed clinical hours for registration, and another which has had the opportunity for consistent simulation during their undergraduate education. The window for this comparison will close as high-fidelity

simulation becomes more integrated into the undergraduate nursing programme, so timing is of the essence. As future simulation scenarios are integrated, current students in the third year could be compared with students who not have been trained using simulation. A clinical judgment rubric could be used to evaluate both groups as to their ability to work in teams, communicate, and instigate critical interventions for deteriorating patients. Research in this area could contribute to a more standardised preparation of undergraduate nurses across New Zealand along with building collaboration amongst institutions involved in healthcare education.

It would be valuable to begin discussions with the Nursing Council in order to determine specific requirements they would envisage in order to allow simulation to replace some clinical hours, and what research design would confirm simulation as a legitimate teaching tool for undergraduate nursing education in New Zealand.

Simulation as a means of developing interprofessional competency.

Further action research could involve students in a simulated interprofessional experience. Training for healthcare professionals has historically been designed and delivered in silos. This has resulted in a fragmentation of care when these professionals move into clinical environments (Disch, 2013). One way to manage this problem might be to develop a high-fidelity simulation scenario involving an individual having minor foot surgery who subsequently develops chest pain. The podiatry students might be involved initially; their responsibility might then be to contact paramedicine who would then assess and transport 'the patient' to a place where a simulated emergency department would be available. Nursing students might receive handover from paramedical students and begin management of care for 'this patient'. This type of scenario would involve three different disciplines in a manner which may help clarify and strengthen professional role acquisition and scope for each discipline. Studies have shown that this type of inter-professional high-fidelity simulation can enhance communication and teamwork in deteriorating situations (Garbee et al., 2013). This university, which educates undergraduate paramedics, nurses, midwives, occupational therapists, oral health practitioners, podiatrists, and physiotherapists, is particularly well situated to run this sort of inter-professional experience. Interprofessional collaboration is a necessary precursor to effective team functioning (Disch, 2013), and teamwork is part of the professional competencies required for all healthcare careers. High-fidelity simulation is one way of developing interprofessional collaboration.

Simulation as a means of assessing competence.

In traditional clinical practice settings, students can operate in less than competent ways and go unnoticed by clinical educators and registered nurses. After all, clinical educators are typically present for a fraction of the entire shift, and registered nurses are often too busy to take notice. Clinical placements do not guarantee a standard experience for every student. This is one of the key arguments for integrating high-fidelity simulation into undergraduate nursing curricula (Adamson, 2010; Health Workforce Australia, 2010a; Starkweather & Kardong-Edgren, 2008). When a gap in understanding is uncovered, the simulation facilitator can address the issue with the entire group during a short teaching session and in the follow-up discussion. This capability

situates high-fidelity simulation as a significant teaching tool in the development of undergraduate nurses. Assessing competence through simulation may one day become the gold standard for assessing clinical competence of nursing and other healthcare professionals. Research in this area may provide evidence as to both the validity and reliability of high-fidelity simulation as an assessment of competency.

Simulation as a means of aligning undergraduate curricula across New Zealand.

Further action research could emerge from this research exploring ongoing curriculum developments and the process of simulation integration. There are some who believe that nursing in its various silos across the country is in need of a national approach (Walker, 2009). There are currently 16 undergraduate Bachelor of Nursing programmes in New Zealand (Nursing Education in the Tertiary Sector, 2014). Each of these institutions offers a unique curriculum. Anecdotally, some are considered superior, while others are thought to be inferior. All have different levels and requirements around high-fidelity simulation. Surely it is timely for a programme of rigorous research to be initiated to establish exactly what an exemplary undergraduate nursing curriculum should look like integrating simulation. How much is enough? What types of clinical situations do and do not work well in high-fidelity simulation? Should there be implementation of high-stakes simulation? It is possible that well designed simulations can present opportunities to develop students in basic skills and present opportunities to learn collaboration, build communication abilities, and recognise potential errors? Simulation can go beyond the traditional use of skill development by allowing students to observe, anticipate, and predict how systems influence the ways in which they respond to the dynamic care needs of their patients (Lambton, 2010). The potential for multi-site research around these questions could mean an improved national programme for undergraduate nursing education.

Strengths and limitations of this study.

Strengths of this study included the instigation of a form of enquiry which gave students a voice. This became a powerfully liberating form of research in which the researcher consulted participants and together we found ways to improve outcomes for all concerned. Participants were not told what to do, but encouraged to voice what worked and what could be improved upon. Action research is characterised by this type of empowerment which was both motivating and gratifying for all involved. A transformational process was initiated involving the principle of continuity of experience (Dewey, 1938). Future experiences in high-fidelity simulation will take something from these students who have gone before, and these experiences in high-fidelity simulation will modify in some way the quality of those who come after. This is a strength of this study.

The particular approach of a relatively smaller quantitative study embedded within a larger qualitative study allowed for an investigation of both the experience of simulation coupled with an objective viewpoint as to particular influences on student performance. This mixed method approach yielded a rich tapestry of evidence, combining objective and subjective data, which

informed the research question. It also off-set weaknesses inherent in employing just one methodology (Terrell, 2012). This approach became a strength of this study.

There were several limitations which impacted this study. The head of simulation research, who also played a key role as a supervisor in this research, resigned the semester before cycle three commenced. Her extraordinary ability to secure funding, as well as support equipment acquisition and generate business plans, was lost at a most critical time. While her involvement continued as a third supervisor, she was no longer able to be the bridge to higher level decision making and resource allocation. Instigating this research at a time of leadership change has limited opportunity to involve 'leaders' in the change process. Such change initially impacted this study, particularly in having the opportunity to stay closely aligned to key leaders within the school as the findings emerged. As a result, I am still developing collaborative ways of integrating high-fidelity simulation within the revised nursing curriculum.

Cycle three brought its own limitations which came about as a result of short timeframes occurring within this cycle. These timeframes were tied to the semester calendar and were therefore beyond my control. The first limitation resulted from a lack of time to train educators in the use of the LCJR. This rubric was used to evaluate student performance in the third action cycle. I assessed the performance of the students involved in all three scenarios (excluding those students playing family members). In hindsight, it might have been more educative to employ actors to play family members in order to free up these students to perform in a clinical role and be evaluated in the LCJR. This would give these students opportunity to form new habits applicable to professional practice.

Another limitation occurred when neither I nor the other educator who randomly checked my LCJR scores for reliability were trained in the use of the rubric. This meant that the inter-rater reliability (r) had no common ground of experience. If the LCJR or any other evaluation rubric were to be used in the future, educators would need to be trained to implement the rubric reliably. This training would need to be extensive enough to ensure that simulation facilitators felt comfortable with using the rubric as an assessment device.

Another limitation occurring in the third action cycle involved the breakdown of equipment. The paediatric simulator compressor malfunctioned on the second day, disabling the ability to take vital signs (specifically BP, respiratory rate and pulse). This meant that vital signs had to be 'voiced' to the students thus affecting their LCJR scores (which required assessments which could not be completed). Their LCJR scores were adjusted so that they were not penalised for this equipment breakdown, but it posed a limitation none-the-less. The *Nursing Anne* simulator malfunctioned on the third day also resulting in students being unable to feel the BP or pulse. The same limitations in LCJR scores resulted. As in the second day, I was forced to take the equipment malfunction into account when assessing Lasater scores, i.e. they were not penalised for their inability to access vital signs. This assessment shift in Lasater scoring impacted the validity of the LCJR scores. These malfunctions also gave rise to frustration for both students and educators which further hampered student ability to work in teams and communicate professionally. Equipment must be maintained and updated, and simulation educators trained in

trouble-shooting, if research involving said equipment becomes an expectation at our institution. Proper working equipment is necessary to support optimal learning.

Another limitation involved a lack of resources (in terms of personnel) to run the manikins and cameras on the third simulation day of cycle three. Due to educator unavailability on these days, student volunteers were utilised and offered motor vehicle fuel or mobile phone top-up vouchers as 'token gifts.' The limitation, which again was due to short timeframes, was that the volunteer manikin operators did not receive any training in how to run the manikins until they arrived on the day. This meant that their ability to change manikin responses was at times slower than a trained technician might have achieved. This in turn may have influenced student participant responses in the scenarios. It is therefore recommended that such resourcing issues be addressed further (both personnel and equipment) if a simulation programme is to be implemented in the undergraduate nursing curriculum.

Reflection on the past four years.

The journey begun in 2011 with this doctorate has been peppered with moments of joy, sorrow, frustration, discouragement, despair, and hope. The mantra for managing this journey seems to be to, "trust the process." In the end, that three-word phrase has become my mantra. While pursuing this doctoral degree, I was concurrently writing two undergraduate courses (papers) for the nursing degree, completing an e-learning module incorporating clinical skills, and attended six conferences (presenting at four of these). All of these experiences helped to inform personal living theory around how skills dovetail with high-fidelity simulation; and how the automation of skills improves retention in long-term memory. However, not all educators seemingly appreciated the work I was doing on the e-learning skills module or in high-fidelity simulation. I felt unsupported by such attitudes; yet, in turn, they inspired my personal development and a deepened understanding of the social dynamics that can occur in a work setting when new technologies are introduced. I was continuing to develop in how to make new teaching tools safer for those who are not initially interested in adopting these into their teaching frameworks. Being a change agent brings feelings of vulnerability that have had to be managed as this journey unfolded.

Action research is characterised by the formation of new ways of thinking and new forms of theory. When analysing personal professional practice, the final result of action research has been a merging of improved practice along with reasoning as to why this was necessary. Ultimately, the theory which emerged became a part of my teaching strategy in the same way that any worldview interacts with the personality to create a new form of living each day. By becoming intentional about improving teaching in high-fidelity simulation, I have developed a *living theory* around how to maximise high-fidelity simulation. Because this theory is continually morphing as new evidence becomes available, it has been called a *living theory* (McNiff & Whitehead, 2010). The principles which I learned in conducting this study have become embodied values that have transformed personal professional practice into communicable standards of practice and judgment. The question being asked is always, "How can I improve my pedagogical practices working with undergraduate students in the high-fidelity simulation environment?"

The development of my *living theory of simulation facilitation* has at times involved dealing with challenging issues including a lack of resources, equipment breakdown, resistance to change, and lack of time and support from colleagues. This process at times involves making the situation more palatable by providing options to colleagues which ease workloads (e.g. banks of simulation templates, pre-briefing and pre-tests already prepared). The aim is to provide options for colleagues in order to assist in their uptake of high-fidelity simulation while improving workplace practice. It will ultimately be important to promote an ongoing democratic evaluation of this process.

Closing Thoughts

Learning how to improve high-fidelity simulation in this research was achieved when participants, nursing students, technicians and educators, participated as co-researchers in the action research process. The result of such collaborations were seemingly greater than what either the researcher or the participant groups could achieve by themselves. Consequently, the satisfactions expressed by researcher and participants were wide-ranging. This thesis brings their discussions and findings into the public arena in order to stimulate and motivate further research in the area of high-fidelity simulation. This study's findings contribute to a growing body of research involving simulation in undergraduate health education in New Zealand and internationally. Specifically, this research addresses the gap of Millennial-preferred classrooms along with why and how simulation as an immersive classroom can be made more educative for this generational cohort. It highlights the importance of integrating sound pedagogical underpinnings into the design of high-fidelity simulation. This research shows the ability of simulation to enhance student knowledge, improve clinical judgment and reasoning, and bolster student confidence. The participatory process was empowering for both students, educators, and technicians.

As this study comes to an end, the question emerges, "What big idea encapsulates what has been learned from students about how to improve high-fidelity simulation?" To answer this, a return to the research question is required:

"How can I improve my pedagogical practices working with undergraduate students in the high-fidelity simulation environment?"

There have been many lessons learned from students in this process. Pedagogical practices which create educative environments in high-fidelity simulation are unique. Behaviourist, cognitivist, and constructivist philosophical underpinnings must be acknowledged and their use clarified as they apply to high-fidelity simulation. This study's student participants, including Millennials, thrive on learning which is designed with consideration to detail (e.g. equipment, paperwork, cameras, and templates all exactly correct and working well). They become quickly frustrated when equipment fails, or planning and design have not been dealt to effectively. They expect to feel 'safe' in high-fidelity simulation, with communication clear, emotionally neutral, and concise. Students value feeling a part of a team with clear roles delineated, and they want to partner with educators in their learning. They do not respond well to top-down approaches where they are relegated to being a passive receptor of information. Modelling expected behaviour

coupled with allowing students to repeat their performance after feedback were two key elements which enabled students involved in this project to feel part of a team. If all of these features are not carefully considered in the design, I suggest it is less likely that high-fidelity simulation will be an effective teaching tool in undergraduate nursing curricula.

In order to achieve integration of high-fidelity simulation, I recommend that simulation facilitators receive extensive preparation. This ought to involve gaining fluency in the philosophies and pedagogy underpinning a curriculum and how they will guide learning-relevant skills in simulation such as design, manikin use and maintenance, facilitation techniques, role development, debriefing, development of teams, and strategies to scaffold high-fidelity simulation throughout the curriculum ensuring effective integration. I propose that learning outcomes for high-fidelity simulation be directly tied to learning outcomes for individual undergraduate nursing courses. If simulation is to be an assessed activity that contributes to 'clinical hours' in undergraduate curricula, I propose that learning outcomes be particular to the behavioural, cognitivist and constructivist aspects of student performance being measured. Similarly, I propose that those evaluating student competence be skilled in using whichever evaluation rubric is chosen. Such practices will be resource intensive, time-consuming, and require genuine commitment to integrate high-fidelity simulation into curricula instead of allowing it to become another 'add-on' to what may already be content-laden learning. Yet, when done well, the applied educative benefits of participatory models of high-fidelity simulation will breathe life into situated learning, thus maximising its educative effectiveness with undergraduate students.

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Appendix A – Project and Ethics Approval Documents

A1 Project Approval – 1 October 2012

A2 Psychological Support for Research Participants – 13 July 2012

A3 Ethics Approval Memorandum – 28 Nov. 2012

A4 Ethics Approval Memorandum – 28 Mar. 2012

A5 Ethics Approval Memorandum – 9 Aug. 2013

A6 Ethics Approval Memorandum – 12 Mar. 2014

A1 Project Approval – 1 October 2012



MEMORANDUM

Auckland University of Technology Ethics Committee (AUTEC)

To: LizSmythe
From: Rosemary Godbold, Executive Secretary, AUTEC
Date: 1 October 2012
Subject: Ethics Application Number **12/208** **Maximising the potential of simulation for Millennial health care students.**

Dear Liz

Thank you for providing written evidence as requested. I am pleased to advise that it satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC) at their meeting on 27 August 2012 and I have approved your ethics application. This delegated approval is made in accordance with section 5.3.2.3 of AUTEC's Applying for Ethics Approval: Guidelines and Procedures and is subject to endorsement by AUTEC at its meeting on 29 October 2012.

Your ethics application is approved for a period of three years until 10 October 2015. I advise that as part of the ethics approval process, you are required to submit the following to AUTEC:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/research/research-ethics/ethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 10 October 2015;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/research/research-ethics/ethics>. This report is to be submitted either when the approval expires on 10 October 2015 or on completion of the project, whichever comes sooner;

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are reminded that, as applicant, you are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

Please note that AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to make the arrangements necessary to obtain this.

To enable us to provide you with efficient service, we ask that you use the application number and study title in all written and verbal correspondence with us. Should you have any further

enquiries regarding this matter, you are welcome to contact me by email at ethics@aut.ac.nz or by telephone on 921 9999 at extension 6902. Alternatively you may contact your AUTECH Faculty Representative (a list with contact details may be found in the Ethics Knowledge Base at <http://www.aut.ac.nz/research/research-ethics/ethics>).

On behalf of AUTECH and myself, I wish you success with your research and look forward to reading about it in your reports.

Yours sincerely,

Dr Rosemary Godbold

Executive Secretary

Auckland University of Technology Ethics Committee

Cc: Gwen Erlamgerlam@aut.ac.nz, Anita Bamford-Wade

A2 Psychological Support for Research Participants – 13 July 2012



MEMORANDUM

TO Gwen Erlam

FROM Kevin Baker

SUBJECT Psychological support for research participants

DATE 13th July 2012

Dear Gwen

I would like to confirm that Health, Counselling and Wellbeing are able to offer confidential counselling support for the participants in your AUT research project entitled:

"Maximising the potential of simulation environments for millennial health care students"

The free counselling will be provided by our professional counsellors for a maximum of **three** sessions and must be in relation to issues arising from their participation in your research project.

Please inform your participants:

- They will need to contact our centres at WB219 or AS104 or phone **09 921 9992 City Campus** or **09921 9998 North Shore campus** to make an appointment
- They will need to let the receptionist know that they are a research participant
- They will need to provide your contact details to confirm this
- They can find out more information about our counsellors and the option of online counselling on our website:
http://www.aut.ac.nz/students/student_services/health_counselling_and_wellbeing

Yours sincerely

Kevin Baker
Head of Counselling
Health, Counselling and Wellbeing

A3 Ethics Approval Memorandum – 28 Nov. 2012



A U T E C
S E C R E T A R I A T

28 November 2012

LizSmythe
Faculty of Health and Environmental Sciences

Dear Liz

Re: **12/208 Maximising the potential of simulation environments for Millennial health care students.**

Thank you for your request for approval of amendments to your ethics application.

