EMERGENCY CARE PRACTITIONER STUDENTS' SATISFACTION WITH SIMULATION ACROSS TWO UNIVERSITIES IN SOUTH AFRICA.

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DECLARATION

I, Helen Slabber, hereby declare that the work on which this dissertation is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university. I empower the university to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever.

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Marcus, this one is for you my love.

ABSTRACT

Background

Simulation learning is an educational strategy that has been used in South African Emergency Care Practitioner training for at least a decade. No authors had previously measured the satisfaction of South African ECP students with simulation learning.

Objective

The objectives of this study were to explore the simulation satisfaction of students from two universities in South Africa, and to describe the simulation satisfaction using descriptive statistics.

Methods

This cross-sectional, descriptive, quantitative study used an English, electronic version of the SSES with one item from the tool deleted.

Results

A total of 81 students participated in the study - 32 from Nelson Mandela University (NMU) (39.5%) and 49 (60.5%) from the University of Johannesburg (UJ). Statistically significant differences were noted between the two groups in all three factors between the students from NMU and UJ: debriefing and reflection (median = 3.5 vs median = 4.2; p = 0.000; r = 0.5), clinical reasoning (median = 3.6 vs median = 4.0; p=0.002; r = 0.3.) and clinical learning (median = 3.7 vs median = 4.0; p=0.005; r = 0.3).

Conclusions

Students from both universities have had an overall positive experience of simulation learning, the students from UJ reported higher levels of satisfaction with simulation. These data provide important information for ECP student educators and highlight areas of satisfaction as well as dissatisfaction with simulation learning. This study also indicates that further research is required into the ECP student experiences of simulation learning in South Africa.

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ACRONYMS AND ABBREVIATIONS

ACLS	Advanced Cardiac Life Support
ALS	Advanced Life Support
AFJEM	African Journal of Emergency Medicine
BTech EMC	Bachelor of Technology in Emergency Medical Care
B.EMC	Bachelor of Emergency Medical Care
CPUT	Cape University of Technology
CPR	Cardio-pulmonary resuscitation
DUT	Durban University of Technology
ECP	Emergency Care Practitioner
EC	Emergency Centre
EFA	Exploratory Factor Analysis
EMC	Emergency Medical Care
EMS	Emergency Medical Services
HPCSA	Health Professions Council of South Africa
ICU	Intensive Care Unit
NDip EMC	National Diploma in Emergency Medical Care
NMU	Nelson Mandela University
OSCE	Objective structured clinical examination
SATLAB	Simulation assessment tool for limiting assessor bias
SSES	Satisfaction with simulation experience scale
SSSL	Student satisfaction and self-confidence in learning scale
UJ	University of Johannesburg
WIL	Work integrated learning

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CHAPTER 1: INTRODUCTION

1.1 Background

Simulation learning is an educational strategy that is used widely within medical education. It employs the use of mannequins and false environments that mimic reality instead of live patients, in order to facilitate the teaching and learning process. The birth of simulation for teaching and learning occurred in 1911 with the introduction of “Mrs. Chase”, a life size mannequin. This was the brainchild of Ms. Lauder Sutherland. This mannequin was used to mimic a human and to teach midwifery skills.(1) Since then the use of mannequins for patient simulation and clinical teaching has become increasingly common.(1) For the purposes of this study, a simulation is considered to be the process of using a simulator or simulators, to teach and learn skills and recreate the elements of a clinical situation.(2) A simulator may include any instrument used to simulate the “real thing”, including screens to simulate environment, mannequins to simulate human patients or skills trainers to simulate specific body parts (e.g. IV arms or intubation heads). Simulation can however also include paper-case based thought vignettes, simulation with computer programmes, or can even employ the use of live patient actors.(2)

Using a mannequin for learning instead of practicing on humans removes patient risk and as such, the use of simulation in medical education has become popular in the last decade since 2010.(3–6) That said, simulation does not entirely replace interaction with real patients, especially in the development of attributes such as bedside manner.(7) Instead, it is considered as a method of developing certain competencies and skills that would better enable students to manage patients within the real world setting.(7)

As an educational strategy, simulation has been found to compare favourably with that of theory lectures in the realm of clinical skill performance.(7–9) Simulation leads to skill acquisition (8,10–12), and improves student confidence (13,14) and is thus generally considered to be an important educational strategy, specifically within the fields of nursing, medicine, emergency medicine and emergency medical care (EMC).

1.1.1 Education of Emergency Medical Care students

Emergency Medical Care (EMC) is the field of study in South Africa that produces Emergency Care Practitioners through completion of a four-year full-time degree. The full-time degree is still relatively new, with the first graduates having registered in 2006 at the University of Johannesburg. Previously a three-year National Diploma was available, which produced advanced life support (ALS) paramedics. In 2000 the first part-time, two-year Bachelor of Technology in Emergency Medical Care became available, for those paramedics who already held a three year National Diploma in EMC.

Across South Africa, EMC students are trained in both medical rescue as well as emergency medical care during their four years of study. Four universities are currently accredited by the HPCSA to offer the four-year degree in Emergency Medical Care in South Africa: Cape Peninsula University of Technology; Durban University of Technology; Nelson Mandela University and the University of Johannesburg.