I have approved the minor amendment to your ethics application allowing an additional participant group.

I remind you that as part of the ethics approval process, you are required to submit the following to AUTEK:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/research/research-ethics/ethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 10 October 2015;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/research/research-ethics/ethics>. This report is to be submitted either when the approval expires on 10 October 2015 or on completion of the project.

It is a condition of approval that AUTEK is notified of any adverse events or if the research does not commence. AUTEK approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTEK grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this. If your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply there.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

All the very best with your research,

A handwritten signature in black ink, appearing to read 'Rosemary Godbold'.

Dr Rosemary Godbold
Executive Secretary
Auckland University of Technology Ethics Committee

Cc: Gwen Erlangerlam@aut.ac.nz, Anita Bamford-Wade

A4 Ethics Approval Memorandum – 28 Mar. 2012



A U T E C
S E C R E T A R I A T

28 March 2013

LizSmythe
Faculty of Health and Environmental Sciences

Dear Liz

Re: Ethics Application: **12/208 Maximising the potential of simulation environments for Millennial health care students.**

Thank you for your request for approval of amendments to your ethics application.

I have approved the minor amendment to your ethics application allowing the addition of a student feedback questionnaire.

I remind you that as part of the ethics approval process, you are required to submit the following to AUTEK:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/researchethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 10 October 2015;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/researchethics>. This report is to be submitted either when the approval expires on 10 October 2015 or on completion of the project.

It is a condition of approval that AUTEK is notified of any adverse events or if the research does not commence. AUTEK approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTEK grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this. If your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply there.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

All the very best with your research,

A handwritten signature in black ink, appearing to read 'Rosemary Godbold'.

Dr Rosemary Godbold
Executive Secretary
Auckland University of Technology Ethics Committee

Cc: Gwen Erlamgerlam@aut.ac.nz, Anita Bamford-Wade

A5 Ethics Approval Memorandum – 9 Aug. 2013



A U T E C
S E C R E T A R I A T

9 August 2013

LizSmythe
Anita Bamford-Wade
Faculty of Health and Environmental Sciences

Dear Liz and Anita

Re: Ethics Application: **12/208 Maximising the potential of simulation environments for Millennial health care students.**

Thank you for your request for approval of an amendment to your ethics application.

I have approved the minor amendment to your ethics application allowing an anonymous educator feedback questionnaire.

I remind you that as part of the ethics approval process, you are required to submit the following to AUTEK:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/researchethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 10 October 2015;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/researchethics>. This report is to be submitted either when the approval expires on 10 October 2015 or on completion of the project.

It is a condition of approval that AUTEK is notified of any adverse events or if the research does not commence. AUTEK approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTEK grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this. If your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply there.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

All the very best with your research,

A handwritten signature in black ink, appearing to read 'Kate O'Connor'. The signature is written in a cursive, flowing style.

Kate O'Connor
Executive Secretary
Auckland University of Technology Ethics Committee

Cc: Gwen Erlamgerlam@aut.ac.nz

A6 Ethics Approval Memorandum – 12 Mar. 2014



A U T E C
S E C R E T A R I A T

12 March 2014

LizSmythe
Faculty of Health and Environmental Sciences
12 March 2014

Dear Liz

Re: Ethics Application: **12/208 Maximising the potential of simulation environments for Millennial health care students.**

Thank you for your request for approval of amendments to your ethics application.

I have approved minor amendments to your ethics application allowing in the third action cycle pre and post-tests, focus groups and educator video simulation.

I remind you that as part of the ethics approval process, you are required to submit the following to AUTEK:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/researchethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 10 October 2015;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/researchethics>. This report is to be submitted either when the approval expires on 10 October 2015 or on completion of the project.

It is a condition of approval that AUTEK is notified of any adverse events or if the research does not commence. AUTEK approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTEK grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this. If your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply there.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

All the very best with your research,

A handwritten signature in black ink, appearing to read 'K O'Connor'.

Kate O'Connor
Executive Secretary
Auckland University of Technology Ethics Committee

Cc: Gwen Erlangerlam@aut.ac.nz

Appendix B – Action Cycle One Documents

B1 Email to recruit participants for simulation project

B2 Participant Information Sheet

B3 Confidentiality Agreement

B4 Focus Group Consent Form

B5 Video Consent and Release Form

B6 Observation Protocols

B7 Focus Group Questions

B8 Email Feedback Questionnaire for Students

B9 Technician Information Sheet

B10 Technician Consent Form

B11 Technician Group Interview Questions

Email to recruit participants for simulation project (Cycle one)



My name is Gwen Erlam, and I am currently studying to complete my Doctorate in Health Science at AUT University. I have had the privilege of 20 years of clinical nursing in the areas of intensive care, coronary care and the cardiac catheterization lab where I have witnessed first-hand the management of deteriorating patients along with being immersed in multiple critical events. The past twelve years have found me teaching nursing at various tertiary institutions across New Zealand where I have come to understand the importance of preparing students for the complex healthcare environments they will encounter upon graduation. Through this research process it is my desire to understand more clearly how we as educators can maximize the potential of simulation for the largest generational cohort to enter the tertiary setting since the Baby Boomers—the Millennials (also known as Gen Y, Net Gen, Digital Natives). My passion for improving my facilitation of your learning in simulation is the reason for pursuing this project.

I would like to invite you to participate with me in improving how simulated education is delivered. Your participation in this project is voluntary and you may withdraw at any time prior to the completion of data collection. If you are receiving this email, it is because of one of the following reasons:

- You are currently studying an undergraduate healthcare degree or,
- You are a staff member teaching in an undergraduate healthcare degree or,
- You have been involved in some form of simulation as part of your degree preparation, or as a staff member or,
- You have indicated an interest in improving how simulation is delivered and I (Gwen) am not currently responsible for assessing your performance.

If you would like to find out more about how you can participate in this research, please accept this formal invitation to meet with me and discuss the details on Day/Month/Year at time. At this meeting I will endeavour to address any further questions/concerns that you might have. Looking forward to working together.

Kind Regards,

Gwen Erlam

Participant Information Sheet Cycle one



Date Information Sheet Produced: 25-07-12

Project Title: Maximising the potential of simulation environments for Millennial health care students

An Invitation

My name is Gwen Erlam, and I am currently studying to complete my Doctorate in Health Science at AUT University. I have had the privilege of 20 years of clinical nursing in the areas of intensive care, coronary care and the cardiac catheterization lab where I have witnessed first-hand the management of deteriorating patients along with being immersed in multiple critical events. The past twelve years have found me teaching nursing at various tertiary institutions across New Zealand where I have come to understand the importance of preparing students for the complex healthcare environments they will encounter upon graduation. Through this research process it is my desire to understand more clearly how we as educators can maximize the potential of simulation for the largest generational cohort to enter the tertiary setting since the Baby Boomers—the Millennials (also known as Gen Y, Net Gen, Digital Natives). Your participation in this project is voluntary and you may withdraw at any time prior to the completion of data collection.

It is important for you to understand that I am undertaking this research as part of a doctoral qualification, and not as a senior educator in nursing. As a conflict of interest may exist with these two roles, it is understood that your participation will be separate from any degree or assessment you are currently pursuing. You will not be advantaged or disadvantaged in your educational pursuits through your participation or lack of participation in this project.

What is the purpose of this research?

I would like to invite you to participate in a research project which will involve your participation in a focus group, simulation learning experience, and debriefing session which will occur in two separate sessions of two hours, and over a two week period (it is possible the group may decide to extend this time commitment). The sessions will be recorded with the intention of getting your ideas on how to improve these learning environments for undergraduate Millennial (18-30 year old) students. The aim will be to understand more clearly what is currently occurring in simulation along with a critique of what is working well and what barriers are impeding your progress. You will be asked to answer the question, "In a perfect world, what would the ultimate simulation environment look like?"

As stated earlier, this research is a part of my doctoral qualification, where I will be using the data collected to complete my doctoral thesis. I may present some of the findings at conferences and/or in refereed journals. Your involvement will be filmed and possibly used to produce a product at the end of this research which showcases how simulation implementation has changed throughout this project. It is even possible that some of these video clips will be placed on social networking sites for learning purposes (e.g. You Tube™). It is important that you understand this before participating in this project.

How was I identified and why am I being invited to participate in this research?

You have been identified and invited to participate in this research because:

- I have had interactions with you in the undergraduate nursing degree, and am no longer responsible for assessing you as part of your undergraduate qualification.
- You have been involved in simulation in your undergraduate qualification.
- You have expressed previous interest in being involved in a simulation research project.
- You are a member of the millennial generation (i.e. 18-30 years of age).

I have obtained your contact details from AUT online, or from you personally and have chosen to invite you personally due to our previous connections within the undergraduate nursing programme. If you are over 30 years of age, or are not studying in an undergraduate healthcare programme, I have excluded you from participating in this project.

What will happen in this research?

If you decide to become involved in this research project, two slots of two-hour commitments (a week apart) will be required of you. The group may decide to extend this time commitment.

Scoping phase: In the first 2-hour session you will participate in a focus group (which will be filmed) in which you will be asked to respond to the question, "If life were perfect, how could we improve our delivery of simulation so that you (the millennial student) are the most prepared for the complex, real world of healthcare you are destined for?" You will be asked to draw on previous simulation you have experienced and identify both positive aspects and challenges you have experienced as part of the simulation at this institution. This focus group will be video recorded so that your comments can be reviewed and a summary provided. You will be given a summary of the focus group so that you can reflect on the ideas over the ensuing week.

Simulation and debriefing: One week after the above focus group meeting, the same students (as a group) will be asked to write their own simulation exercise incorporating their suggestions and tapping their own creativity. They will "perform" the simulation which will be recorded and shown to the same students who will then be asked to participate in a second focus group (debriefing) to discuss the effectiveness of their simulation for preparing them for complex clinical settings. The students will be queried as to what worked (enablers), and what proved to be barriers in the simulation. This focus group (debriefing) will also be recorded to allow for data analysis at a later time.

As you work through the above stages, the group will explore details of their activities through a constant process of observation, reflection, and action (action research). At the completion of this cycle, you will review (look again), reflect (re-analyse) and discuss how the simulation could be changed to become the most effective with Millennial students. This process is not expected to be neat, and will most likely involve thinking backward through what has happened, rethinking your previous interpretations, and sometimes making radical changes in direction as you move forward. I am intending to pursue pathway #3 (thesis presented as a project report and artefact). The artefact may take the form of a visual record of a series of changes in simulation over time and/or the impact of these changes on the students involved in simulation. It is therefore possible that your performance in simulation or in focus groups may form a part of the artefact for this project.

What are the discomforts and risks?

You may find watching yourself in the video clips of either the focus groups or simulated scenarios a bit awkward or even embarrassing. This is a normal response as we see ourselves from a different vantage point. It is normal to notice things about your performance on film that are not ideal, or that you would not repeat. However, the purpose of this research is to learn how we can improve simulation, so less than perfect performances are expected and actually desired in order to stimulate discussion around how we can enhance your learning by implementing changes for the next time. I would therefore ask that you take allow yourself to risk, and to learn from less-than-perfect performances in order to assist me in adapting simulation so that it can have maximal impact for students at this institution.

How will these discomforts and risks be alleviated?

If you find that your participation in this project becomes overwhelming, you are entitled to confidential counselling support by the Health, Counselling and Wellbeing department at AUT. This free counselling will be provided by AUT's professional counsellors for a maximum of **three**

sessions and must be in relation to issues arising from your participation in this research project. If you find counselling necessary you will need to contact Kevin Baker (Head of Health, Counselling and Wellbeing) and follow the below steps:

- You will need to contact centres at WB219 or AS104 or phone **09 921 9992 City Campus** or **09921 9998 North Shore campus** to make an appointment
- You will need to let the receptionist know that you are a research participant
- You will need to provide your contact details to confirm this
- You can find out more information about our counsellors and the option of online counselling on our website:
http://www.aut.ac.nz/students/student_services/health_counselling_and_wellbeing

What are the benefits?

This research is part of the requirements for completion of my Doctorate in Health Science (DHSc). Additionally, the aim of this research is to involve students in an action research project with the intention of maximising the learning that occurs in simulated environments involving undergraduate healthcare professionals at AUT. Your participation has the potential to impact simulation for future nurses, midwives, and paramedics in undergraduate training. It is also possible that you may participate in inter-professional simulation situations as the project progresses. This type of interaction has the potential to foster communication and team building as professionals learn to work together for the benefit of patients and their families. This type of learning has the potential to keep patients safer when they are the most vulnerable, and improve the ability of healthcare professionals to respond with greater effectiveness to the complex situations they encounter on a daily basis.

How will my privacy be protected?

Your involvement in this project will not be anonymous (i.e. the research will know who you are). However, your involvement will be kept confidential as far as is possible from the rest of the staff employed in teaching undergraduate healthcare degrees at this institution, unless you chose to make your involvement known. The intention is to protect you from any untoward effects that may result from your participation or declination to participate in this research. Any quotations that are used in the writing of the research report will be anonymised in order to maintain confidentiality for all participants, unless the participants themselves seek recognition of their contribution.

What are the costs of participating in this research?

No financial cost will be involved for those who desire to participate in this project. However, two (2) two-hour blocks of time will be required, with at least 7 days separating them in order to allow for reflection between the two segments of this first action cycle.

What opportunity do I have to consider this invitation?

You will be given 14 days between the email and verbal invitation to consider whether or not you would like to respond to the invitation to be involved in this research.

How do I agree to participate in this research?

You will need to complete a Consent Form which will be emailed to you upon receiving your request to be involved in this research. The Consent Form will need to be printed, completed, and placed in Gwen Erlam's box in AA217, or emailed to gerlam@aut.ac.nz within 14 days of receiving the invitation.

Will I receive feedback on the results of this research?

The results of this research will be made available on the scholarly commons section of the AUT library website upon completion of this project.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Liz Smythe, lsmythe@aut.ac.nz, 921-9999 Ext. 7196 or

Supervisor, Anita Bamford-wade, abamford@aut.ac.nz, 921-9999 Ext. 7391

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTEK, Dr Rosemary Godbold, rosemary.godbold@aut.ac.nz, 921 9999 Ext 6902.

Whom do I contact for further information about this research?***Researcher Contact Details:***

Gwen D. Erlam, gerlam@aut.ac.nz, 921-9999 Ext. 7656

Project Supervisor Contact Details:

Supervisor, Liz Smythe, lsmythe@aut.ac.nz, 921-9999 Ext. 7196 or

Supervisor, Anita Bamford-wade, abamford@aut.ac.nz, 921-9999 Ext. 7391

Approved by the Auckland University of Technology Ethics Committee on 1 October 2012, AUTEK Reference number 12/208.

Confidentiality Agreement



Project title: Maximising simulation for millennial undergraduate healthcare students

Project Supervisor: Dr Liz Smythe, Dr Anita Bamford-Wade

Researcher: Gwen D. Erlam

- I understand that all the material I will be asked to transcribe is confidential.
- I understand that the contents of the tapes or recordings can only be discussed with the researchers.
- I will not keep any copies of the transcripts nor allow third parties access to them.

Transcriber signature:

Transcriber Name:

Transcriber's Contact Details (if appropriate):

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.....

Date:

Project Supervisor's Contact Details (if appropriate):

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Approved by the Auckland University of Technology Ethics Committee on *October 1, 2012* AUTEK Reference number *12/208*

Note: The Transcriber should retain a copy of this form.

B4 Focus Group Consent Form

Consent Form Cycle One

For use when focus groups are involved.



Project title: Maximising the potential of simulation environments for millennial health care students
Project Supervisor: Dr Liz Smythe, Dr Anita Bamford-Wade
Researcher: Gwen D. Erlam

- I have read and understood the information provided about this research project in the Information Sheet dated 25 July 2012
- I have had an opportunity to ask questions and to have them answered.
- I understand that identity of my fellow participants and our discussions in the focus group is confidential to the group and I agree to keep this information confidential.
- I understand that notes will be taken during the focus group and that it will also be video and audio-taped and transcribed.
- I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- If I withdraw, I understand that while it may not be possible to destroy all records of the focus group discussion of which I was part, the relevant information about myself including tapes and transcripts, or parts thereof, will not be used.
- I agree to take part in this research.
- I understand that the results of this research will be made available on the scholarly commons section of the AUT library website upon completion of this project.

Yes No

Participant signature:

Participant Name:

Participant contact details (if appropriate):

.....
.....
.....
.....

Date:

Approved by the Auckland University of Technology Ethics Committee on 1 October 2012
AUTEC Reference number 12/208

Note: The Participant should retain a copy of this form.

B5 Video Consent and Release Form

Consent and Release Form Cycle One

For use with photographic projects and simulated events



Project title: Maximising the potential of simulation environments for millennial health care students
Project Supervisor: Dr Liz Smythe, Dr Anita Bamford-Wade
Researcher: Gwen D. Erlam

- I have read and understood the information provided about this research project in the Information Sheet dated 25 July 2012.
- I have had an opportunity to ask questions and to have them answered.
- I understand that I may withdraw myself, my image, or any other information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- If I withdraw, I understand that all relevant information will be destroyed.
- I permit the researcher to use the photographs and video clips that are part of this project and/or any reproductions or adaptations from them, either complete or in part, alone or in conjunction with any wording for (a) student learning; and (b) conference presentation; Once I have viewed the video/audio clips, I will need to give further consent to these clips being placed in a public forum (e.g. You Tube™ or other social networking site) for educational purposes.
 - I do give permission for clips to be placed on a public forum (You Tube™, Facebook™, etc.)
 - I do not give permission for clips to be placed online (You Tube™, Facebook™, etc.)
- I understand that the photographs will not be published in any form outside of this project without my written permission.
- I understand that any copyright material created by the photographic or video sessions is deemed to be owned by Gwen Erlam/AUT and that I do not own copyright of any of the photographs.
- I agree to take part in this research.

Participant signature:.....

Participant Name:

Participant's contact details (if appropriate):

Date:

Approved by the Auckland University of Technology Ethics Committee on 1 October 2012
AUTEC Reference number 12/208

Note: The Participant should retain a copy of this form.

Observation protocols



Observation protocols for this research will involve the following processes:

- **How people will be recruited?** The methods used for recruitment in this study will be the following:
 - via invitation of an intermediary
 - via public invitation
 - via email
- **How people will be informed about the observation?** Participants will be informed about the observation through the participant information sheet which will be given to each potential participant at the beginning of the first action cycle focus group.
- **How will people consent to the observation?** Consent for the observation will be obtained before the first focus group in the form of a written consent form (see attachments)
- **What will be observed and what data will be collected?**
 - Participants in the focus group will be observed and their responses to the focus group questions will form the data for the scoping phase of the first action cycle.
 - This focus group will be audio/video recorded and the responses transcribed for future reference.
 - The second phase of the first action cycle will involve video/audio recording of a simulation event followed by a debriefing session involving the participants in the simulated event. Both of these will be video/audio taped and the sessions transcribed for future and multiple access.
- **How the data will be collected?** The data will be collected via video/audio recording and the events transcribed to facilitate future reference and multiple access.
- **How any deception involved will be managed?** Participants will be notified of the beginning and ending of the video/audio recording and any extraneous or unintentional recording will be deleted from the final files in order avoid any deception or misrepresentation of data.
- **The data collection instrument?** No data collection instrument is intended for the first action cycle.

B7 Focus Group Questions

Focus Group Questions (Cycle One)



1. Please describe the types up simulation you've been involved in up to this point in your degree programme?
2. What did you find helpful about the above simulated experience?
3. Do you still remember something that you learned during the simulation?
4. If your answer "yes" to question #3 is yes, why do you think you've retained this learning? In other words, was there something about the simulation that made it more memorable?
5. Were there any techniques used by educators or technicians during the simulation that helped/hindered what you took away from the simulation?
6. If the world was perfect, what would you design into a simulation experience in order to make it the perfect learning environment?
7. Is there anything else you want to add to this discussion that has not already been asked/commented on?

Cycle one: Email feedback questionnaire for students after revised high-fidelity simulation



1. I tried to be present in the room and not behind the glass when the simulations (2nd and 3rd ones) were taking place in order to facilitate your learning. Please indicate what difference this made if any?
2. I tried to orient you to the simulator, the skills required, and the assessment parameters required BEFORE the simulation. How did that affect your learning—if at all?
3. I tried to debrief you in a non-threatening and supportive manner after you'd completed your simulation. What are your thoughts on this? Did it help?
4. I gave you another opportunity after the first to redo the simulation in order to get an “Oscar performance” out of you. Did that help? How?

Technician Information Sheet



Date Information Sheet Produced: 26-11-12

Project Title: Maximising the potential of simulation for Millennial health care students

An Invitation

My name is Gwen Erlam, and I am currently studying to complete my Doctorate in Health Science at AUT University. I have had the privilege of 20 years of clinical nursing in the areas of intensive care, coronary care and the cardiac catheterization lab where I have witnessed first-hand the management of deteriorating patients along with being immersed in multiple critical events. The past twelve years have found me teaching nursing at various tertiary institutions across New Zealand where I have come to understand the importance of preparing students for the complex healthcare environments they will encounter upon graduation. Through this research process it is my desire to understand more clearly how we as educators can maximize the potential of simulation for the largest generational cohort to enter the tertiary setting since the Baby Boomers—the Millennials (also known as Gen Y, Net Gen, Digital Natives). Your participation in this project is voluntary and you may withdraw at any time prior to the completion of data collection.

It is important for you to understand that I am undertaking this research as part of a doctoral qualification, and not as a senior educator in nursing. As a conflict of interest may exist with these two roles, it is understood that your participation will be separate from any hired role at AUT you are currently involved in.

What is the purpose of this research?

I would like to invite you to participate in a research project which will involve your participation in a group interview around simulation as it is currently being implemented in the undergraduate nursing programme at AUT. The group interview will be recorded with the intention of getting your ideas on how to improve these learning environments for undergraduate Millennial (18-30 year old) students. The aim will be to understand more clearly what is currently occurring in simulation along with a critique of what is working well and what barriers are impeding your progress. You will be asked to answer the question, “In a perfect world, what would the ultimate simulation environment look like?”

As stated earlier, this research is a part of my doctoral qualification, where I will be using the data collected to complete my doctoral thesis. I may present some of the findings at conferences and/or in refereed journals. Your involvement will be filmed and possibly used to produce a product at the end of this research which showcases how simulation implementation has changed throughout this project.

How was I identified and why am I being invited to participate in this research?

You have been identified and invited to participate in this research because:

- In your job you facilitate and work in simulation at AUT.
- You are observing simulation at AUT on a regular basis.

What will happen in this research?

If you decide to become involved in this research project, you will be interviewed by Gwen and the session will be recorded and transcribed into a Word document. Your comments will become part of the data being collected around the research question, "How can simulation be maximised for millennial healthcare students?"

At the completion of this cycle, I will review (look again) at your comments, reflect (re-analyse) and discuss how the simulation could be changed to become the most effective with millennial students. This process is not expected to be neat, and will most likely involve thinking backward through what has happened, rethinking previous interpretations, and sometimes making radical changes in direction. I am intending to pursue pathway #3 (thesis presented as a project report and artefact). The artefact may take the form of a visual record of a series of changes in simulation over time and/or the impact of these changes on the students involved in simulation. It is therefore possible that your responses may form a part of the artefact for this project.

What are the discomforts and risks?

You may find watching yourself in the video clips, or hearing yourself on audio tape a bit awkward or even embarrassing. This is a normal response as we see ourselves from a different vantage point. However, the purpose of this research is to learn how we can improve simulation, so your comments are integral to how we can enhance student learning by implementing changes. I appreciate your thoughts which will help me in adapting simulation so that it can have maximal impact for students at this institution.

In order to ensure your comfort with this project, you will be asked to review the video data that is filmed. At this point, (i.e. directly after the video data is shot) you will have the right to remove any footage of yourself that you do not approve of.

How will these discomforts and risks be alleviated?

If you find that your participation in this project becomes overwhelming, you are entitled to confidential counselling support by the Health, Counselling and Wellbeing department at AUT. This free counselling will be provided by AUT's professional counsellors for a maximum of **three** sessions and must be in relation to issues arising from your participation in this research project. If you find counselling necessary you will need to contact Kevin Baker (Head of Health, Counselling and Wellbeing) and follow the below steps:

- You will need to contact centres at WB219 or AS104 or phone **09 921 9992 City Campus** or **09921 9998 North Shore campus** to make an appointment
- You will need to let the receptionist know that you are a research participant
- You will need to provide your contact details to confirm this
- You can find out more information about our counsellors and the option of online counselling on our website:

http://www.aut.ac.nz/students/student_services/health_counselling_and_wellbeing

What are the benefits?

This research is part of the requirements for completion of my Doctorate in Health Science (DHSc). Additionally, the aim of this research is to involve students in an action research project with the intention of maximising the learning that occurs in simulated environments involving undergraduate healthcare professionals at AUT. Your participation has the potential to impact simulation for future nurses, midwives, and paramedics in undergraduate training at AUT. Simulation has the potential to keep patients safer when they are the most vulnerable, and improve the ability of healthcare professionals to respond with greater effectiveness to the complex situations they encounter on a daily basis.

How will my privacy be protected?

Your involvement in this project will not be anonymous (i.e. the research will know who you are). However, your involvement will be kept confidential as far as is possible from the rest of the staff employed at this institution, unless you chose to make your involvement known. The intention is to protect you from any untoward effects that may result from your participation or declination to participate in this research. Any quotations that are used in the writing of the research report will

be anonymised in order to maintain confidentiality for all participants, unless the participants themselves seek recognition of their contribution.

What are the costs of participating in this research?

No financial cost will be involved for those who desire to participate in this project.

What opportunity do I have to consider this invitation?

You will be given the opportunity to decline participation in this research with no prejudice or untoward affects in regard to your employment here at AUT.

How do I agree to participate in this research?

You will need to complete a Consent Form which will be presented to you at the beginning of the group interview.

Will I receive feedback on the results of this research?

The results of this research will be made available on the scholarly commons section of the AUT library website upon completion of this project.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Liz Smythe, lsmythe@aut.ac.nz, 921-9999 Ext. 7196 or

Supervisor, Anita Bamford-wade, abamford@aut.ac.nz, 921-9999 Ext. 7391

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTEK, Dr Rosemary Godbold, rosemary.godbold@aut.ac.nz, 921 9999 Ext 6902.

Whom do I contact for further information about this research?

Researcher Contact Details:

Gwen D. Erlam, gerlam@aut.ac.nz, 921-9999 Ext. 7656

Project Supervisor Contact Details:

Supervisor, Liz Smythe, lsmythe@aut.ac.nz, 921-9999 Ext. 7196 or

Supervisor, Anita Bamford-wade, abamford@aut.ac.nz, 921-9999 Ext. 7391

Approved by the Auckland University of Technology Ethics Committee on *October 1, 2012*, AUTEK Reference number *12/208*.

Technician Consent Form (Cycle one)



For use when group interviews are involved.

Project title: Maximising the potential of simulation for millennial health care students
Project Supervisor: Dr Liz Smythe, Dr Anita Bamford-Wade
Researcher: Gwen D. Erlam

- I have read and understood the information provided about this research project in the Information Sheet dated 26-11-12
- I have had an opportunity to ask questions and to have them answered.
- I understand that identity of my fellow participants and our discussions in the interview is confidential and I agree to keep this information confidential.
- I understand that notes will be taken during the interview and that it will also be audio-taped and transcribed.
- I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- If I withdraw, I understand that while it may not be possible to destroy all records of the interview of which I was part, the relevant information about myself including tapes and transcripts, or parts thereof, will not be used.
- I agree to take part in this research.
- I understand that the results of this research will be made available on the scholarly commons section of the AUT library website upon completion of this project.

Yes No

Participant signature:

Participant Name:

Participant contact Détails (if appropriate):

.....
.....
.....
.....

Date:

**Approved by the Auckland University of Technology Ethics Committee on 1 October 2012
AUTEK Reference number 12/208**

Note: The Participant should retain a copy of this form.

Technician Group Interview Questions



1. As you have supported simulation with educators and students for several years, what benefits do you think simulation offers to the students?
2. What kinds of support from the educators coordinating the simulation is most helpful for you to get your job done when the simulation is in progress?
3. What are the most unhelpful behaviours on the part of academic staff in regards to the preparation or implementation of simulation at AUT?
4. What could lectures/clinical educators do to maximise the potential of these simulation from your perspective?
5. Were there any techniques used by educators or yourselves during the simulation that helped/hindered what you perceive students took away in the way of learning?
6. If the world was perfect, what would you design into a simulation experience in order to make it the perfect learning environment?
7. Is there anything else you want to add to this discussion that has not already been asked/commented on?

Appendix C – Action Cycle Two Documents

C1 Participant Information Sheet

C2 Video Consent and Release Form

C3 Student Evaluation of Simulation

C4 Educator Information Sheet

C5 Educator Evaluation of Simulation Day

C1 Participant Information Sheet

Participant Information Sheet (Cycle two)



Date Information Sheet Produced: 25-03-13

Project Title: Maximising the potential of simulation for Millennial health care students

Researcher: Gwen Erlam (as part of her Doctor of Health Science degree)

You are invited to complete this questionnaire reflecting on today's learning experience.

Gwen is doing an action research project seeking to improve simulation experiences. From the insights that came out of cycle one of her study she has made some changes to how she runs a simulation teaching session. She is keen to get your feedback on this learning experience.

You are under no compulsion to complete this questionnaire. Your participation (or non participation) will have no influence on your grades in this paper.

This is an anonymous questionnaire; your identity will not be known.

The feedback to give will inform the next cycle in this action research study, and also inform Gwen's ongoing teaching. This is a study where the teaching/research nexus are intertwined.

Will I receive feedback on the results of this research?

The results of this research will be made available on the scholarly commons section of the AUT library website upon completion of this project.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Liz Smythe, lsmythe@aut.ac.nz, 921-9999 Ext. 7196 or

Supervisor, Anita Bamford-wade, abamford@aut.ac.nz, 921-9999 Ext. 7391

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTEK, Dr Rosemary Godbold, rosemary.godbold@aut.ac.nz, 921 9999 Ext 6902.

Whom do I contact for further information about this research?

Researcher Contact Details:

Gwen D. Erlam, gerlam@aut.ac.nz, 921-9999 Ext. 7656

Project Supervisor Contact Details:

Supervisor, Liz Smythe, lsmythe@aut.ac.nz, 921-9999 Ext. 7196 or

Supervisor, Anita Bamford-wade, abamford@aut.ac.nz, 921-9999 Ext. 7391

Approved by the Auckland University of Technology Ethics Committee on *October 1, 2012*, AUTEK Reference number *12/208*.

C2 Video Consent and Release Form

Consent and Release Form (Cycle two)

For use with photographic projects and simulated events



Project title: Maximising the potential of simulation for millennial health care students
Project Supervisor: Dr Liz Smythe, Dr Anita Bamford-Wade
Researcher: Gwen D. Erlam

- I have read and understood the information provided about this research project in the Information Sheet dated 25 March 2013.
- I have had an opportunity to ask questions and to have them answered.
- I understand that I may withdraw myself, my image, or any other information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- If I withdraw, I understand that all relevant information will be destroyed.
- I permit the researcher to use the photographs and video clips that are part of this project and/or any reproductions or adaptations from them, either complete or in part, alone or in conjunction with any wording for (a) student learning; and (b) conference presentation; Once I have viewed the video/audio clips, I will need to give further consent to these clips being placed in a public forum (e.g. You Tube™ or other social networking site) for educational purposes.
 - I do give permission for clips to be placed on a public forum (You Tube™, Facebook™, etc.)
 - I do not give permission for clips to be placed online (You Tube™, Facebook™, etc.)
- I understand that the photographs will not be published in any form outside of this project without my written permission.
- I understand that any copyright material created by the photographic or video sessions is deemed to be owned by Gwen Erlam/AUT and that I do not own copyright of any of the photographs.
- I agree to take part in this research.

Participant signature:

Participant Name:

Participant's contact details (if appropriate):

Date:

Approved by the Auckland University of Technology Ethics Committee on 1 October 2012
AUTEC Reference number 12/208

Note: The Participant should retain a copy of this form.

C3 Student Evaluation of Simulation

Student Evaluation of Simulation (Cycle two)



1. How did you feel about coming to this simulation event today?

Please rank your simulation experience PRIOR to today's simulation on the scale below:

(Negative feelings) 1.....2.....3.....4.....5 (Positive feelings)

Words that describe your feelings about previous simulation experiences:

2. What did you value most in today's simulation experience?

3. What could educators/clinical educators do better?

4. What hindered your learning today?

5. If the world was perfect, what would you design into a simulation experience?

6. How do you feel about today's learning experience?

(Negative feelings) 1.....2.....3.....4.....5 (Positive feelings)

Words that describe your feelings:

7. Is there anything else you want to add to this discussion that has not already been asked/commented on?

Educator Information Sheet (Cycle two)



Date Information Sheet Produced: 08-08-13

Project Title: Maximising the potential of simulation for Millennial health care students

Researcher: Gwen Erlam (as part of her Doctor of Health Science degree)

You are invited to complete this questionnaire reflecting on today's learning experience.

Your feedback will help inform an action research project seeking to improve simulation experiences. It is being done by Gwen Erlam, who is working closely with Anita Bamford-Wade and the wider initiatives within the School of Nursing. The teaching/research nexus are closely intertwined. You are under no compulsion to complete this questionnaire. This is an anonymous questionnaire which you will return in a labelled, stamped envelope provided.

The feedback you give will inform the next cycle of Gwen's action research study, and also inform ongoing teaching developments within the School.

Will I receive feedback on the results of this research?

The results of Gwen's action research will be made available on the scholarly commons section of the AUT library website upon completion of this project.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Liz Smythe, lsmythe@aut.ac.nz, 921-9999 Ext. 7196 or

Supervisor, Anita Bamford-Wade, abamford@aut.ac.nz, 921-9999 Ext. 9391

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTEK, Dr Kate O'Connor, 921 9999 ext. 6038

Whom do I contact for further information about this research?

Researcher Contact Details:

Gwen D. Erlam, gerlam@aut.ac.nz, 921-9999 Ext. 7656

Project Supervisor Contact Details:

Supervisor, Liz Smythe, lsmythe@aut.ac.nz, 921-9999 Ext. 7196 or

Supervisor, Anita Bamford-wade, abamford@aut.ac.nz, 921-9999 Ext. 9391

Approved by the Auckland University of Technology Ethics Committee on *October 1, 2012*, AUTEK Reference number *12/208*.