Simulation learning has been used as an educational tool within the EMC realm in South Africa for more than a decade. (15) Simulation is used for both the EMC aspects and rescue aspects of EMC student training. For rescue training, simulation is traditionally used in its most basic form, through the use of a life-size, low-fidelity adult mannequin which weighs approximately 80kg. In these scenarios, the mannequin is most often simply used to mimic the weight and dimensions of a real human, without any physiological response or treatment. This is not always the case in all rescue training though, as some universities are adding more focus on the medicine involved in the rescue, and using higher fidelity mannequins for this purpose. (16)

For the Emergency Medical Care aspect of EMC student education, simulation learning is used extensively at all four institutions that offer the degree. (17–20) Skills trainer mannequins such as an intravenous catheterisation arm, or intubation head are used to teach skills without clinical context. These skills are generally repeated multiple times until a student consistently achieves success. Within the realm of EMC, the use of a skill trainer to complete a specific skill with limited variation in clinical outcome is generally called an OSCE. When EMC educators and students refer to

simulation (or a sim), they are most often referring to a simulation learning or assessment experience that is characterised by the use of a medium to high fidelity, full body mannequin, set in a clinical context and the expectation that the student must treat the patient holistically as opposed to only performing a certain skill set.(21) The clinical context may be created by use of a realistic (high fidelity) environment such as a skills lab that has been designed to look like a hospital, or the inside of an ambulance, or in lower fidelity environments the context may have to be described verbally by the prompter. Simulations most often have a prompter who will provide information that the student cannot establish by looking at the mannequin or the environment. In high fidelity (high realism) simulation, the prompter tries to minimize the amount of information that has to be provided to the student verbally, because the high fidelity mannequin can mimic certain physiological responses, such as breathing – chest wall moves up and down, whilst a speaker within the chest wall creates breath sounds that are audible with a stethoscope. A simulation can last between 15 minutes for a simple first year simulation, to more than an hour in the case of senior student simulations.

During the simulated case, the student has a partner to assist them. This partner may perform low level skills but may not assist the student in clinical decision making or procedures that are on an advanced life support level. This is because in South Africa, the standard practice is for an advanced life support practitioner to work alone on a response vehicle or with a partner that has a lower qualification on an ambulance and as such will not routinely have someone who can assist them in clinical decision making once they are qualified.

An example of a clinical simulation is:

The student is told by the prompter that they have been dispatched to a patient who has been involved in a motor vehicle accident. The student is told that the time of the incident is 10:00 and the current temperature outside is 24 degrees Celsius. If the student asks other questions regarding the presence of bystanders that can possibly assist, such as police officers or firemen, they will be prompted accordingly. The student may also ask questions regarding the approximate speed of the vehicle etc.

The simulation starts. The student walks toward the patient that is lying on the floor of the simulation laboratory or classroom (after having been ejected from the vehicle), and speaks to the patient as if they are a real person. The student makes a concerted effort to determine what the patient's level of consciousness is, and when the student elicits a pain response, the mannequin (or the prompter in the case of a low fidelity mannequin) will then moan. The student will be prompted that the patient does not open their eyes after the painful stimulus. The prompter will add that the patient exhibits a decorticate response to the painful stimulus. The student will then ask their partner to attach a three lead ECG and pulse oximeter, before taking a blood pressure and respiratory rate. Whilst their partner continues the student should perform a rapid trauma survey which will indicate that the patient has a traumatic head injury, with noticeable depressed skull fracture in the parietal region. The rapid trauma survey yields no other findings. The pulse oximeter reading measures 82% and the patient's respiratory rate is 8 breathes per minute. The student then instructs their partner to start ventilation with a bag-valve-mask ventilator with oxygen attached, in order to increase the percentage of inhaled oxygen as well as supplement the ventilation rate. The student now needs to take into consideration all of the information that they have learned to make clinical decisions regarding the treatment of the patient. The patient's haemodynamic status and provisional diagnosis will guide the intravenous fluid administration plan; and the prompted distance to hospital and clinical status of the patient will affect whether he student decides to perform rapid sequence intubation (RSI) in order to secure the airway of the patient. This is where clinical reasoning is tested. The student needs to make these clinical decisions on their own, and manage any consequences that arise from their actions. Whatever interventions the student chooses to perform, is completed on the mannequin – if the student chooses to perform RSI then they need to place an IV line in the mannequin, deliver the drugs required for the procedure in the correct doses, and then intubate the mannequin successfully. This whole process tests the student's clinical reasoning ability, as well as their procedural competence. Being competent at a procedure but performing it at the wrong time will be deleterious to the patient.

After the simulation the educator will start to debrief the student or to facilitate the peer debriefing process. The educator or the student's peers, may discuss the simulation in detail with the student, focusing on areas that were performed well and areas that require improvement.

Due to the fact simulation does not entirely replace interaction with real patients, specifically the development of bedside manner, students from each year of study in the two departments still have specific skill requirements that need to be performed on human patients for the student to be able to proceed to the next year of study.(22–25) Skill performance on a human patient provides the necessary anatomical variety and human interaction necessary to improve the student's clinical skillset in preparation for independent practice when they qualify.(6) However, students are generally not allowed to perform clinical skills on patients unless they have been found competent to do so in the simulation laboratories. Detailed descriptions of simulation at Nelson Mandela University and University of Johannesburg are included (Appendix 4 and 5).

1.1.2 The Importance of Satisfaction with Simulation Learning

When students are satisfied with their learning experience, they will be engaged in their learning process and enjoy meaningful leaning. An environment in which a student is satisfied with their simulation learning experiences, promotes a student to become actively engaged in the learning experience, and promotes enthusiastic participation.(26) A student's satisfaction with a teaching method also impacts on their capacity to advance their skills and knowledge. (27) Exploring the student satisfaction with simulation can yield data that may be used to improve current methods, in such a way that improved satisfaction is experienced and in turn, learning is improved.(27)

In 2011 Levett-Jones et al. published their work in which they developed the Satisfaction with Simulation Experience Scale.(28) This instrument looked at three realms within simulation learning and how satisfied the students were with each realm. The three realms that the tool explores are: debrief and reflection; clinical learning and clinical reasoning.