Educator Evaluation of Simulation Day (Cycle two)



1. Please rate how you felt today's learning experience influenced **your confidence** to use simulation as a teaching tool on the below Likert scale.

Not very helpful 1 ----- 2 ----- 3 ----- 4 ----- 5 Most helpful

2. Please rate how you felt today's learning experience influenced **your enthusiasm** to use simulation with your students.

Not very helpful 1 ----- 2 ----- 3 ----- 4 ----- 5 Most helpful

3. Please rate how useful you felt today's learning experience was **overall** on the below Likert scale.

Not very useful 1 ----- 2 ----- 3 ----- 4 ----- 5 Very useful

4. What did you value most in today's learning experience?

5. What was the least helpful aspect of today's learning experience?

6. If the world was perfect, what would you design into a simulation experience in order to maximise this pedagogy?

7. How might what you've learned today change your teaching practice?

8. Is there anything else you want to add to this discussion that has not already been asked/commented on?

Appendix D – Action Cycle Three Documents

D1 Email for Student Recruitment

D2 Participant Information Sheet

D3 Student Consent Form

D4 Video Consent and Release Form

D5 Focus Group Consent Form

D6 Educator Information Sheet

D7 Educator Consent Form

D8 Email to Elicit Educator Feedback or Participation

D1 Email for Student Recruitment

Email for student Recruitment (Cycle three)



Hello Semester 6 students,

Most of you participated in my research last year when you were in semester 5. Remember that I surveyed you both before and after your simulated experience in order to understand more clearly my research question:

“How can simulation be maximised for millennial healthcare students?”

I have now taken your responses (over 50% which stated that you wanted a simulation suite of scenarios to help prepare you for your career in nursing), and prepared a suite of scenarios for you to participate in. The Nursing Council is interested in us producing some evidence as to the effect of simulation on your learning.

This opportunity will occur on four days (which Shayne has identified might work for you). The first is **March 17th (one-hour focus group March 18th)** and the second **March 24th (one-hour focusgroup March 25th)**. You will be involved in three scenarios (cardiac, shock, paediatric) which will each take 1-1.25 hours to complete and will involve a pre and post-test. You will be filmed in your final performance and you may be randomly selected to be evaluated using a simulation evaluation rubric.

Your performance in this research will in **no way impact on any mark in your semester 6 papers** and your participation will be voluntary. No preparation is required. I will follow the scenarios with a focus group so I can gain your feedback on the scenario suite. This is optional.

Participation will involve you signing up for this opportunity by emailing me with your name and the date you prefer (March 17th or 24th). You may wish to submit the names of two others that will form your group (total of 3). The slots will be populated on a first come, first served basis.

Time	Group A	Group B	Group C
0900-1015	SIM 1		
1015-1130	SIM 2	SIM 1	
1200-1315	SIM 3	SIM 2	SIM 1
1315-1430		SIM 3	SIM 2
1430-1545			SIM 3

You are under no compulsion to participate in this simulation. Your participation (or non participation) will have no influence on your grades in your current undergraduate nursing course.

Thank-you in advance for your help with this project, and for assisting us in providing evidence to the Nursing Council. Feel free to email me at gerlam@aut.ac.nz with any queries and to let me know of your interest. If you want to be involved on March 17th, you will have to reply to me by this Friday (March 14th). The cut off for those wishing to be involved on March 24th will be Friday (March 21st).

Kind Regards,

Gwen

Gwen D. Erlam
Senior Educator Nursing
Healthcare Practice
AUT Ext. 7656 Mobile: 021-046-0846
Email: gerlam@aut.ac.nz

Participant Information Sheet (Cycle three)



Date Information Sheet Produce: 10-03-14

Project Title: Maximising the potential of simulation for Millennial health care students

An Invitation

My name is Gwen and I am doing an action research project seeking to improve simulation experiences for undergraduate millennial healthcare students. This research will contribute to a doctorate in health science from AUT. From the insights that came out of cycles one and two of my study I have made changes to how I run a simulation teaching session. I am keen to get your feedback on this learning experience. If you decide to be involved, your participation in this project is entirely voluntary. You may withdraw at any time prior to the completion of data collection if you so desire.

As I am also employed as a educator in the undergraduate nursing department, it is important for you to understand that if you choose to participate, you will in no way be disadvantaged or advantaged in regards to the marks you achieve in your current papers in the undergraduate programme.

What is the purpose of this research?

This research will contribute to my qualification of DHSc (doctorate in health science). Likely research outputs from this study will include a thesis, journal articles and academic presentations, conference presentations, and potentially a suite of simulated scenarios to be used in educating undergraduate nursing students.

How was I identified and why am I being invited to participate in this research?

You have been identified as a potential participant in this research due to the fact that you are an undergraduate nursing student who falls between the ages of 18 and 30. I have chosen to invite you personally as I worked with many of you last year in simulation while you were in semester 5. Your feedback in that semester has informed the changes that I am currently trying to instigate in this third action cycle.

Your contact details have been obtained via AUT online where you are currently enrolled in the semester 6 transition to graduate nursing paper. What will happen in this research?

If you choose to be involved in this research you will participate in the following sequence of events:

- You would go through a sequence of three different simulation scenarios (cardiac, shock, and paediatric) in which you will be allowed to practice after watching a pre-briefing video podcast. Each scenario (including all elements) will take approximately 1.5 hours (for a total of 4.5 hours of simulation).
- You would be asked to complete a pre- and post-test before and after each simulation experience. You would be invited to provide written reflection on the

entire process. These tests would be given out during this event. The results from these tests will be used to inform Gwen's analysis of how well the session worked in improving your knowledge and performance during acute deteriorating conditions in practice.

- After you have been allowed to practice each scenario, your final performance will be filmed and your performance may be randomly selected to be evaluated using a simulation evaluation rubric. You will be informed of your mark if you so desire, but it will not be known to any undergraduate educator and will not impact on your grade for any undergraduate course.
- You will be invited to attend a focus group the day following the above simulated events. **This is optional.** You will be asked to give input on how the suite of three simulations worked for you, and how it could be improved. These insights will inform my ongoing teaching using simulation. This is a study where the teaching/research nexus are intertwined.

What are the discomforts and risks?

Many individuals find that watching themselves on video clips can be uncomfortable. Part of the reason for this is that it exposes blind spots in our performance that we may not have known, and can therefore make us feel vulnerable. Every attempt will be made to manage this in a safe and supportive manner.

How will these discomforts and risks be alleviated?

Every effort will be made to provide this feedback in an environment that is safe and friendly. You will not be targeted or made to feel your performance is inferior as we are all learning together. These video clips may help others who are learning to work better in acute situations. As participants in this project you will be co-researching what works best in partnership with me (Action Research). These video clips will be available for you to view and may provide helpful learning as you grow in your ability to provide safe and appropriate care. They will not be used on any social networking sites without your explicit permission, and will be used for educational purposes only.

What are the benefits?

The benefit to me as previously stated is that your participation will form the data for my third action cycle and ultimately the fulfilment of requirements for my DHSc.

The benefits to you as a participant in this study are the following:

- You may improve in your ability to respond to deteriorating conditions of various kinds
- You may extend your knowledge base in what is required of a nurse in these situations
- You may gain confidence in your ability to practice as a nurse
- You may gain in your ability to work amongst a team and inter-professionally
- You may gain an improved ability to communicate using ISBAR format thus improving collaboration and management of deteriorating conditions.

How will my privacy be protected?

You are under no compulsion to participate in this simulation. Your participation (or non-participation) will not be known to the paper leader or any other educators involved in the delivery of your current study. All video clips and pre- post-test results will remain with me and will not be known by the current paper leader. In this way your participation will remain confidential. Remembering that anonymity means that the researcher does

not know who the participant is, you will not be anonymous to me (the researcher). However, your involvement will remain confidential.

What are the costs of participating in this research?

The primary cost for involvement in this research is time. You will give approximately 3 hours of time in the simulated scenarios, and if you choose to do so, one hour in a focus group.

What opportunity do I have to consider this invitation?

The planned dates for this simulation suite are March 17th and March 24th. Focus groups (optional) will occur on the following day in both cases. Due to circumstances beyond my control, the timeframe for the March 17th scenarios will be tight and you will need to email me (gerlam@aut.ac.nz) indicating your interest. I will attempt to accommodate all requests up until March 16th (for the March 17th scenarios), and up to March 23rd for the March 24th date. Thank-you in advance for your participation.

How do I agree to participate in this research?

You will need to complete a consent form for filming, and for your participation in order to agree for this research. These forms will be available on the day of your attendance.

Will I receive feedback on the results of this research?

The results of this research will be made available on the scholarly commons section of the AUT library website upon completion of this project. You will be able to know the results of pre- and post-tests and your simulation score (if you are chosen to be evaluated by the simulation rubric) upon request.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Liz Smythe, lsmythe@aut.ac.nz, 921-9999 Ext. 7196 or secondary supervisor, Valerie Wright-St Clair, vwright@aut.ac.nz, 921-9999 Ext. 7736

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTEK, Kate O'Connor, 921 9999 Ext. 6038.

Whom do I contact for further information about this research?

Researcher Contact Details:

Gwen D. Erlam, gerlam@aut.ac.nz, 921-9999 Ext. 7656

Project Supervisor Contact Details:

Supervisor, Liz Smythe, lsmythe@aut.ac.nz, 921-9999 Ext. 7196 or

Supervisor, Valerie Wright-St Clair, vwright@aut.ac.nz, 921-9999 Ext. 7736

Approved by the Auckland University of Technology Ethics Committee on *October 1, 2012*, AUTEK Reference number *12/208*.

D3 Student Consent Form

Student Consent Form (Cycle three)



For student participation in simulation

Approved by the Auckland University of Technology Ethics Committee on March 14, 2014 date on which the final approval was granted AUTEK Reference number 12/208 AUTEK reference number

Project title: Maximising the potential of simulation for millennial health care students
Project Supervisor: Dr Liz Smythe, Dr Valerie Wright-St Clair
Researcher: Gwen D. Erlam

- I have read and understood the information provided about this research project in the Information sheet dated 10-03-14
- I have had an opportunity to ask questions and to have them answered.
- I understand that identity of my fellow participants and our discussions in the simulation experiences is confidential to the group and I agree to keep this information confidential.
- I understand that I will be video and audio-taped and that my performance may be evaluated using a simulation rubric. I understand that I may learn the scores I obtained upon request.
- I understand that I will take a pre and post-test with each scenario and that these results will be made available to me upon request.
- I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- If I withdraw, I understand that while it may not be possible to destroy all records of the simulation of which I was part, the relevant information about myself will not be used.
- I agree to take part in this research.
- I would like to participate in the focus group associated with this simulation suite?
Yes No
- I understand that the results of this research will be made available on the scholarly commons section of the AUT library website upon completion of this project.
Yes No

Participants signature:

Participants Name:

Participants contact details (if appropriate):
.....
.....

Date:

Approved by the Auckland University of Technology Ethics Committee on March 14, 2014 date on which the final approval was granted AUTEK Reference number 12/208 AUTEK reference number

Note: The Participant should retain a copy of this form.

D4 Video Consent and Release Form

Consent and Release Form (Cycle three)

For use with photographic projects



Project title: Maximising the potential of simulation for millennial health care students

Project Supervisor: Dr Liz Smythe, Dr Valerie Wright-St Clair

Researcher: Gwen D. Erlam

- I have read and understood the information provided about this research project in the Information Sheet dated March 6, 2014.
- I have had an opportunity to ask questions and to have them answered.
- I understand that I may withdraw myself, my image, or any other information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- If I withdraw, I understand that all relevant information will be destroyed.
- I permit the researcher to use the photographs and video clips that are part of this project and/or any reproductions or adaptations from them, either complete or in part, alone or in conjunction with any wording for (a) student learning; and (b) conference presentation; (c) for examination of thesis for doctorate; (d) possible future use with students at AUT for training purposes
- I understand that the photographs will not be published in any form outside of this project without my written permission.
- I understand that any copyright material created by the photographic or video sessions is deemed to be owned by Gwen Erlam/AUT and that I do not own copyright of any of the photographs.
- I agree to take part in this research.

Participants signature:

Participants Name:

Participant's contact details (if appropriate):

.....
.....

Date:

D5 Focus Group Consent Form

Consent Form (Cycle Three)

For use when focus groups are involved.



Project title: *Maximising the potential of simulation for millennial health care students*

Project Supervisor: *Dr Liz Smythe*

Researcher: *Gwen D. Erlam*

- I have read and understood the information provided about this research project in the Information Sheet dated 10-03-14.
- I have had an opportunity to ask questions and to have them answered.
- I understand that identity of my fellow participants and our discussions in the focus group is confidential to the group and I agree to keep this information confidential.
- I understand that notes will be taken during the focus group and that it will also be audio-taped and transcribed.
- I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- If I withdraw, I understand that while it may not be possible to destroy all records of the focus group discussion of which I was part, the relevant information about myself including tapes and transcripts, or parts thereof, will not be used.
- I agree to take part in this research.
- I wish to receive a copy of the report from the research (please tick one):
Yes No

Participants signature:

Participants Name:

Participants Contact Details (if appropriate):

.....
.....
.....

Date:

Approved by the Auckland University of Technology Ethics Committee on 1 October 2012 AUTEK Reference number 12/208

Educator Information Sheet (Cycle three)



Project Title: Maximising the potential of simulation for Millennial health care students

An Invitation

My name is Gwen and I am doing an action research project seeking to improve simulation experiences for undergraduate millennial healthcare students. This research will contribute to a doctorate in health science from AUT. From the insights that came out of cycles one and two of my study, I have made changes to how I run a simulation teaching session. I am keen to get your feedback on this learning experience. If you decide to be involved, your participation in this project is entirely voluntary. You may withdraw at any time prior to the completion of data collection if you so desire.

What is the purpose of this research?

This research will contribute to my qualification of DHSc (doctorate in health science). Likely research outputs from this study will include a thesis, journal articles and academic presentations, conference presentations, and potentially a suite of simulated scenarios to be used in educating undergraduate nursing students.

How was I identified and why am I being invited to participate in this research?

You have been identified as a potential participant in this research due to the fact that you are educator in the undergraduate or post-graduate programme at AUT in the school of Healthcare Practice. You are considered to have some expertise in your chosen field, and your feedback is greatly needed in order to ensure the validity and reliability of content being used in these simulated events.

Your contact details have been obtained via AUT staff address book.

If you choose to be involved in this research you may be involved in the following sections of this action cycle:

- You may be asked to give feedback on the pre and post tests as to their validity and reliability for each simulated event.
- You may be asked to be filmed in a simulation event in order to provide some exemplars for students to draw upon as they proceed through simulation.

What are the discomforts and risks?

Many individuals find that watching themselves on video clips can be uncomfortable. Part of the reason for this is that it exposes blind spots in our performance that we may not have known, and can therefore make us feel vulnerable. Every attempt will be made to manage this in a safe and supportive manner.

How will these discomforts and risks be alleviated?

Your expertise is invaluable as I am trying to put together a suite of scenarios for the students to view as exemplars of how they might perform in deteriorating situations. You will be allowed to practice these scenarios until you feel comfortable with your performance and the clips will only be used with your permission. They will not be used on any social networking sites without your explicit permission, and will be used for educational purposes only.

What are the benefits?

The benefit to me as previously stated is that your participation will form the data for my third action cycle and ultimately the fulfilment of requirements for my DHSc.

The benefits to you as a participant in this study are the following:

- You may become more comfortable with simulation as a pedagogy
- You will be allowed to share your knowledge with other educators in a collegial manner
- Your feedback will inform the suite of scenarios we are attempting to create as an additional learning platform for the undergraduate nursing students.

How will my privacy be protected?

You are under no compulsion to participate in this project. Video clips may be used as exemplars for students and staff in order to inform the ongoing development of simulation in the nursing programme.

What are the costs of participating in this research?

The primary cost for involvement in this research is time. You will give approximately 3 hours of time in the simulated scenarios, and if you choose to do so, one hour in a focus group.

What opportunity do I have to consider this invitation?

The planned dates for this simulation suite are March 17th and March 24th. Due to circumstances beyond my control, the timeframe for the March 17th scenarios will be tight and you will need to email me (gerlam@aut.ac.nz) or verbally state your ability to participate in pre- post-test review or in filming of exemplars for the simulation. Thank-you in advance for your participation.

How do I agree to participate in this research?

You will need to complete a consent form for filming, and for your participation in order to agree for this research. These forms will be available on the day of your participation.

Will I receive feedback on the results of this research?

The results of this research will be made available on the scholarly commons section of the AUT library website upon completion of this project.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Liz Smythe, lsmythe@aut.ac.nz, 921-9999 Ext. 7196 or secondary supervisor, Valerie Wright-St Clair, vwright@aut.ac.nz, 921-9999 Ext. 7736

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTEK, Kate O'Connor, 921 9999 Ext. 6038.

Whom do I contact for further information about this research?

Researcher Contact Details:

Gwen D. Erlam, gerlam@aut.ac.nz, 921-9999 Ext. 7656

Project Supervisor Contact Details:

Supervisor, Liz Smythe, lsmythe@aut.ac.nz, 921-9999 Ext. 7196 or

Supervisor, Valerie Wright-St Clair, vwright@aut.ac.nz, 921-9999 Ext. 7736

Approved by the Auckland University of Technology Ethics Committee on *October 1, 2012*, AUTEK Reference number *12/208*.

D7 Educator Consent Form

Educator Consent Form (Cycle three)

For participation in feedback and informing content



Project title: Maximising the potential of simulation for millennial health care students

Project Supervisor: Dr Liz Smythe, Dr Valerie Wright-St Clair

Researcher: Gwen D. Erlam

- I have read and understood the information provided about this research project in the Information Sheet dated 10-03-14
- I have had an opportunity to ask questions and to have them answered.
- I am willing to give feedback as to the reliability and validity of pre and post-tests to be used with the simulated suite of scenarios—drawing on my expertise as a nurse and educator of nurses.
- I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection.
- If I withdraw, I understand that while it may not be possible to destroy all records of discussion of which I was part, the relevant information about myself including tapes and transcripts, or parts thereof, will not be used.
- I agree to take part in this research.
- I understand that the results of this research will be made available on the scholarly commons section of the AUT library website upon completion of this project.

Yes No

Participants signature:

Participants Name:

Participants contact details (if appropriate):

.....
.....
.....

Date:

Approved by the Auckland University of Technology Ethics Committee on March 12, 2014 on which the final approval was granted AUTEK Reference number 12/208 AUTEK reference number

Note: The Participant should retain a copy of this form.

Email to elicit educator feedback or participation (Cycle three)



Dear Colleagues:

I am planning for data collection for my third actin cycle in which students will progress through a series of simulations in semester 6 of their training in the undergraduate nursing programme. I am planning on using pre- and post-tests of 10 questions for each scenario in order to gain an understanding of how students' knowledge is affected by the SLE. I would like to ask your assistance in checking the validity and reliability of these tests. If you would be able to give about 15-30 minutes to this validation, would you please email me at gerlam@aut.ac.nz? I will then email you the tests and associated scenarios in order for you to provide feedback.

Secondly, I would like to film several of you performing simulations in order to begin an exemplar data bank which we can draw upon as educators in order to provide students (and ourselves) with best practice in simulation. If you could help me in the making of these clips, please email me at gerlam@aut.ac.nz.

Thank-you in advance for your assistance with this project.

Kind Regards,

Gwen Erlam
021-046-0846 or
gerlam@aut.ac.nz

Appendix E – Documents used to support student learning in simulated events

Tools and Templates

E1 ISBAR Communication Tool

E2 Reference Cards for use by Students

Action Cycle Three - Scenario Templates

E3 Hypovolaemic Shock – Orientation Overview

E4 Hypovolaemic Shock - Resources

E5 Hypovolaemic Shock - Scenario

E6 Paediatric Croup – Orientation Overview

E7 Paediatric Croup – Resources

E8 Paediatric Croup – Scenario

E9 Acute Coronary Syndrome – Orientation Overview

E10 Acute Coronary Syndrome – Resources

E11 Acute Coronary Syndrome – Scenario

Action Cycle Three - Pre and Post Tests

E12 Pre-test - Hypovolaemic Shock Scenario

E13 Post-test - Hypovolaemic Shock Scenario

E14 Pre-test - Paediatric Croup Scenario

E15 Post-test - Paediatric Croup Scenario

E16 Pre-test - Acute Coronary Syndrome

E17 Post-test - Acute Coronary Syndrome

Tools and Templates

E1 ISBAR Communication Tool

E2 Reference Cards for use by Students

E1 ISBAR Communication Tool

Royal Melbourne Hospital. (2014, 13 May 2014). *ISBAR communication tool* [JPEG]. Retrieved January 25, 2014, 2014, from <http://www.royalmelbournehospital.org/www/353/files/page0001.jpg3>

Date Information Sheet Produced:10-03-14

ISBAR COMMUNICATION TOOL

<h1 style="font-size: 4em; margin: 0;">I</h1> <p style="margin: 0;">Identify</p>	<ul style="list-style-type: none"> ➤ Yourself: <ul style="list-style-type: none"> <input type="checkbox"/> name, <input type="checkbox"/> position, <input type="checkbox"/> location ➤ Receiver: Confirm who you are talking to ➤ Patient: name, age, sex, location
<h1 style="font-size: 4em; margin: 0;">S</h1> <p style="margin: 0;">Situation</p>	<ul style="list-style-type: none"> ➤ State purpose "The reason I am calling is....." ➤ If urgent – SAY SO, Make it clear from the start ➤ May represent a summary of Assessment and Requirement
<h1 style="font-size: 4em; margin: 0;">B</h1> <p style="margin: 0;">Background</p>	<ul style="list-style-type: none"> ➤ Tell the story ➤ Relevant information only: <ul style="list-style-type: none"> <input type="checkbox"/> history, <input type="checkbox"/> examination, <input type="checkbox"/> test results, <input type="checkbox"/> management ➤ If urgent: Relevant vital signs, current management
<h1 style="font-size: 4em; margin: 0;">A</h1> <p style="margin: 0;">Assessment</p>	<ul style="list-style-type: none"> ➤ State what you think is going on, your interpretation ➤ Use ABCDE approach <ul style="list-style-type: none"> <input type="checkbox"/> Airway <input type="checkbox"/> Breathing <input type="checkbox"/> Circulation <input type="checkbox"/> Disability <input type="checkbox"/> Exposure ➤ State any interventions e.g applied oxygen
<h1 style="font-size: 4em; margin: 0;">R</h1> <p style="margin: 0;">Requirement</p>	<ul style="list-style-type: none"> ➤ What you want from them – BE CLEAR ➤ State your request or requirement <ul style="list-style-type: none"> <input type="checkbox"/> Urgent review (state time frame) <input type="checkbox"/> Give approval / recommendation for further course of action while awaiting attendance eg. ECG, bloods <input type="checkbox"/> Give opinion on appropriate management

Modified from Southern Health

E2 Reference Cards for use by Students

Each student received a pocket-sized double-sided card with the following information:

(Side one)

TIMELINE IN DETERIORATING SITUATIONS

Vital signs: Temp—Pulse—Resp. BP PaO₂

Appropriate assessments

(CV, Resp., GI, GU, Neuro)

Interventions:

Medications, positioning (trendelenburg, fowlers, supine) interventions (CPR, oxygen, blood products, volume expanders, IV fluids etc.)

Assess effect of interventions:

Vital signs, reassess affected body systems (CV, Respiratory, GI, GU, and Neurological), re-check relevant lab work (ABGs, PT/PTT, haemoglobin, electrolytes, BUN, creatinine, etc.)

Repeat T-P-R-BP PaO₂

Call ISBAR report in using timeline of above events

(Side two)

ISBAR

Identify

Your name, your role, patient name, and patient location

Situation

What is going on with the patient? Why are you calling?

Background

What is the clinical background/context? What has been the timeline or course of events?

T-P-R-BP PaO₂, Interventions, T-P-R-BP PaO₂

Assessment

What do I think the problem is? Give any further relevant assessment information.

Recommendation or request for assistance

What would you like to happen? Check back for shared understanding. Assign and accept responsibility and/or accountability for your actions and theirs.

Action Cycle Three - Scenario Templates

E3 Hypovolaemic Shock – Orientation Overview

E4 Hypovolaemic Shock - Resources

E5 Hypovolaemic Shock - Scenario

E6 Paediatric Croup – Orientation Overview

E7 Paediatric Croup – Resources

E8 Paediatric Croup – Scenario

E9 Acute Coronary Syndrome – Orientation Overview

E10 Acute Coronary Syndrome – Resources

E11 Acute Coronary Syndrome – Scenario

E3 Hypovolaemic Shock – Orientation Overview

Hypovolaemic shock r/t bowel obstruction – AUT, Semester 1 2014

Debriefing/Guided Reflection	Scenario	Report to student
<p>Condition Overview:</p> <ul style="list-style-type: none"> Hypovolaemia occurs when loss of extracellular fluid volume exceeds the intake of fluid. It occurs when water and electrolytes are lost in the same proportion as they exist in normal body fluids, so that the ratio of serum electrolytes to water remains the same. Hypovolaemia should not be confused with dehydration, which refers to loss of water alone with increased serum sodium levels. Hypovolaemia may occur alone or in combination with other imbalances. Unless other imbalances are present concurrently, serum electrolyte concentrations remain essentially unchanged. <p>Causes: Hypovolaemia results from loss of body fluids and occurs more rapidly when coupled with decreased fluid intake. Causes include abnormal fluid losses such as those resulting from diarrhoea, GI suctioning, sweating, and decreased intake, as in nausea or inability to gain access to fluids.</p> <p>Causes also include third-space fluid shifts, movement of fluids out of the vascular system (trauma), or oedema formation resulting from burns, or ascites resulting from liver dysfunction.</p> <p>Signs and symptoms:</p> <ul style="list-style-type: none"> Acute weight loss, weakness, Decreased skin turgor Oliguria, Concentrated urine, increased BUN creatinine 	<p>Estimated scenario time: 15 minutes</p> <p>Guided reflection time: 15 minutes</p> <p>Target group: year 3 nursing students</p> <p>Brief summary: This case is a 45 year old male patient to a surgical ward in your hospital for acute appendicitis 48 hours ago. An acute appendectomy was performed and the client has failed to gain normal bowel sounds after the surgery. He is now complaining of abdominal pain, inability to pass flatus, and dizziness. The student will be expected to follow the standard protocols for the treatment of hypovolaemic shock.</p> <p>LEARNING OBJECTIVES:</p> <p>General:</p> <ul style="list-style-type: none"> Identifies the primary nursing diagnosis (fluid volume deficit R/T fluid shifts in bowel obstruction) Implements risk assessment—what kinds of shock could this be? Hypovolaemic, septic, cardiogenic? Implements patient safety measures Evaluates patient assessment information including vital signs, pain, and abdominal assessment Implements therapeutic communication with team and in ISBAR format Demonstrates effective teamwork 	<p>Patient Overview: Thomas Jones is a 45-year-old male developed RLQ abdominal pain about a week ago which waxed and waned. About 72 hours ago the pain became acute and sharp and he presented to the emergency department where acute appendicitis was diagnosed. He underwent an acute appendectomy 48 hours ago, at which time surgeons discovered that his appendix had ruptured. It was removed, his abdomen flushed, and he was sent to your ward for recovery.</p> <p>Patient data: male, age 45 years, weight 78Kg, height 1.75 metres</p> <p>DOB: 19-07-XX</p> <p>Hospital ID number: 987654</p> <p>Past medical history: Thomas has a history of a broken arm as a child, tonsillectomy at age 13. He is not currently on any medications except vitamins and has no allergies.</p> <p>Recent medical history: Has been really “pushing” himself lately and feels the “stress” is starting to get to him. He went out for dinner 3 nights ago and found he was so unwell he was having difficulty eating or drinking. He was having nausea and acute RLQ pain at this time.</p>

Debriefing/Guided Reflection	Scenario	Report to student
<ul style="list-style-type: none"> • Postural hypotension, Weak, rapid heart rate • Flattened neck veins • Increased temperature • Cool, clammy skin, muscle weakness and cramps <p>Management of care—nursing interventions include: Three goals exist in the emergency treatment of the patient with hypovolemic shock as follows: (1) maximize oxygen delivery - completed by ensuring adequacy of ventilation, increasing oxygen saturation of the blood, and restoring blood flow, (2) control further fluid loss, and (3) fluid resuscitation. Also, the patient's disposition should be rapidly and appropriately determined.</p> <ul style="list-style-type: none"> • Obtaining lab values: <ul style="list-style-type: none"> ○ Serum urea, serum creatinine: Volume-depleted individuals show serum urea elevated out of proportion to the serum creatinine level (ratio greater than 20:1). ○ Haematocrit higher than normal as RBCs suspended in decreased volume. ○ Monitor K⁺ and Na⁺ levels as they may be reduced or elevated. • Two large-bore IV lines should be started. • Fluid balance every 4 hours with vital signs hourly • Assess daily weights and record • Skin turgor and mucous membrane assessment q8hrs • Administer fluids or plasma expanders to replace fluids lost or shifted into intravascular space • Place bed in reverse trendelenburg position until BP is up over 100 systolic, then flat until boluses completed and BP stable at over 120 systolic. 	<ul style="list-style-type: none"> • Prioritises and implements doctors instructions appropriately <p>Scenario specific:</p> <ul style="list-style-type: none"> • Tips bed into reverse trendelenburg to ↑BP • Shows ability to identify appropriate assessments which may help with differential diagnosis (e.g. abdominal assessment, fluid volume assessment) • Able to begin volume resuscitation (either 2L .9NS or 500ml colloid with recheck of BP for effect) • Initiates check of fluid balance for last 24 hours 	

E4 Hypovolaemic Shock - Resources

Equipment checklist	Student Involvement	Potential nursing problems
<p>Equipment to have in the room for this scenario:</p> <ul style="list-style-type: none"> • Standard precautions equipment • Stethoscope • Blood pressure cuff • SpO2 monitor and probe • Thermometer • ECG monitor and leads • Oxygen supply source • Oxygen delivery devices (nasal cannula, mask, and ambu bag) <p>Medication and fluids:</p> <ul style="list-style-type: none"> • Normal saline 1000ml infusing at 75ml/hour • Tramadol 50-100mg po prn pain • Maxalon 10mg po prn for nausea <p>Documentation forms:</p> <ul style="list-style-type: none"> • Doctors instructions/DHB protocols • Observation record, medication sheet, nursing notes • Fluid balance chart <p>Manikin Details:</p> <ul style="list-style-type: none"> • Nursing Anne • Location: Surgical ward • Dress Anne in male clothing • Lying down in bed • Secure ID band with patient name, DOB, and hospital ID number 	<p>Student Performance Indicators</p> <ul style="list-style-type: none"> • Wear gloves • Identify patient name from ID band (DOB, hospital ID number) • Ask client what prompted him to ring bell • Obtain BP, pulse, RR, Temp, SpO2 • Place client in trendelenburg • Assess pain utilising pain scale • Do abdominal assessment • Administer bolus IV fluids • Monitor vital signs every 2-5 min. • Call Registrar with ISBAR report at end of scenario <p>Number of participants:</p> <ul style="list-style-type: none"> • 1 student—recorder and calling ISBAR ROLE • 1 student—doing primary assessment, giving medications • 1 student—Vital signs and airway management • 1 student—play family role to improve team communication 	<p>Acute pain related to bowel obstruction</p> <p>Defining characteristics:</p> <ul style="list-style-type: none"> • Verbal report • Changes in BP, resp. rate, AP <p>Fluid volume deficit R/T fluid shifts in bowel obstruction</p> <ul style="list-style-type: none"> • Abdomen hard to palpation • Fluid balance In=2100ml Out=300ml last 24 hours • Postural hypotension shift of > 20 beats in pulse, and drop of 20 systolic points in BP when sitting <p>Pain r/t increasing abdominal girth and lack of bowel sounds</p> <ul style="list-style-type: none"> • Abdominal girth increasing 20cm in last 4 hours • Pain 8-9/10 with no relief with medication

E5 Hypovolaemic Shock - Scenario

SIM MAN settings	Patient/manikin actions	Student interventions	Cue/prompt
<p>Initial state (0-2 min.) Heart rate: 140/minute Respiratory rate: 24/min. BP: 100/70 SpO2: 97% Temp. 37 C</p>	<p>Lung sounds: clear bilaterally Abdomen: distended and hard Vocal sounds: "It feels like my abdomen is a block of cement. The pain is '8!'" Rates pain as '8' on scale of 1-10</p>	<p>Student should do the following:</p> <ul style="list-style-type: none"> • Wear gloves • Identify patient and introduce self • Obtain vital signs & assess pain and abdomen • Ask client if passing flatus or stool • Last pain medication • Do abdominal assessment 	<p>Role member providing cue: patient Cue: if student does not look at abdomen say, "My stomach is hurting so bad I can hardly stand it. They gave me something last night but nothing since about 10pm"</p>
<p>3-6 minutes Hypovolaemia trend: HR: 160/min. Resp. rate: still 24/min. BP: 70/40 SpO2: to 97%</p>	<p>Vocal sounds: "The pain is '10' out of 10 now." I think there are black spots in front of my eyes. What is happening?" Other indicators: Eyes roll back and client groans. Patient becomes unconscious.</p>	<ul style="list-style-type: none"> • Take vital signs, note trending in BP and pulse • Report values to recorder • Place bed in trendelenburg • Give fluid bolus of 1 Litres .9NS • Continue to take vital signs every 1-2 minutes to monitor effect of fluid bolus 	<p>Role member to provide cue: patient Cue: if nurse does not act, patient will say, "All I see are black spots! Please do something!"</p>
<p>9-12 minutes Heart rate: 90/min. BP: 90/50 Resp rate: 24/min.</p>	<p>Vocal sounds (after saline bolus): "I feel a little better now."</p>	<ul style="list-style-type: none"> • Continue to monitor vital signs every 2 minutes and report to recorder • Communicate therapeutically with patient • Monitor and record vital signs (BP, AP, SpO2,) every 2 minutes • CALL ISBAR to physician requesting further orders 	<p>Role member to provide cue: primary care provider Cue (final orders):</p> <ul style="list-style-type: none"> • Transfer to ICU • Call when blood results are available (Troponin-T, CK-MB, Myoglobin), BUN, creatinine, and HCT/HGB