Developing good clinical reasoning skills is paramount for an ECP student, in order to practice safely once they are qualified and working on their own. Simulation provides

an avenue to safely practice clinical reasoning, in a setting where a real patient cannot be harmed, should the student make the incorrect clinical decision. The clinical learning experience that simulation learning affords a student is also vitally important. Despite the fact that students at both NMU and UJ are exposed to reals patients during work integrated learning shifts, there is never any guarantee regarding what sort of caseload a student will be exposed to when dealing with real patients. One student may see several patients with seizures during their WIL shifts, throughout their university career, whereas another student may never see any patients with seizures. Simulated cases allow the students to learn how to practically manage cases that they would have learned about in case studies during theory classes, despite possibly never seeing a real case before they qualify. Debrief and reflection are skills that are crucial to any student engaging in the process of learning. The lecturer should always debrief the student after the simulation, providing constructive feedback and highlighting areas that require attention. This allows the student an opportunity to reflect in the criticism and praise that they received and allows them to incorporate the suggested changes into their practice.

Therefore, we undertook a study to explore the level of satisfaction amongst the students at the two universities with their simulation learning as the simulation learning practices that the educators engage in at the two universities differ somewhat.

1.2 Aims and Objectives

The aim of this study was to determine simulation satisfaction among ECP students from two universities in South Africa.

The objectives of this study were to:

1. Explore the simulation satisfaction of students from two universities in South Africa, through the use of a validated questionnaire.
2. Describe the simulation satisfaction of students from two universities in South Africa, using descriptive statistics.

1.3 Motivation for the study

There is a paucity of literature regarding the satisfaction with simulation learning amongst ECP students in South Africa. Since we did not know whether the students were satisfied with simulation learning as an educational tool, we also did not know whether they are as actively and meaningfully engaged in their learning process as they can be. Both the UJ and NMU departments of EMC use clinical learning, clinical reasoning and debriefing and reflection to develop their EMC students' clinical skills and critical thinking. It was therefore appropriate to use an instrument that had been developed to look at the students' satisfaction with simulation, with regards to these aspects of simulation learning in the South African context.

The researcher explored and described the satisfaction with simulation amongst Emergency Care Practitioner (ECP) students from these two universities in South Africa.

1.4 Summary

Students from both NMU as well as UJ engage in simulation learning which may be satisfactory or dissatisfactory to them as an educational strategy. If the execution of the debriefing and reflection, clinical learning, or clinical reasoning aspects of simulation learning as an educational strategy are poor, then it will be detrimental to the student's learning experience. Both universities' departments of EMC acknowledge the value of the students' perceptions of their satisfaction with simulation learning as it is currently offered at the university which they attend.

Chapter 2 is a literature review that introduces the history of simulation learning, the aspects of simulation learning that are important, as well as highlighting the gap in knowledge regarding the student satisfaction with simulation learning in South Africa. Chapter 3 describes the design and methodology employed in this study, describing exactly how this study was performed. Chapter 4 presents the findings of this study in a tabulated format. Chapter 5 discusses the findings from chapter 5, and provides the researcher's interpretations of the findings. Chapter 6 describes the researcher's

conclusions based on the findings and the interpretation. Chapter 7 contains the recommendations that the researcher has based on this research.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter provides a literature review regarding simulation learning and satisfaction with simulation learning as an educational tool. This literature review aims to illuminate the reader with regards to the history, value and purpose of simulation learning; the significance of clinical reasoning in a health care professional's education; the importance of clinical learning; the implications that adequate or inadequate debriefing and reflection have on a student's educational experience; as well as satisfaction with simulation as a measure of simulation as an educational strategy.

The data contained in this review were identified through searches of PubMed, Google Scholar and targeted African journals. PubMed was searched for "(Simulation [Title/Abstract]) AND (Satisfaction [Title/Abstract])". African Journal of Health Professions Education African Journal of Nursing and Midwifery & International Journal of Africa Nursing Sciences & African Journal of Emergency Medicine were searched for "simulation learning". Google scholar was searched for the terms "simulation learning", "paramedic student simulation", "clinical reasoning in simulation", "clinical learning in simulation", "simulation satisfaction" and "debriefing in simulation". The work of Tracey Levett-Jones was explored in order to identify literature that was relevant to this review as the tool used for this study was designed by Levett-Jones et. al. and because she has published extensively on the three constructs that are explored in the tool used in this study. This literature review included literature regarding simulation learning in fields other than EMC, due to the paucity of literature in this field. The majority of the literature regarding simulation learning in health care professional education, is in the realm of nursing. Literature that had not been published or translated to English, Afrikaans or Dutch was excluded from the literature review as the researcher was unable to understand anything published in languages other than those mentioned above. One study that was published in Korean was considered, as the results were numerical and abstract was translated into English. The literature search focussed primarily on literature that had been published in the last ten years although some earlier publications were considered due to their importance.

2.2 Simulation learning as an educational tool

In the teaching of critical thinking, clinical reasoning and patient management, simulation has been found to be a superior educational tool when compared to traditional learning techniques. (5,14,29–32) In Miller's framework for clinical assessment, simulation assessment falls under the category of "shows how" and clinical practice is "does".(33) "Shows how" refers to a student's ability to demonstrate competence in a skill, whereas "does" indicates the ability of a student to demonstrate competence in a skill in the context of a real patient.

Figure 1. Miller's Framework of Clinical Assessment. (33)

The diagram above indicates that, in the context of Miller's framework, simulation assessment is closer to true clinical practice than the assessment of theory knowledge is, therefore using it as an assessment tool in health care education is vital. (34) Clinical scenario simulation for assessment of ALS paramedic students in South Africa has been described by Campbell et. al.(21) Clinical scenario simulation is used to develop a student's clinical practice and clinical reasoning. (7) Simulation is a critical part of the clinical skill development process, and plays a big role in bridging the gap between theory and clinical practice in a patient context. (35) This form of simulation learning has been used to teach nursing students, medical students, and paramedic students.(36–38)

Simulation in paramedic, nursing and medical doctor training develops the critical thinking and clinical reasoning required to safely treat a patient. (39–42) Once a student has mastered a technique in a simulated environment, they can then endeavour to attain the same skill in a clinical environment, in a safer fashion than if they had never had the opportunity to learn through simulation first. (3,14) Nearly a decade ago, Murray et al. noted a lack of data that report on the consequence of simulation practice on clinical practice, insinuating that it may not be a powerful enough instrument to safely replace practice on a real human patient. (43) However, the greatest advantage of simulation is that simulation provides a learning opportunity where the risk of patient harm is eliminated. (1–4,8,11,17,20,22,25, 27,29,31,42–44)

Beyond the removal of risk to patients, simulation is an effective way to teach psychomotor skills.(50) These are not the only benefits of simulation. In 1987 McDonald described the advantages of simulation learning (51) as:

- Having variables that can be controlled.
- Learning time can be maximized.
- Ethical concerns are minimized.
- Experimentation and failure are allowed.
- Self-evaluation is promoted.
- Feedback can be elicited.
- Decision making can be learned effectively."(50)

With the prospect of patient harm removed, simulation becomes a memorable, and potentially powerful learning experience in a controlled environment.(29) It is this "lack of potential patient harm" that makes simulation appealing as an educational technique to students and educators alike.(52) Nursing students have reported that the possibility of "hurting the patient" in a real clinical scenario is something that scares them, and so by using a mannequin that cannot be injured or harmed, this pressure is removed.(52) Simulation learning can however be psychologically challenging for students. Muldoon et. al described how students found simulation OSCEs to be very stressful experiences, indicating that there may be risk to the student's wellbeing when they engage in simulation.(53)

The safety and consistency of simulation learning are two contributing factors as to why the two universities in this study use scenario-based simulations to prepare the ECP students to manage emergency cases in the real-world environment. In both Departments of EMC, simulation is used extensively for teaching, learning and assessment in conjunction with traditional learning techniques and clinical practice.(21) Hobgood et. al. described how simulation should form part of emergency medicine specialist training which is specifically pertinent to the African context.(54) The fact that South African EMC students need to be proficient with emergency skills would indicate that they, along with other African students, should benefit from simulation learning.

2.3 Simulation Learning in Africa

Simulation learning has been described in an African context by a number of authors, although the volume of African literature is far from comparable with that of first world countries. The African literature often describes simulation in resource constrained settings, as one would expect from a developing nation. The African literature speaks to the following concepts:

Hobgood et. al. have the view that simulation learning is important in Emergency Medicine training.(54) This is echoed by Treadwell who reports that simulation learning is highly effective for teaching, learning and assessment of emergency skills.(55) Treadwell and Havenga also noted that inter-professional simulation learning has a valuable role to play in the African context.(56)

In Ghana, simulation learning is considered to be one of the most helpful learning tools for physician assistants, who make up a vital part of the Ghanaian health care system.(57) African countries like Ghana face many challenges that first-world countries do not, such as resource limitations. Cattermole et.al. propose that models of low-fidelity simulation should form part of the Freely Accessible Medical Education for Africa curriculum, due to its value as an educational technique.(58) At times, first-world countries partner with developing nations, to make simulation learning available. An example of this is that students in Rwanda benefitted from a Canadian-Rwandan partnership, whereby a simulation and skills centre was developed in Rwanda.(59)

These sorts of collaborations allow third-world countries to become self-sufficient through development of their medical education systems.

A study in Kenya however, identified that EMS personnel had difficulty applying theory knowledge to clinical practice in a simulated setting.(60) This led to a recommendation that the training of these personnel becomes more oriented toward critical thinking and clinical reasoning (60), which could be done through the use of well-designed simulation learning.(61) This indicates that the type of simulation learning that is executed needs to be well constructed in order to be beneficial to African students due to their culturally diverse backgrounds.

Simulation learning is described by a number of authors in South Africa (21,55,62–64) and other countries within the SADEC region such as Lesotho and Botswana. These two countries have demonstrated the successful implementation of simulation learning as an educational strategy despite their resource constraints.(65,66) Simulation learning has helped these students to develop the clinical reasoning that they require to treat patients. (55,62–66)

Development of clinical reasoning skill environment is vital for health care practitioners who work in an emergency medicine environment.(54) In order to create the best learning experience for a health science student, simulation learning should aim to develop the student's clinical reasoning and clinical practice, and this learning should be supplemented by excellent student debriefing and reflection.(28)

2.4 Clinical reasoning

Clinical reasoning is a metacognitive concept that encompasses both clinical decision making and critical thinking.(67) Clinical decision making combines the health care practitioner's knowledge, skills and attitudes with their critical thinking in order to select their course of action with regards to patient treatment.(68) Clinical reasoning extends further in that it encompasses: the patient's diagnosis; the patient's needs; the practitioner's logic about the diagnosis and care planning process; and the environment in which the patient is treated.(12)

Clinical reasoning was defined by Banning in 2008 as "utilising one's knowledge and expertise to seek a solution in a clinical situation."(32) Hoffmann considers clinical

reasoning to be a process whereby information is gathered and interpreted, the problem is understood, interventions are planned and performed, the consequences of those interventions are evaluated and finally learning takes place after reflection on the entire process.(69) Levett-Jones et al. depicted the eight distinct steps of the clinical reasoning cycle in a figure in 2010.(68)