E6 Paediatric Croup – Orientation Overview

Impaired gas exchange R/T inflammation of croup - AUT Semester 1, 2014

Debriefing/Guided Reflection	Scenario	Report to student
<p>Condition Overview:</p> <ul style="list-style-type: none"> Croup is a common childhood illness in children under the age of 5 and is characterised by a harsh, barking cough. <p>Causes:</p> <ul style="list-style-type: none"> Croup is caused by a variety of viruses, often the parainfluenza virus that may begin as what appears to be a common cold. The barking cough that gives croup its name is caused by inflammation of the child's windpipe and voice box (trachea and larynx) that partially causes a blockage in the windpipe. Children have very small airways to begin with, so croup can cause air passages to narrow quite a bit. Occasionally, croup is caused by a bacterial infection, but this is not common. <p>Signs and symptoms:</p> <ul style="list-style-type: none"> Affects children 6 months to 6 years Stridor which often develops after a cold May develop wheezing, grunting, tracheal tug Low-grade temperature Hoarse voice and harsh barking cough 1% develop severe obstruction and require intubation <p>Management of care—nursing interventions include:</p> <ul style="list-style-type: none"> Assessment for respiratory distress (intercostal or subcostal recession, tachypnoea, use of accessory muscles). 	<p>Estimated scenario time: 15 minutes</p> <p>Guided reflection time: 15 minutes</p> <p>LEARNING OBJECTIVES:</p> <p>General:</p> <ul style="list-style-type: none"> Medications used include Paracetamol po, dexamethasone IM, and adrenaline via nebuliser. Students should review how to calculate medications based on weight. <ul style="list-style-type: none"> For infants < 12 months <ul style="list-style-type: none"> Weight(kg)=age in months + 9/2 Children 1-5 yrs <ul style="list-style-type: none"> Weight(kg)=2x(age in yrs +5) Children>5 <ul style="list-style-type: none"> Weight(kg)=age x 4 Students should recognise what is normal/abnormal in assessment of 9 month-old infant. Students should be able to state the signs of infant respiratory distress (i.e. nasal flaring, intercostal retractions, tachypnoea, subcostal and intercostal in-drawing, tracheal tug, mouth open in "air hunger." <p>Scenario specific:</p> <ul style="list-style-type: none"> Student will demonstrate how to obtain a full set of vital signs and know normal vital sign parameters for 9-month old child. 	<p>Target group: Year 3 nursing students</p> <p>Name: Dylan Afualo</p> <p>Hospital ID number: 322976</p> <p>Brief summary:</p> <ul style="list-style-type: none"> Past history: healthy, reports a "few colds" Prenatal history—mother attended all clinics, uncomplicated pregnancy Born at 39 weeks; weight 3.6kg at birth. Parent unsure of current weight. Up-to-date on immunisations Current medications: None Breastfed; foods slowly being introduced Allergies: no known food or drug allergies <p>Time: 0900</p> <p>Recent medical history: This case is a 9-month old male infant who presents to an urgent care clinical with his parent. Dylan's parent reports that he had a "barking cough" throughout the night. His parent states, "He still seems to be struggling to get air."</p>

Debriefing/Guided Reflection						Scenario	Report to student
Paediatric Vital Sign Normal Ranges						<ul style="list-style-type: none"> Students must demonstrate therapeutic communication with the parent so as to decrease stress of infant. Students will obtain weight of child through weighing, asking parent, or using formula for estimate. Students must state the procedure of administering an IM injection to an infant. Know landmarks and safety consideration when holding to prevent movement. Students must demonstrate proper documentation of medications administered, along with documentation of vital signs. Student will demonstrate ability to get swabs to test for RSV and influenza. 	<p>The mother notes that Dylan had a cold about a week ago and she thought he was “over that.”</p> <p>Student Roles:</p> <ol style="list-style-type: none"> Recorder and calling of ISBAR Respiratory assessment, give medications Vital signs and airway management
Age Group	Resp Rate	Heart Rate	Systolic BP	Weight in kilos	Weight in pounds		
New-born	30 - 50	120 - 160	50 - 70	2 - 3	4.5 - 7		
Infant (1-12 months)	20 - 30	80 - 140	70 - 100	4 - 10	9 - 22		
Toddler (1-3 yrs.)	20 - 30	80 - 130	80 - 110	10 - 14	22 - 31		
Pre-schooler (3-5 yrs.)	20 - 30	80 - 120	80 - 110	14 - 18	31 - 40		
School Age (6-12 yrs.)	20 - 30	70 - 110	80 - 120	20 - 42	41 - 92		
Adolescent (13+ yrs.)	12 - 20	55 - 105	110 - 120	>50	>110		
<ul style="list-style-type: none"> Identify any features of chronic respiratory distress—runny nose, clubbing, barrel-shaped chest. Obtain a peak flow—useful to provide objective evidence of severity of condition. Cooperation is essential so can only be obtained with children 5-6 years of age and over Inhaler/nebuliser: for severe cases use 1:1000 epinephrine ampoules at a dose of 0.5ml/kg/dose, max dose 5ml (make up to at least 4ml with 0.9% normal saline). 							

E7 Paediatric Croup – Resources

Equipment checklist	Student Involvement	Potential nursing problems
<p>Equipment to have in the room for this scenario:</p> <ul style="list-style-type: none"> • Sim infant (9 months old) • Standard precautions equipment • Paediatric stethoscope • Blood pressure cuff • SpO2 monitor and probe • Thermometer • ECG monitor and leads • Oxygen supply source • Oxygen delivery devices • Nebuliser cups for 9 month old baby along with labelled adrenaline ampoules (1:1000ml ampoules) • IM injection with labelled dexamethasone 4mg/ml <p>Medication and fluids:</p> <ul style="list-style-type: none"> • IM injection of dexamethasone 0.6 mg/kg po or IM with max dose of 12mg. Label the saline ampoules with “Dexamethasone 4mg/ml” • Nebulised adrenaline with paediatric mask (1:1000ml ampoules at a dose of 0.5ml/kg/dose with max dose of 5ml (make up to at least 4ml with 0.9% saline). • Cool-mist nebuliser <p>Documentation forms:</p> <ul style="list-style-type: none"> • Doctors instructions/DHB protocols • Observation record, medication sheet, nursing notes <p>Manikin Details:</p> <ul style="list-style-type: none"> • Preparation of Sim NewB or infant • Location: Paediatric ward Starship • Baby cot or roll bed • Secure ID band with patient name, DOB, and hospital ID number 	<p>Student Performance Indicators</p> <ul style="list-style-type: none"> • Wash hands and introduce self to parent • Identify patient name from ID band (DOB, hospital ID number) • Ask parent what prompted them to ring bell • Obtain BP, pulse, RR, Temp, SpO2 • Do respiratory assessment of child • Give IM injection of dexamethasone using proper technique • Place child on Nebulised adrenaline with paediatric mask (calculate proper dose based on weight) • Reassess respiratory status and vitals every 2-5 min. • Call Registrar with ISBAR report at end of scenario <p>Number of participants:</p> <ul style="list-style-type: none"> • 1 student—recorder and calling ISBAR ROLE • 1 student—doing primary assessment, giving medications • 1 student—Vital signs and airway management 	<p>Alteration in Respiratory function r/t inflammation associated with croup</p> <p>Defining characteristics:</p> <ul style="list-style-type: none"> • Respiratory assessment abnormal • Changes in vital signs associated with audible wheeze, stridor and/or barking cough. <p>Nursing Diagnosis:</p> <ul style="list-style-type: none"> • Alteration in Respiratory function r/t inflammation associated with croup

E8 Paediatric Croup – Scenario

SIM Infant settings	Patient/manikin actions	Student interventions	Cue/prompt
<p>Initial state (0-3 minutes) Heart rate: 150/minute Respiratory rate: 55/min. BP: 100/70 SpO2: 88% Temp. 38.5 C</p>	<p>Lung sounds: stridor, barking cough and audible wheeze</p> <p>Abdomen: abdominal retractions (if available)</p> <p>Vocal sounds: barking cough, baby groaning</p>	<p>Student should do the following:</p> <ul style="list-style-type: none"> • Wear gloves • Introduce self to parent • Identify patient using armband • Attend to ABCs, give oxygen mask • Obtain vital signs and report to recorder • Assess respiratory status (lung sounds, retractions, RR, colour, pulse ox) • Check medications to see if anything appropriate ordered • Take vital signs 	<p>Role member providing cue: patient</p> <p>Cue: if student does not proceed to assessing baby or taking vital signs, mother can say: "What's wrong with Dylan? He can't seem to get his air."</p>
<p>4-9 minutes Respiratory trend upward Heart rate trend upward HR: 170/min. Resp. rate: 70/min. with perioral cyanosis present (if available), wheezing, and stridor BP: 90/40 SpO2: to 85%</p>	<p>Vocal sounds: baby now grunting with perioral cyanosis present.</p> <p>Vocal sounds: grunting which proceeds to respiratory arrest if student does not place child on nebuliser and give IM dexamethasone</p>	<ul style="list-style-type: none"> • Take vital signs, see trending in respiratory status and reassess • Give Dexamethasone 0.6mg/kg IM with max dose 12mg (5.4mg which in 4mg/ml=1.35ml as calculated dose) • Nebulised adrenalin given (1:1000 ampoules at a dose of 0.5ml/kg/dose. You need 4.5 ml and make to 5ml with .9NS. Max dose 5ml (make up to at least 4ml with 0.9% saline) 	<p>Role member to provide cue: Mother</p> <p>Cue: "I'm worried, what are you going to do to help Dylan? He can't breathe!"</p>
<p>10-12 minutes Heart rate: 150/min. Resp. rate: 45/min. BP: 100/50</p>	<p>Vocal sounds (after saline bolus): —"I feel a little better now."</p>	<ul style="list-style-type: none"> • Monitor child closely during and after nebuliser treatment (if child is relieved and remain well 3 hours after nebuliser and steroids, they may go home). 	<p>Role member to provide cue: "Mother—so what is going to happen now?"</p> <p>Cue (final orders):</p>

SIM Infant settings	Patient/manikin actions	Student interventions	Cue/prompt
SpO2: 93%		<ul style="list-style-type: none"> • Communicate therapeutically with parent • Monitor and record vital signs (BP, AP, SpO2,) every 15 minutes until stable • CALL ISBAR to physician requesting further orders 	<ul style="list-style-type: none"> • Call physician with ISBAR report of events • Transfer to PICU for monitoring and further evaluation

E9 Acute Coronary Syndrome – Orientation Overview

Acute Coronary Syndrome – AUT, Semester 1, 2014

Debriefing/Guided Reflection	Scenario	Report to student
<p>In New Zealand the following is true:</p> <ul style="list-style-type: none"> • Cardiovascular disease (heart, stroke and blood vessel disease) is still the leading cause of death in New Zealand, accounting for 30% of deaths annually (2010 Ministry of Health Mortality data). • The CHD death rate is more than twice as high in men as in women. • Mortality rates for Maori from cardiac related disease are higher than non-Maori (2-4x higher). Therefore, Maori need to be assessed 10 years earlier for risk factors than non-Maori. • Pacific Island peoples do not have quite as high cardiac risk as Maori, higher than non-Maori. (New Zealand Health Information Service, 2001). <p>Risk Factors:</p> <ul style="list-style-type: none"> • Non-modifiable risk factors: <ul style="list-style-type: none"> ○ Family history of coronary heart disease ○ Increasing age ○ Gender ○ Ethnicity • Modifiable risk factors: <ul style="list-style-type: none"> ○ High serum lipids (LDLs) ○ Cigarette smoking ○ Hypertension ○ Diabetes Mellitus ○ Physical inactivity ○ Obesity 	<p>Estimated scenario time: 15 minutes</p> <p>Guided reflection time: 15 minutes</p> <p>Target group: Year 3 nursing students</p> <p>Brief summary: This case is a patient in the Emergency Department who is complaining of chest pain. The student will be expected to follow the standard protocols for the treatment of chest pain suggestive of ischaemia and appropriate protocols for ventricular tachycardia.</p> <p>LEARNING OBJECTIVES:</p> <p>General:</p> <ul style="list-style-type: none"> • Identifies the primary nursing diagnosis • Implements risk assessment • Implements patient safety measures • Evaluates patient assessment information including vital signs • Implements therapeutic communication with team and in ISBAR format • Implements direct communication to multi-disciplinary team members • Demonstrates effective teamwork 	<p>Time: 1330</p> <p>Patient Overview: Carl Shapiro is a 54-year-old male who travels frequently on business. He has had two previous heart attacks with subsequent stents placed in his right and circumflex arteries. He sought help in the ED and has been transferred to your cardiac ward with complaints of dull aching chest pain and shortness of breath. He is currently visiting the area on business so has no local GP. He has a 40 pk/year smoking history and drinks alcohol occasionally. He describes work as ‘stressful.’</p> <p>Additional information (medical history):</p> <p>Patient data: male, age 54years, weight 110Kg, height 1.75 metres</p> <p>DOB: 19-07-XX</p> <p>Hospital ID number: 256789</p> <p>Past medical history: Has a history of hypertension. He states he takes ‘water pills’ for his blood pressure and has been trying to exercise and lose weight but admits it is very hard when he travels.</p> <p>Recent medical history: Has been really ‘pushing” himself lately and feels the “stress” is starting to get to him. He has noticed this type of chest pain before but it usually goes away when he</p>

Debriefing/Guided Reflection	Scenario	Report to student
<p>Management of care: Management of coronary clients involves the following nursing interventions:</p> <ul style="list-style-type: none"> • Securing the airway and assessing oxygen saturation. Starting oxygen at 4L/min. until SpO2 is >92% • Administer Aspirin (chewed) • Evaluate pain and scale it (0-10) • Administer GTN (get history first and check for medications for erectile dysfunction) • Monitor vital signs closely for hypotension every 2-5 minutes • Morphine—only administered if not pain free after GTN (3 doses every 5 minutes) • 12-lead ECG obtained and evaluated within 10 min. of admission to the ward/unit • When ventricular tachycardia <ul style="list-style-type: none"> ○ CPR 30:2 when unresponsive ○ AED hooked up and shock delivered ○ CPR 30:2 again ○ AED shock delivered ○ Adrenaline after 2nd shock (1mg IV) 	<ul style="list-style-type: none"> • Prioritises and implements doctors instructions appropriately <p>Scenario specific:</p> <ul style="list-style-type: none"> • Recalls indications, contraindications, and potential adverse effects of prescribed medications • Implements the ‘5 rights’ of medication administration • Recognises signs and symptoms of an adverse reaction • Implements a focused respiratory assessment • Recalls indications and contraindications for oxygen therapy • Initiates relevant cardiac and respiratory monitoring • Applies cardiac chest pain protocol according to DHB 	<p>rests. He became worried when he began sweating and became short of breath.</p>

E10 Acute Coronary Syndrome – Resources

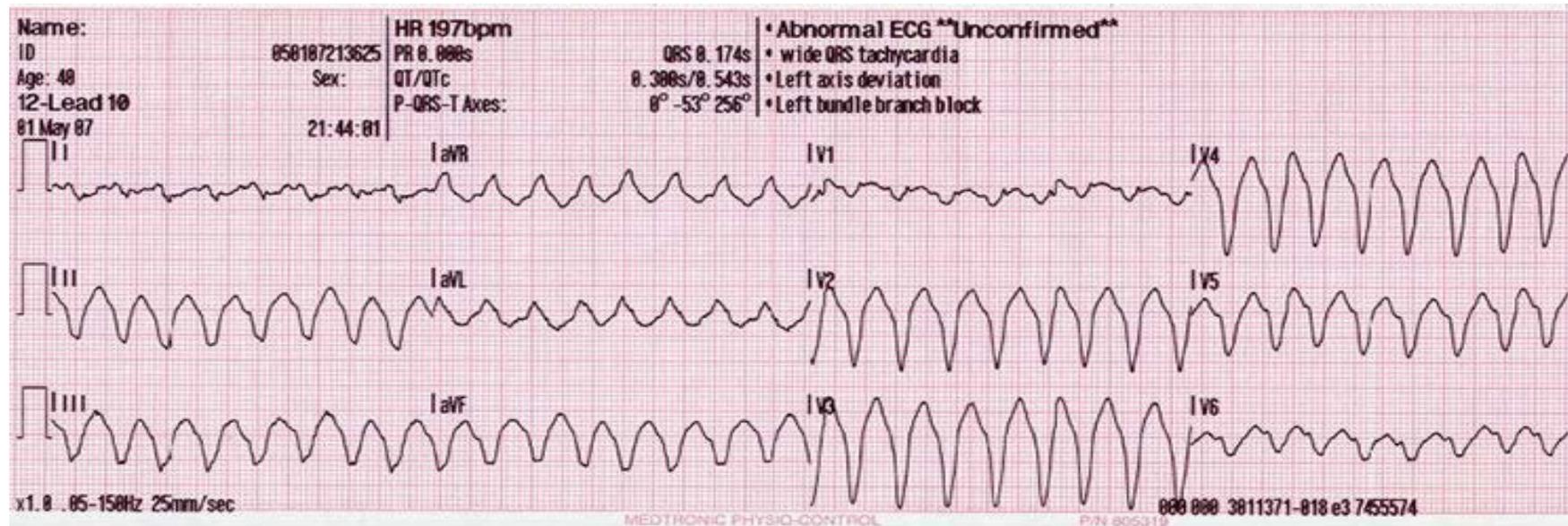
Equipment checklist	Student Involvement	Potential nursing problems
<p>Equipment to have in the room for this scenario:</p> <ul style="list-style-type: none"> • Standard precautions equipment • Stethoscope • Blood pressure cuff • SpO2 monitor and probe • Thermometer • ECG monitor and leads • Oxygen supply source • Oxygen delivery devices (nasal cannula, mask, and ambu bag) <p>Medication and fluids:</p> <ul style="list-style-type: none"> • Normal saline 1000ml infusing at 75ml/hour • Aspirin 300mg in a bottle • GTN sublingual spray 0.4mg • Morphine sulphate 10mg/10ml vial <p>Documentation forms:</p> <ul style="list-style-type: none"> • Doctors instructions/DHB protocols • Observation record, medication sheet, nursing notes <p>Diagnostic equipment:</p> <ul style="list-style-type: none"> • AED machine with pads that stick • Preparation of SimMan simulator: • Location: cardiac ward hospital • Dress SimMan in male clothing • Sitting up on the bed (semi-fowlers) • Secure ID band with patient name, DOB, and hospital ID number 	<p>Student Performance Indicators</p> <ul style="list-style-type: none"> • Gloves on • Identify patient name from ID band (DOB, hospital ID number) • Obtain BP, pulse, RR, Temp, SpO2 • Attach ECG monitor leads • Give oxygen • Assess pain utilising pain scale • Obtain 12-lead ECG if student has skills • Notify medical team (involve MDT) • Administer medications per protocol MONA • Monitor cardiovascular and respiratory state every 2-5 min. <p>Number of participants:</p> <ul style="list-style-type: none"> • 1 student—recorder and calling SBAR ROLE • 1 student—doing primary assessment, giving medications • 1 student—Vital signs and airway management • 1 student—family member 	<p>Acute pain related to cardiac ischaemia</p> <p>Defining characteristics:</p> <ul style="list-style-type: none"> • Verbal report • Changes in BP, resp. rate, AP <p>Ineffective tissue perfusion, cardiopulmonary related to interruption of flow (arterial)</p> <ul style="list-style-type: none"> • Chest pain • Dyspnoea • Arrhythmias <p>Activity intolerance related to imbalance between oxygen supply/demand</p> <p>Defining characteristics:</p> <ul style="list-style-type: none"> • Verbal report of fatigue • Electrocardiographic changes • Exertional discomfort