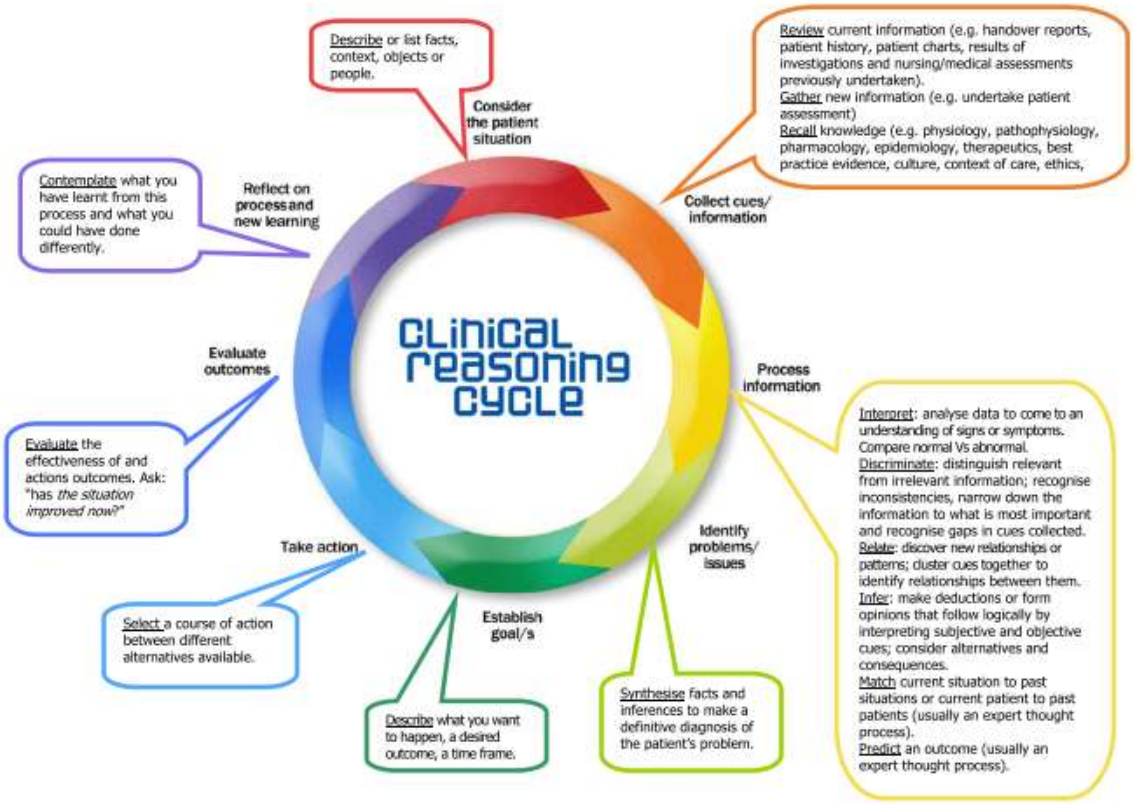

Figure 2. The clinical reasoning process with descriptors.(68)

This process is crucial to patient safety. If a health care practitioner is unable to effectively engage in clinical reasoning they will not recognise patient deterioration and as such the patient's safety will be at risk.(32) Poor clinical reasoning is a major barrier to the recognition and appropriate response to deteriorating patients amongst nurses.(32) It is therefore crucial that healthcare practitioners develop adequate clinical reasoning skills.(32)

The terms “clinical reasoning” and “clinical judgement” are often used interchangeably.(68) In 2004 the four realms of the development of clinical judgement were explored by Lasater. The four realms were (50):

- “Students’ self-report of confidence in their clinical judgment skills.
- Students’ aptitude for critical thinking, an important component of clinical judgment.
- Qualitative observations of students’ clinical judgment skill during simulation.
- Students’ experience with simulation, conveyed through a focus group.”

Lasater then published an interactive model of clinical judgement development in 2007.

Figure 3. The Lasater Interactive Model of Clinical Judgement Development. (50)

This model indicates how developing clinical judgment or clinical reasoning requires interaction between the student’s skill, experience, aptitude and confidence. When these factors align appropriately the student’s ability to engage in clinical reasoning improves. (50)

The simulated environment is a safe place in which to develop and test clinical reasoning skills due to the fact that a patient cannot be harmed in the process if the health care practitioner’s clinical reasoning skills are inadequate. (32) Real clinical situations in which patients deteriorate may seem like the best exposure that a student

can get, but often the student will be limited to the role of observer or assistant, and will rarely be able to perform the required clinical reasoning completely on their own.(32) Furthermore, patient deterioration is never guaranteed and as such each student will have a different experience of their clinical learning time, and may never have the chance to experience clinical reasoning in a real clinical setting.(32)

It is therefore vital that simulation learning addresses clinical reasoning due to the direct impact that clinical reasoning has on patient safety.(32) Clinical reasoning is very closely linked to clinical learning. (70). Clinical reasoning guides the decision of which clinical skills need to be executed for the wellbeing of the patient, whereas clinical learning is the process of learning to perform the actions of the skills required to manage a patient. (70)

2.5 Clinical learning

Although EMC students engage in work integrated learning shifts, in real clinical settings, the real clinical setting is too erratic to rely on as an educational tool in the realm of clinical learning. Student experiences in the real world may vary widely, with one student being exposed to many critically ill patients and another not receiving much exposure at all.(69) The student's learning experience is also impacted by the guidance they receive in that true clinical setting, as well as the feedback they receive.(71) Considering the fact that not all health care practitioners are adept at education, the feedback and support that a student may receive in a real clinical setting may be lacking.(71) Furthermore, there may be limited time between patient interactions, meaning that the time taken to reflect on the clinical interaction may be inadequate.(36) This results in a student whose confidence may be affected negatively due to their inadequate learning experience.(71)

Considering the ability that simulation provides educators with: to control variables; maximise learning time; provide constructive feedback and allow time for reflection – in theory simulation becomes an excellent proxy for a real clinical situation.(36) Clinical learning during simulated cases is controlled and will never lead to the deterioration of a real patient.(40) A student has an opportunity to safely make mistakes, and learn from them during simulated cases, whether these mistakes are linked to their clinical

reasoning, or their clinical skill-set – it is all part of the process of clinical learning.(72) What is most important when an educator witnesses these mistakes, is the way in which the student is debriefed regarding their clinical practice and clinical reasoning.(72) Should the student be debriefed in a positive manner as well as being afforded an opportunity to reflect on their mistakes, a positive learning outcome is likely to occur.(72)

2.6 Debriefing and reflection

Debriefing is the process of discussing what happened during a simulation, with the student that was involved in the simulation.(73) The educator often facilitates this process. (73) The debrief aims to delve into the student's rationale for their actions.(72) Through doing so, the educator can understand why the student did what they did, and can then rectify any incorrect clinical rationale.(72) If the educator can highlight the areas that are incorrectly understood by the student, it becomes easier to rectify the areas in which the student's understanding requires improvement.(72) Good debriefing and constructive criticism can change the student's entire experience of the simulation.(72)

During a simulation the student experiences the simulation, but will potentially not make sense of the learning experience immediately. Debriefing assists the student to "make sense" of what happened during the simulation, and thereby aims to improve learning.(29) When a student reflects on what has been discussed during debriefing, they have the opportunity to learn more than they would have if they had not been debriefed.(29) Debriefing also creates an opportunity for the student to express their thoughts about their performance in the simulation and those clinical interventions that they did or did not do.(73)

Debriefing is a vitally important part of this simulation learning process. (12,29,38,74) The goal of debriefing in simulation learning is to enhance learning, improve the student's clinical decision making in future and ultimately to improve patient outcomes.(38) In order to achieve this, debriefing needs be done according to best practice methods.

Literature suggests that debriefing should be done immediately after the simulation has been completed (29) and that the debrief needs to be facilitated by an educator that has been trained in debriefing and who witnessed the simulation learning activity. (73) It is not uncommon for the debriefing of the simulation to take more time than the actual simulation itself. (73) Decker et. al. highlight the importance of certain criteria that need to be satisfied for an effective debrief to take place. These criteria include that the debrief must take place in a space where there is trust relationship between the educator and the student, where open communication is valued, where confidentiality is prioritised and where self-analysis and reflection are promoted.(75) Decker et. al. also state that the debriefing should be done according to a structured debriefing framework and that the debriefing should be consistent with the outcomes and objectives of the simulation.(75)

Reflective thinking is a concept that was first postulated by John Dewey in 1910. In 1983 Donald Schön built on this concept, and proposed the model of the reflective practitioner.(73) Schön postulated that “reflection-in-action” and “reflection-on-action” allows the student to consciously review their actions during and after an activity or situation.(73) When students reflect in and on their actions, they create the opportunity to learn from them.(73) In order to reflect on their actions, students must have enough time after the experience, for the information they have gained to be digested.(73)

It is logical that since good debriefing is the most important aspect of simulation learning(38), that good debriefing strategies would improve students’ satisfaction with their simulation experience. Since educational satisfaction is closely linked to promoting active engagement in the learning experience as well as active and enthusiastic participation(26), it is vital that a students’ satisfaction with the educational process is prioritised. This is especially true because the student’s satisfaction also affects their ability to improve their skills and knowledge. (27)

Students from various health sciences are exposed to simulation as an educational technique. Many of these students, such as nursing students, pharmacy students, paramedic students and medical students have indicated that they experience simulation as a satisfying educational technique.(5,28,76–78) Although many health

science students find simulation to be a satisfying educational technique, not all students prefer it to traditional teaching techniques.(31,79) Zulkosky describes how some students who are accustomed to being taught using traditional theory techniques, preferred that to simulation learning.(31) Furthermore some students find simulation learning to be intimidating and stressful.(53) Educators in the realm of emergency care could however argue that the nature of working with a critically ill patient in the real world is inherently stressful, and as such an educational technique that encourages students to learn to manage their stress is a positive thing despite the impact that this may have on the student's satisfaction with this educational technique.(78)

2.7 Satisfaction with simulation

The Oxford University Press defines satisfaction as: "Fulfilment of one's wishes, expectations, or needs, or the pleasure derived from this."(80) This would indicate that in order for students to be satisfied with simulation learning, they would need to be fulfilled by it as an educational technique and that they may possibly even enjoy it.

Satisfaction with simulation learning in healthcare students has been explored by numerous researchers. Some have delved into the qualitative experiences of students with simulation learning (81), whereas others have quantitatively measured the satisfaction of students with simulation(63). Many of the studies were performed in the realm of nursing (28,70,82–85), but the satisfaction of paramedic students, medical students, pharmacy students, physician assistant students and midwifery students has also been reported.(27,57,77,79,86–88) Studies about student satisfaction with simulation are also not limited to certain regions, but instead are from across the globe, albeit that the African data is scant in comparison to the rest of the world.

It would be impossible to comment on the findings of each study that has been performed in lieu of satisfaction with simulation in this review. One can however highlight the general trends that the literature reports on. Many of these trends, span across different fields of healthcare and are not limited to only nursing, medicine or EMC.

Some studies described satisfaction with the superficial elements of simulation. Aspects like the amount of time that students had available to them to practice

simulations as well as the availability of mannequins to practice on, were highlighted as concerns by some students.(34,86,89) These were aspects that led to dissatisfaction on the students' part. One could argue though that these constraints are not due to the educator directly, but more closely linked to resource constraints.