E11 Acute Coronary Syndrome – Scenario

SIM MAN settings	Patient/manikin actions	Student interventions	Cue/prompt
<p>Initial state (0-2 minutes) Heart rate: 140/minute Respiratory rate: 24/min. BP: 158/92 SpO2: 94% Temp. 37 C ECG: 140/min. sinus tachycardia</p>	<p>Lung sounds: clear bilaterally Peripheral pulses: strong Vocal sounds: “It feels like an elephant sitting on my chest. The pain is ‘8!’” Rates pain as ‘8’ on scale of 1-10</p>	<p>Student should do the following:</p> <ul style="list-style-type: none"> • Gloves on • Introduce self, identify patient • Obtain vital signs & assess pain • Apply ECG leads • Apply oxygen 4L/min. • Obtain 12-lead ECG • Give first dose NTG • Administer Aspirin 	<p>Role member providing cue: patient</p> <p>Cue: if student does not apply oxygen patient will say, “It feels like an elephant is sitting on my chest. Can you do something to help the pain?”</p> <p>“When will the doctor take a look at me? What do you think is happening here?”</p>
<p>2-5 minutes GTN trend: HR: 150/min. Resp. rate: Not breathing ECG: <i>VTACH this frame after 2nd GTN given</i> BP: Not obtainable SpO2: not obtainable</p>	<p>Vocal sounds: “The pain is ‘5’ out of 10 now.’ (after 1st dose of GTN) Vocal sounds: “The pain is getting worse” (after 2nd dose of GTN)</p>	<ul style="list-style-type: none"> • Administer 2nd dose of GTN & record • Continue to monitor pain and vital signs continuously • Check for responsiveness • Call for help • Commence CPR 30:2 • Apply pads AED • Press charge on AED • State, “Shock advised, stand clear, shocking now” • Deliver shock—check for responsiveness • CPR again 30:2 	<p>Role member to provide cue: patient</p> <p>Cue: if nurse does not notify doctor when space allows, family member will ask, “What is going to happen next? Is he alright?”</p>
<p>7-10 minutes Heart rate: 90/min. BP: 90/50 ECG: 90/min. Sinus rhythm</p>	<p>Vocal sounds (with hypotension):—“I feel really light-headed and I see black spots in front of my eyes.” Vocal sounds: Eyes roll back and client groans. Patient becomes unconscious.</p>	<ul style="list-style-type: none"> • Note IV LINE • Adrenaline 1mg every 2nd cycle • Provide fluid bolus for ↓BP (500ml) 	<p>Role member to provide cue: primary care provider Cue (final orders):</p> <ul style="list-style-type: none"> • Transfer to CCU

BP: 90/70,
Resp: 28/min.

- Communicate therapeutically with patient when back to NSR
- Monitor and record vital signs (BP, AP, SpO₂,) continuously
- Call ISBAR to physician and obtain orders
- Call when blood results are available (Troponin-T, CK-MB, Myoglobin)



Ventricular fibrillation and **pulseless ventricular tachycardia** are included in the Pulseless Arrest Algorithm. This is the most important algorithm in ACLS, and one that should be mastered. Both are shockable rhythms, in contrast to PEA and asystole, which fall on the right side of the algorithm.

The ventricular fibrillation and pulseless ventricular tachycardia algorithm can be found [here](#). The high resolution PDF for member download can be found [here](#).

Ventricular fibrillation is the most common rhythm experienced by patients who experience cardiac arrest. This is why so much emphasis in ACLS is placed upon learning and memorizing this rhythm and its treatment. Evidence reveals that rapid treatment of ventricular fibrillation using the ACLS pulseless arrest algorithm is the best way to achieve return of spontaneous circulation (ROSC).

The following points are essential to remember when treating a patient using the Pulseless Arrest Algorithm for ventricular fibrillation and pulseless ventricular tachycardia:

1. Until the defibrillator is attached to the patient, high quality CPR should be performed.
2. Interruptions in chest compressions should be minimized.
3. **Rapid use of the defibrillator** is the key component of treatment for VF and VT.
4. Use of an AED may involve prolonged interruptions in chest compressions for analysis of the rhythm and administration of shock. **Use a manual defibrillator if available.**
 - Stacked shocks are no longer used.
 - CPR should be resumed for five cycles between each shock.

Defibrillation and Shock

We will be using AEDs as students have not been trained in defibrillation with paddles at this point. Paramedicine has advised use of AEDs due to lack of previous skill training with paddles.

Vasopressors

Definition: A vasopressor is a medication that produces constriction of the blood vessels, with a subsequent rise in blood pressure.

In the treatment of ventricular fibrillation and pulseless ventricular tachycardia, the vasopressors used in the ACLS algorithm are **Adrenaline** and **vasopressin**. While Adrenaline is primarily used for its vasoconstrictor effects, vasopressin increases blood flow to the brain and heart, and has vasoconstrictor effects similar to those of Adrenaline.

Anti-arrhythmic

Amiodarone, lidocaine, and magnesium are the antiarrhythmic medications used in the pulseless arrest algorithm. More detailed information about these medications is located [here](#). Rhythm checks should be limited to 10 seconds and should be performed after 5 cycles of CPR, to minimize interruptions in CPR.

Action Cycle Three - Pre and Post Tests

E12 Pre-test - Hypovolaemic Shock Scenario

E13 Post-test - Hypovolaemic Shock Scenario

E14 Pre-test - Paediatric Croup Scenario

E15 Post-test - Paediatric Croup Scenario

E16 Pre-test - Acute Coronary Syndrome

E17 Post-test - Acute Coronary Syndrome

E12 Pre-test - Hypovolaemic Shock Scenario



1. What is the cause of hypovolaemic shock?
 - a) A lack of adrenaline in the body
 - b) The body experiences a stressing event
 - c) A loss of extracellular fluid volume which exceeds fluid intake
 - d) A loss of intracellular fluid volume which causes cellular dehydration
2. Which one of the following signs might NOT indicate hypovolemic shock?
 - a) A decreased appetite
 - b) Weak, rapid pulse and hypotension
 - c) Cool, clammy skin
 - d) Tachypnoea
 - e) Reduced urine output
3. Which interventions would NOT BE APPROPRIATE in managing hypovolaemic shock in a client who has undergone spinal anaesthesia?
 - a) Elevate the legs
 - b) Notify the registered nurse and/or physician immediately
 - c) Establish IV access
 - d) Check vital signs frequently
4. What kind of position does reverse trendelenburg indicate?
 - a) Sitting upright at a 90 degree angle
 - b) Lying flat in bed with knees elevated
 - c) Lying in a supine position
 - d) Lying with lower extremities lower than the head and neck
5. Which of the following lab values is NOT relevant for a client experiencing hypovolaemic shock?
 - a) Serum urea and creatinine
 - b) Serum CO2 levels
 - c) Haematocrit
 - d) K+ and Na+ levels
6. Which of the following would NOT be appropriate in the management of a client with hypovolaemic shock?
 - a) Elevate the head of the bed in order to ensure proper respiratory pattern
 - b) Maximise oxygen delivery
 - c) Control further fluid loss
 - d) Implement fluid resuscitation procedures
7. What aspects of the abdominal assessment would be abnormal in the case of a bowel obstruction?
 - a) Palpation—the abdomen will not be soft to palpation
 - b) Percussion—the percussion note would not be tympanic
 - c) Inspection—there would be visual changes
 - d) Auscultation—there would not be normal bowel sounds
 - e) All of the above would be abnormal
8. Which of the following conditions would NOT cause hypovolaemic shock?
 - a) Burns
 - b) Diarrhoea
 - c) Excessive perspiration
 - d) Seizures
 - e) Vomiting
9. When communicating using the ISBAR format, what does the “S” stand for?
 - a) S stands for “substance”—which substance is present in their blood?
 - b) S stands for “situation”—what is the situation of your patient?
 - c) S stands for “standard”—which standard nursing diagnosis are you concerned about?
 - d) S stands for “serum concentration”—what is the serum concentration of CO2 in their blood?
10. What of the following is a true statement?
 - a) Cardiogenic shock involves neurotransmitters
 - b) Hypovolaemic shock is about fluid volume in the body
 - c) Septic shock involves a kind of electrolyte shift in the body
 - d) Cardiogenic shock is always fatal

E13 Post-test - Hypovolaemic Shock Scenario



1. What is the cause of hypovolaemic shock?
 - a) A lack of adrenaline in the body
 - b) The body experiences a stressing event
 - c) A loss of extracellular fluid volume which exceeds fluid intake
 - d) A loss of intracellular fluid volume which causes cellular dehydration
2. Which one of the following signs might NOT indicate hypovolemic shock?
 - a) A decreased appetite
 - b) Weak, rapid pulse and hypotension
 - c) Cool, clammy skin
 - d) Tachypnoea
 - e) Reduced urine output
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 - a) Elevate the legs
 - b) Notify the registered nurse and/or physician immediately
 - c) Establish IV access
 - d) Check vital signs frequently
4. What kind of position does reverse trendelenburg indicate?
 - a) Sitting upright at a 90 degree angle
 - b) Lying flat in bed with knees elevated
 - c) Lying in a supine position
 - d) Lying with lower extremities lower than the head and neck
5. Which of the following lab values is NOT relevant for a client experiencing hypovolaemic shock?
 - a) Serum urea and creatinine
 - b) Serum CO2 levels
 - c) Haematocrit
 - d) K+ and Na+ levels
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 - a) Elevate the head of the bed in order to ensure proper respiratory pattern
 - b) Maximise oxygen delivery
 - c) Control further fluid loss
 - d) Implement fluid resuscitation procedures
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 - a) Palpation—the abdomen will not be soft to palpation
 - b) Percussion—the percussion note would not be tympanic
 - c) Inspection—there would be visual changes
 - d) Auscultation—there would not be normal bowel sounds
 - e) All of the above would be abnormal
8. Which of the following conditions would NOT cause hypovolaemic shock?
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 - b) Diarrhoea
 - c) Excessive perspiration
 - d) Seizures
 - e) Vomiting
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 - a) S stands for “substance”—which substance is present in their blood?
 - b) S stands for “situation”—what is the situation of your patient?
 - c) S stands for “standard”—which standard nursing diagnosis are you concerned about?
 - d) S stands for “serum concentration”—what is the serum concentration of CO2 in their blood?
10. What of the following is a true statement?
 - a) Cardiogenic shock involves neurotransmitters
 - b) Hypovolaemic shock is about fluid volume in the body
 - c) Septic shock involves a kind of electrolyte shift in the body
 - d) Cardiogenic shock is always fatal

In addition to the above 10 post-test questions, please take five minutes to answer the following reflective questions:

1. How satisfied were you with this simulated suite?

Not very helpful 1-----2-----3-----4-----5 **Very helpful**

How did the suite of scenarios affect your knowledge base in dealing with deteriorating situations?

Not very helpful 1-----2-----3-----4-----5 **Very helpful**

How did participating in this suite of scenarios affect your confidence in dealing with deteriorating client situations?

Not very helpful 1-----2-----3-----4-----5 **Very helpful**

How did participating in this suite of scenarios affect your ability to work in a team?

Not very helpful 1-----2-----3-----4-----5 **Very helpful**

2. Which role did you play in this scenario, and was it harder or easier than the other roles? Please tell why below.

- a) Recorder of data and calling ISBAR report
- b) Assessment of relevant system and medications
- c) Vital signs repeatedly and securing airway and oxygen devices

3. Which role do you think is hardest to master and why?

4. What was the least valuable aspect of your learning today? What changes would you make?

5. If the world were perfect and you could have whatever you desired, how would you alter what happened today to maximise your learning in simulation?

E14 Pre-test - Paediatric Croup Scenario

- Which organism is primarily responsible for the development of croup?
 - Streptococcal A
 - Staphylococcus
 - Parainfluenza
 - Clostridium
- What is the normal breathing rate for an infant 9 months old?
 - 30-40 breaths/minute
 - 20-24 breaths/minute
 - 50-60 breaths/minute
 - 18-20 breaths/minute
- What is the formula for estimating the weight of a 9 month child?
 - Length multiplied by age in months
 - Age divided by height
 - Age in months plus 9, divided by 2
 - Age x 4
- What medications would be appropriate in assisting with management of severe croup?
 - Vitamin C
 - Epinephrine (adrenaline)
 - Dexamethasone
 - B & C
- Where would an IM injection of medication would be given in a 9 month old child?
 - Deltoid
 - Vastus lateralis
 - Ventrogluteal
 - Subcutaneous abdomen
- In the ISBAR reporting framework what does the "B" stand for?
 - Behaviour—what is the behaviour of the client?
 - Bad—what has gone wrong with this client's management?
 - Background—what is the recent history of this client?
 - Begin—what do we want to begin to do?
- What is the normal pulse rate for an infant of 9 months?
 - 190 beats/minute
 - 120 beats/minute
 - 40 beats/minute
 - 75 beats/minute
- What are the features you might observe in acute respiratory distress?
 - Respiratory rate of 30/minute
 - Tracheal and intercostal retractions
 - Clubbing of nails
 - Good appetite
- What dose of epinephrine would be useful in an acute episode of croup for your 9 month old patient?
 - 0.5 ml of 1:10,000 solution given subcutaneously (0.5 ml/kg)
 - 1ml IM of 1:1000 solution (1ml/kg dose)
 - Nebulised epinephrine 1:1000 solution (0.5ml/kg dose)
 - 0.5 ml of 1:1000 solution given IV over 1 hour
- What causes the barking cough often heard in croup?
 - Inflammation of trachea and larynx causing narrowing
 - Excess stomach acids
 - Mucous lodged in the trachea
 - An inability to swallow

E15 Post-test - Paediatric Croup Scenario



1. Which organism is primarily responsible for the development of croup?
 - a) Streptococcal A
 - b) Staphylococcus
 - c) Parainfluenza
 - d) Clostridium
2. What is the normal breathing rate for an infant 9 months old?
 - a) 30-40 breaths/minute
 - b) 20-24 breaths/minute
 - c) 50-60 breaths/minute
 - d) 18-20 breaths/minute
3. What is the formula for estimating the weight of a 9 month child?
 - a) Length multiplied by age in months
 - b) Age divided by height
 - c) Age in months plus 9, divided by 2
 - d) Age x 4
4. What medications would be appropriate in assisting with management of severe croup?
 - a) Vitamin C
 - b) Epinephrine (adrenaline)
 - c) Dexamethasone
 - d) B & C
5. Where would an IM injection of medication be given in a 9 month old child?
 - a) Deltoid
 - b) Vastus lateralis
 - c) Ventrogluteal
 - d) Subcutaneous abdomen
6. In the ISBAR reporting framework what does the "B" stand for?
 - a) Behaviour—what is the behaviour of the client?
 - b) Bad—what has gone wrong with this client's management?
 - c) Background—what is the recent history of this client?
 - d) Begin—what do we want to begin to do?
7. What is the normal pulse rate for an infant of 9 months?
 - a) 190 beats/minute
 - b) 120 beats/minute
 - c) 40 beats/minute
 - d) 75 beats/minute
8. What are the features you might observe in acute respiratory distress?
 - a) Respiratory rate of 30/minute
 - b) Tracheal and intercostal retractions
 - c) Clubbing of nails
 - d) Good appetite
9. What dose of epinephrine would be useful in an acute episode of croup for your 9 month old patient?
 - a) 0.5 ml of 1:10,000 solution given subcutaneously (0.5 ml/kg)
 - b) 1ml IM of 1:1000 solution (1ml/kg dose)
 - c) Nebulised epinephrine 1:1000 solution (0.5ml/kg dose)
 - d) 0.5 ml of 1:1000 solution given IV over 1 hour
10. What causes the barking cough often heard in croup?
 - a) Inflammation of trachea and larynx causing narrowing
 - b) Excess stomach acids
 - c) Mucous lodged in the trachea
 - d) An inability to swallow

In addition to the above 10 post-test questions, please take five minutes to answer the following reflective questions:

1. How satisfied were you with this simulated suite?

Not very helpful 1----- 2----- 3----- 4----- 5 **Very helpful**

How did the suite of scenarios affect your knowledge base in dealing with deteriorating situations?