Many studies looked at how students felt about simulation as an educational technique. Considering that simulation learning is an educational technique that is not likely to be used in primary or high school teaching, students may enter a university programme never having experienced this type of learning before. Students may respond with a variety responses to simulation learning. In cases where it is novel to the student, it may lead to a lot of excitement and thus leads to higher levels of satisfaction.(28,90) In cases where students are well accustomed to simulation learning, the novelty may have worn off and their views are thus more pragmatic. Some students report that they prefer theory based lectures to simulation learning (31) and some mention that simulation with a mannequin who cannot talk may not be appropriate for their setting (62), however many students enjoy simulation learning as a technique. (10,91–93)

An aspect that plays a role in the students' satisfaction is whether they feel that the aims of the simulation are appropriate and whether the simulation is well-designed.(60,92,94) Some students feel that their simulation experience may be testing the wrong elements or may be designed to mimic patients that are irrelevant to their setting.(60) For a student's learning experience in the classroom to be transferable to a real clinical setting, the simulations need to be relevant.(48,63,64,70,91) This means exposing students to simulated cases that mimic cases that they are likely to be exposed to in their clinical setting. In a European setting, it may be irrelevant to simulate a case of a patient with a tuberculosis infection with concomitant HIV infection, however in parts of Africa, this is a very common patient presentation making it worthy of a simulated scenario. (95)

Transferability, speaks directly to realism as a scenario that a student will never see in a clinical setting is unrealistic. Realism in simulation is often referred to as fidelity.(96) Fidelity is the topic of many studies, as it is arguably one of the primary goals of simulation learning – to simulate reality as closely as possible. Technology has allowed fidelity to increase over the years, with companies creating more realistic mannequins each year.(85) Authors have explored whether students learn more from

higher fidelity simulations, and whether students enjoy higher fidelity simulations more.(30,50,82,96–98) Simulation learning is assumed by educators, to be more beneficial when it is of a higher level of fidelity.(99) Many authors are proponents of high fidelity simulation for exactly this reason.(9,44,100,101) It was however been noted that test scores did not differ significantly between groups that were taught using low vs high fidelity simulation.(30) Furthermore, Kinney and Henderson found no statistical difference between low-fidelity simulation and theory lectures when learning was assessed.(3)

The value that students place on simulation learning is also a concept that is discussed by some authors when ascertaining what the student's level of satisfaction is. Some students value simulation due to its interactive nature and the fact that it is a memorable experience.(28) On the contrary, some students don't value simulation due to the stress it places on them.(53) An element that greatly impacts the value of simulation to students is how they are debriefed. (28,38,72,102,103)

Debriefing and reflection have a powerful impact on the student's psyche.(38) If an educator only criticises a student without giving them any praise, the student's experience will be negative.(72) The will then carry this negative experience with them into their future learning which will likely disadvantage them throughout their studies.(104) Since education of health care professionals is aimed at adults, the educator should respect the knowledge and experiences that the adult learner brings to the classroom with them.(104) If the educator does not keep the context of the student's prior knowledge in mind when debriefing the student, the student may have a negative experience.(104) When students feel that they have been debriefed well and have been allowed an adequate amount of time for reflection, they are more satisfied with their simulation learning experience.(28)

Adequate reflection in clinical practice builds self-confidence.(105) This is another theme that emerged from the studies done regarding student satisfaction with simulation. When students feel more confident due to their simulation experience, they are more satisfied.(106) Self-confidence after simulation is such an important aspect of the student's satisfaction, that Jeffries and Rizzolo developed a tool that has eight questions specific to the student's confidence.(107)

Considering the importance of satisfaction as a factor in a student's educational experience (26), the concept of measuring satisfaction then also becomes important. Measuring a student's level of satisfaction indicates to an educator whether the student finds their education to be fulfilling and whether it lives up to the student's expectations.(26) If an educator becomes aware that students are dissatisfied, they can make efforts to improve the educational experience.(42)

2.8 Measurement of Satisfaction

During the literature review process, several tools for measuring satisfaction with simulation learning were identified. Some tools were highlighted by Kardong-Edgren et. al. during a review of the literature in 2010.(81) Tools that spoke to the evaluation of the student's performance during the simulation were omitted as they were irrelevant as well as tools that considered the satisfaction of a multi-disciplinary team. The tools that speak to student satisfaction with simulation learning have been attached as appendix 1.

When one considers the multiple tools that are available to measure satisfaction with simulation, the decision to use the SSES in this study should be explored. The review of the literature yielded the ten tools listed in Table 1. These tools vary in content and length. Using a validated tool with good levels of reliability is a more rigorous scientific decision, and as such, those tools that have not been tested for validity or reliability were excluded. Some tools were not validated in English, and as such these were also excluded. Of these tools, the SSES is the only tool that has specifically been deemed valid and reliable in a paramedic student population. Since the population in this study are paramedic students, it seemed appropriate that this should be the tool that was used.

In order to quantitatively measure student satisfaction with simulation, Levett-Jones et. al developed the SSES in 2011, to measures satisfaction levels amongst nursing students that were exposed to medium-high fidelity simulation.(28) This Likert scale questionnaire looked at three realms within simulation, namely: clinical learning; clinical reasoning and debriefing and reflection. (28) Although this tool was originally developed for nursing students, it is of such a nature that it is applicable to other health

care students that had been exposed to simulation as an educational strategy and as such, was tested for validity and reliability in paramedic students. (27) In 2012 the tool's validity and reliability was confirmed by Williams and Dousek for use in a paramedic student population.(77) For the questionnaire to be valid for use in a paramedic student group, one item from the original SSES is deleted. (77)

In 2016, Williams et. al used the SSES to compare student satisfaction with simulation in two groups of paramedic students.(27) The groups were from Jordan University of Science and Technology and Monash University respectively.(27) This study compared the satisfaction in the cross-cultural population found at the two universities.(27) This study described how the satisfaction with simulation was higher amongst students from Monash University in Australia as opposed to their counterparts from the Jordan University of Science and Technology.(27)