Not very helpful 1----- 2----- 3----- 4----- 5 **Very helpful**

How did participating in this suite of scenarios affect your confidence in dealing with deteriorating client situations?

Not very helpful 1----- 2----- 3----- 4----- 5 **Very helpful**

How did participating in this suite of scenarios affect your ability to work in a team?

Not very helpful 1----- 2----- 3----- 4----- 5 **Very helpful**

2. Which role did you play in this scenario, and was it harder or easier than the other roles? Please tell why below.
- a) Recorder of data and calling ISBAR report
 - b) Assessment of relevant system and medications
 - c) Vital signs repeatedly and securing airway and oxygen devices

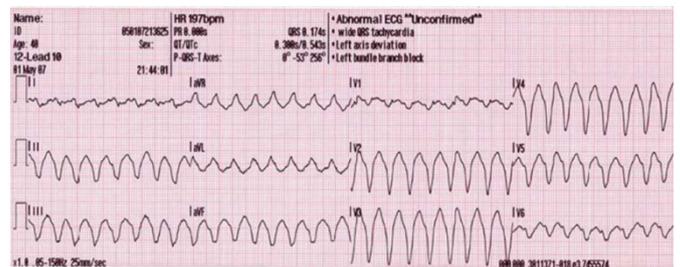
3. Which role do you think is hardest to master and why?

4. What was the least valuable aspect of your learning today? What changes would you make?

5. If the world were perfect and you could have whatever you desired, how would you alter what happened today to maximise your learning in simulation?

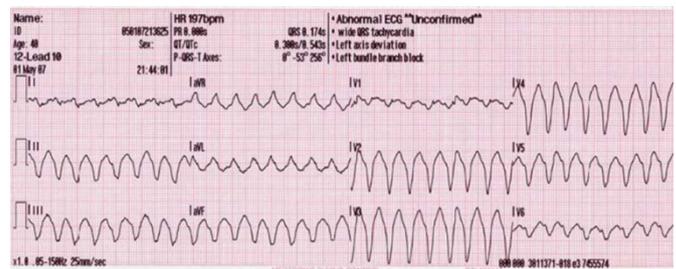
E16 Pre-test - Acute Coronary Syndrome

- What is the purpose of aspirin given early on in an acute coronary event?
 - To decrease the chest pain
 - To protect the lining of the stomach
 - To help with headaches
 - To decrease platelet aggregation
- What does the ventricular tachycardia protocol require as a *first* action?
 - Check for pulse
 - Check for responsiveness
 - Deliver shock
 - Place IV
- What tests can be diagnostic of *ischemia* in the cardiac wall?
 - CT scan
 - ECG
 - Troponin-T
 - MRI
- The two main factors influencing blood pressure are:
 - CO & SVR
 - Heart rate and SVR
 - Kidney function & heart rate
 - SVR and kidney function
- What is the formula for calculating mean arterial pressure (MAP)?
 - Systolic + Diastolic/2
 - Diastolic + heart rate/3
 - Heart rate/Diastolic
 - Systolic+2(Diastolic)/3
- What is the minimum MAP required to perfuse vital organs?
 - 10mm Hg
 - 50mm Hg
 - 120mm Hg
 - 70mm Hg
- What is the medication used specifically to dilate coronary arteries in angina?
 - Labetolol
 - Cardizem
 - Nitroglycerin
 - Aspirin
- When a person is experiencing angina chest pain, what is happening on a cellular level?
 - There is excess acid in their stomach causing irritation
 - The cardiac muscle is becoming ischaemic and dying
 - Their airways are becoming constricted decreasing oxygen availability
 - Plaques are forming in their coronary arteries
- What is the name of the rhythm to the right?
 - Sinus Rhythm
 - First degree AV block
 - Ventricular tachycardia
 - Atrial fibrillation
- What is the first and best intervention used to convert this rhythm to one which is compatible with life?
 - Adrenaline 1mg IV push
 - Adrenaline 1mg down intubation tube
 - Shock
 - CPR 30 compressions:2 breaths



E17 Post-test - Acute Coronary Syndrome

- What is the purpose of aspirin given early on in an acute coronary event?
 - To decrease the chest pain
 - To protect the lining of the stomach
 - To help with headaches
 - To decrease platelet aggregation
- What does the ventricular tachycardia protocol require as a *first* action?
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In addition to the above 10 post-test questions, please take five minutes to answer the following reflective questions:

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How did participating in this suite of scenarios affect your ability to work in a team?

Not very helpful 1----- 2----- 3----- 4----- 5 **Very helpful**

2. Which role did you play in this scenario, and was it harder or easier than the other roles?

Please tell why below.

- a) Recorder of data and calling ISBAR report
- b) Assessment of relevant system and medications
- c) Vital signs repeatedly and securing airway and oxygen devices

3. Which role do you think is hardest to master and why?

4. What was the least valuable aspect of your learning today? What changes would you make?

5. If the world were perfect and you could have whatever you desired, how would you alter what happened today to maximise your learning in simulation?

Appendix F – Executive Summary



Maximising simulation in undergraduate healthcare education

Gwen D. Erlam

Gwen Erlam

SIMULATION IN UNDERGRADUATE NURSING



Current issue: simulation haphazard in occurrence and presentation in nursing programme

Go forward plan:

1. Begin in semester 2
2. 3-4 unfolding cases
3. Nest skills in case studies
4. Link all SIM outcomes to course learning outcomes

Current issue: Staff unfamiliar with simulation pedagogy resulting in mis-educative learning environments

Go forward plan:

1. Staff apply for role to work in simulation
2. Currency maintained through on-going training

Current issue: lack of standardisation often leads to chaotic and mis-educative learning environments

Go forward plan:

1. A basic pedagogical sequence to be used for all SLEs (pre-briefing, simulation, debriefing)
2. A lesson plan integrating these learning elements submitted prior to each SLE

Current issue: simulation a resource-heavy pedagogy difficult to sustain with current staffing levels

Go forward plan:

1. Develop leadership in simulation pedagogy and equipment maintenance
2. Train senior students to mentor juniors in SLEs
3. Update equipment in order to minimise breakdown
4. Develop inter-professional simulation plan

Executive summary: Simulation in undergraduate healthcare education

Abstract

There is often heated debate as to the effectiveness of undergraduate nursing education to remain relevant and keep abreast of both societal and healthcare expectations. Students are being required to “hit the ground running,” capable of managing increasingly complex and life-threatening situations with little or no “hands-on” preparation.

The aim of this research is to explore ways to maximise simulation which mimic actual life-threatening situations in a manner which allows students to progress from novice to expert. An action research methodology using three cycles of investigation was used to explore how to maximise simulation for Millennial (aged 18-30 years) nursing students.

Students in this research reported that simulation as a pedagogy is the “preferred classroom” for Millennials due to its immersive qualities, ability to require application of theory directly to practice, multi-tasking tendencies, use of teamwork, and tie to technology. Simulation provides the perfect mix of technology and realism in a manner which is effective in preparing students for the complex clinical environments they are destined for in today’s healthcare.

Current issues in undergraduate nursing AUT

Simulation is *haphazard* in its occurrence and presentation in undergraduate nursing programme

With simulation emerging in the past 5-7 years as a major teaching/learning platform, many *educators are unfamiliar with how to use it* and therefore do what “seems” right often resulting in a non-educative learning environments.

Presentation of simulation currently *does not follow standardised sequence* of pre-briefing, SLE, debriefing and often unravels into chaos due to poor use of the pedagogy.

Simulation is a resource-heavy pedagogy which is *difficult to sustain* with current staffing guidelines.

Go forward plan

In regards to the haphazard and chance occurrence of simulation in the undergraduate curriculum, it is recommended that a *scaffolded simulation plan* be developed starting with a basic simulation in semester 2, and progressing forward in each semester building on a set of cases agreed upon by the curriculum leaders. With each semester the case will build in complexity and use

of skills. The skills will be taught before students enter the SLE so that the layering of simulation incorporating taught and clinical reasoning skills is properly maintained. The learning outcomes for each SLE will be developed from the learning outcomes of the course in which the SLE is situated in order to maintain alignment and scaffolding of the curriculum overall.

In regards to the *preparation of educators in simulation*, it is recommended that not all educators in the undergraduate curriculum participate in simulated events. This opportunity should be a role that is applied for and currency maintained through attendance at training and conferences available (e.g. through Laerdal Sun conferences and/or training). This will ensure that simulation remains both educative and effective in achieve learning outcomes in the curriculum.

In regards to *lack of standard sequence of learning objects* in simulation, it is recommended that a basic simulation sequence be adopted for all simulation (pre-briefing, simulation, de-briefing). A lesson plan incorporating each of these learning elements must be submitted at least two weeks in advance in order to allow technicians adequate time to secure both equipment and apply necessary props. This process will go far to reduce the often chaotic and confusing educative environment currently dominating the simulation labs.

In regards to meeting *resource demands* occurring in scaffolded simulation plan, it is recommended that a leadership team be developed in order to maximise both leadership and passion amongst the students and educators in simulation. A programme could be developed for the training of more senior students (2nd semester year 2 - year 3) in assisting more junior students (semester 2-3) using simulation for the peer teaching-learning benefit of both groups of students. There needs to be attention given to the purchase, maintenance, and updating of current equipment which is prone to breakdown due to over-use. After the above is in place, it would be advantageous to begin to develop collaborative relationships with other health disciplines in simulation (e.g. podiatry, physiotherapy, oral health, midwifery, paramedicine). Interdisciplinary simulation would help students develop clearer thinking around their unique professional scope and how their particular skills dovetail with other members of the healthcare team.

Conclusion

We are currently at a pivotal and unprecedented position at AUT University in the area of simulation. With the curriculum currently being revised and rolled out, there is opportunity to integrate simulation in a manner as never before. As courses are being revised, simulation can provide a thread with which to consolidate current learning outcomes and make them more applicable to clinical settings. Simulation can ensure all students are able to experience the most common types of patient deterioration and learn strategies to improve patient outcomes. Simulation provides this opportunity despite inequities in clinical placement opportunities. Its use has become the gold standard of professional clinical education in many international health training programmes. Our students at AUT University deserve nothing less.

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Appendix G – Conference Poster Presentation

Poster presented INACSL conference on Orlando, Florida, June 2014.



Coaching 'Oscar' performances out of Millennial healthcare students in simulated learning environments

Gwen D. Erlam
BSN, M.A., M.Ed.
DHSc candidate



Supervisors:
Professor Liz Smythe
Associate Professor Valerie Wright-St Clair

1. ABSTRACT

There is often heated debate as to the effectiveness of undergraduate nursing education to remain relevant and keep abreast of both societal and healthcare expectations. Students are being required to "hit the ground running," capable of managing increasingly complex and life-threatening situations with little or no "hands-on" preparation.

The aim of this research is to explore ways to maximise simulated learning environments which mimic actual life-threatening situations in a manner which allows students to progress from novice to expert. An action research methodology using three cycles of investigation is used to explore how to coach an 'Oscar' performance out of Millennial (18-30 years) nursing students.

Students in this research reported that simulation as a pedagogy is the 'preferred classroom' for Millennials due to its immersive qualities, ability to require application of theory directly to practice, multi-tasking tendencies, use of teamwork, and tie to technology. Simulation provides the perfect mix of technology and realism in a manner which is effective in preparing students for the complex clinical environments they are destined for in today's healthcare.

2. BACKGROUND—WHAT HAS CHANGED IN NURSING EDUCATION?

Undergraduate nursing education has transitioned from apprentice-based training in hospitals to baccalaureate education in tertiary institutions. This transition has resulted in a distancing from clinical environments with an increase in theoretical knowledge not necessarily tied to clinical contexts.

- The delivery of content in undergraduate nursing programmes has not changed to match the preferred classrooms of the largest generation ever to enter the tertiary setting—the Millennials (18-30 years of age)
- Theoretical concepts are learned in isolation from clinical contexts
- Skills training is often done in isolation with little clinical reasoning or rationale as to when/where it should be instigated
- A widening knowledge-practice gap exists with little linkage between the two
- Mandatory clinical hours do not ensure all students uniform exposure to deteriorating situations and how to best manage these
- Students are entering professional practice with a limited ability to communicate deteriorating situations in a manner which will result in assistance from other multi-professionals
- Simulation as a pedagogy has the ability to assist in all of the above when used to its maximum potential

3. OBJECTIVE



The aim of this research is to learn how to maximize simulated learning environments for Millennial (18-30 year old) undergraduate nursing students.

4. METHODS

The methods employed in this technical action research project included:

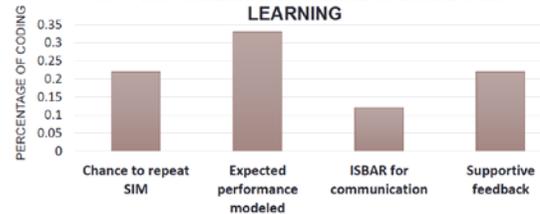
- Cycle #1:** Focus groups and filmed simulation learning event with debriefing (n=15)
- Cycle #2:** Pre- and post-simulation questionnaires (n=125)
- Cycle #3:** Pre- and post-tests (n=21), focus groups (2), and evaluation of performance using Lasater simulation rubric

5. RESULTS ACTION CYCLE #2

125 millennial students completed pre- and post-questionnaires around preferences in simulated learning



TOP FOUR MILLENNIAL VALUES IN SIMULATED LEARNING



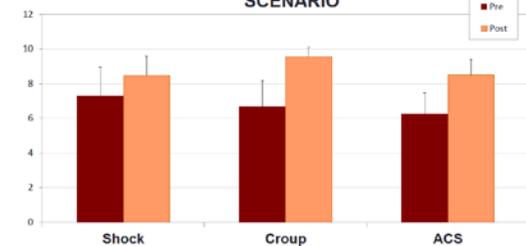
- Millennials value having an *example* of expected performance available to them ('trophy generation' doesn't want to risk failure)
- Millennials value *repeating* the simulation to embed new learning
- Millennials responded best to *supportive feedback* given in a memorable manner (short and sharp like Facebook™ and Twitter™)
- Millennials value a *sequential communication tool* (ISBAR) to help organize their communication when eliciting help in deteriorating situations

6. RESULTS ACTION CYCLE #3

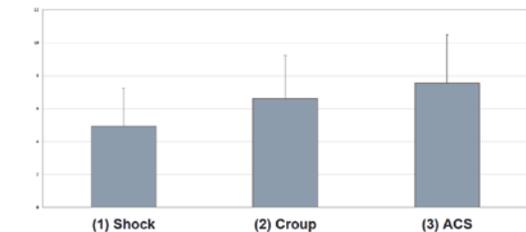
Students in third-year undergraduate progressed through a simulation suite (pre- post test, Lasater rubric evaluation, and focus group feedback:

- Students improved in mean pre- and post-tests scores after participating in scenarios
- Students also improved in average Lasater Rubric scores (SD) as they progressed through the scenarios in sequence.
- Focus group themes indicated that the students enjoyed watching their progress and could sense their improvement as they progressed through the simulation suite. They *resonate* with this kind of learning.

AVERAGE TEST SCORES PRE- AND POST- SCENARIO



AVERAGE LASATER RUBRIC SCORES (SD) FOR SCENARIOS IN SEQUENCE



7. CONCLUSIONS

- Millennials possess certain traits which make *simulated learning particularly effective* for their education.
- Millennials value an opportunity to *repeat the SLE*, view a model clip, get supportive yet concise feedback, and work in teams.
- Millennials as the '*trophy generation*' love to see themselves improve through pre and post-tests, performance rubrics, or viewing clips of their 'Oscar performances.'
- Clinical judgment* and reasoning can be improved through the use of simulation in undergraduate nursing programs.

Appendix H – Response from recommendations presented in this research

The following is the emailed response sent to me after presenting an Executive summary to the Head of School of my findings in the action cycles of this research:

September 10, 2014

Dear Gwen

Thank you for presenting your findings from your doctoral study on 'Maximising simulation in undergraduate healthcare education.'

I was already aware of the potential of simulation however your findings have added considerable weight to the importance of embedding simulation into the curriculum of our clinical disciplines. Your findings have provided evidence of the value of simulation within an undergraduate curriculum.

As a result of our meeting I am going to embark on building a business case for expanding simulation across the clinical areas. I see the opportunity for the university to become a 'Simulation Centre of Excellence' in New Zealand. I would see your involvement in developing the business case as being vital.

Best wishes and I look forward to continuing to work with you as we develop simulation in the coming years.

Congratulations on your research to date

Kind regards

Peter

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