The SSES has also been used in a group of Korean paramedic students, regarding their experience of ACLS education through simulation. (108) The mean scores for all three of the areas of simulation that the SSES evaluates, were close to 5.0. This indicates that the Korean students were highly satisfied with their simulation learning experience.(28)

During the creation of the SSES questionnaire, the researchers started with a pool of 70 questions. These 70 items were presented to a panel of experts for consideration, with the intent of ensuring content and construct validity. Cronbach's Alpha measurements were used to determine internal reliability, and a correlation matrix was used to remove redundant items. (28) Once factor analysis had taken place, the final 18 items were identified. These items related to three distinct constructs; these aspects were labelled as: clinical reasoning; clinical learning; and debriefing and reflection. These three aspects of simulation learning are vital to create an educational experience that advances health care practitioners in their ability to engage in safe clinical practice.(28)

2.9 Knowledge gaps and areas for further research

There are few instances where the satisfaction with simulation learning has been researched in the paramedic student population. In the cases where this concept was

explored in this population, the students were not African. There is thus a knowledge gap in the South African context, as no one has published research about the satisfaction of South African ECP students with simulation before. The literature review also yielded some instances of research pertaining to student perceptions of simulation learning in South Africa, or the rest of Africa, but these studies were done in populations of medical students or student nurses. Generally, these studies also did not speak directly to the students' level of satisfaction and the type of simulation learning that these students engaged in, was different to that of the EMC students.

CHAPTER 3: METHODOLOGY

3.1 Study Design

This was a cross-sectional, descriptive, quantitative study. An 18-point validated questionnaire, produced by Tracey Levett-Jones et. al. from the University of Newcastle was used with one item deleted (Refer to Annexure B). Permission was granted by Professor Tracey Levett-Jones to use the satisfaction with simulation experience scale (SSES) for this study (Refer to Appendix 4). For this study, only seventeen of the original eighteen questions were used. This decision was made based on the validation study published in 2012, which found that when the SSES questionnaire was completed by paramedic students, all but one of the eighteen questions: “The simulation helped me to recognise my clinical strengths and weaknesses”, demonstrated 3-factor solution of construct validity.(77)

Due to the fact that the cohort used for this South African study are a type of paramedic student and not nursing students, the decision was made to delete this item for this study. The original SSES also uses the term “the simulation” referring to a single simulated case that had been done with their students. In this study, the term “the simulation” was changed to “simulation” so that students consider all of their simulation experiences and so that they do not get confused, thinking that the questionnaire is referring to one specific simulation that they have done. In order to guide the students, the following prompt was shown on the screen before the student started to answer the questions: “When you are answering the following questions about simulation, consider your experience of simulation teaching, learning and assessment as a whole during your university career so far”. The student then read seventeen statements regarding simulation learning and stated whether they strongly agreed with the statement, agreed with the statement, neither agreed or disagreed with the statement, disagreed with the statement or strongly disagreed with the statement by clicking the appropriate option on the online questionnaire.

3.2 Research procedures and data collection methods

All of the ECP students from the Nelson Mandela University and the University of Johannesburg who are registered for EMC II, EMC III and EMC IV within the respective departments of EMC were invited to participate.

The invitation to participate was distributed electronically via email to the study population by their head of department. At a later stage a request was made that the heads of departments at both UJ and NMU send the link to the online survey to the students' year co-ordinators, to send out via WhatsApp® in order to increase the response rates. The survey link was sent to the students multiple times. The questionnaire was completed online through the use of an online survey software tool called Survey Monkey ®. Duplicate surveys were produced such that two different links were created to access the survey. One link was sent to the NMU cohort and the other link was sent to the UJ cohort. A question was included at the start of the questionnaire: "Which University do you attend?" so as to ensure that the University from which the data were generated, was identifiable. The responses were captured on a five-point Likert scale (1 = strongly disagree – 5 = strongly agree) for each question, and these responses were documented in the form of tables in Chapter 4 and discussed in Chapter 5 of this dissertation.

3.3 Study Setting

The participants completed the questionnaire online, using the Survey Monkey® software. The study setting therefore allowed the participants to complete the questionnaire at a time that was convenient for them, and in a venue that was convenient for them, where they had access to a computer with internet. There are computers with internet access that students could use to complete the online questionnaire on both of the campuses where the degree is offered.

3.4 Characteristics of the study population

The study population consisted of information rich participants. The study was populated by students from two of the universities in South Africa that offer Bachelor of Emergency Medical Care programmes. The study only included students who have completed their first year of EMC training and were registered for the EMC II, EMC III or EMC IV subjects in 2018, in order to ensure that they had been exposed to a significant amount of simulation teaching, learning and assessment opportunities.

A population census yielded 125 students. Fifty nine students were registered at NMU and sixty six at UJ. These numbers differ from the numbers in the proposal for this study due to NMU's HOD overestimating the number of students that were registered at NMU. This study did not capture the biographical data of the participants.

3.5 Sampling method

Due to the small population size, everyone in the population was invited to participate in the study. The sample size calculation indicated that a population of 125 requires a sample size of 95 participants for a 95% confidence level and a 5% margin of error. After several attempts to encourage participation, 81 people participated in the study. (6.5% margin of error at 95% confidence interval.)

A request was sent to the head of each department that they send out the research invitation by email to the students in their respective departments. The researcher requested that the head of department send the email invitation to participate three times at intervals of three weeks. The researcher sent reminders to the head of departments to remind them to resend the invitation the second and third times. After the third request the researcher had noted that the response rates were still low, and as such the researcher requested that the online link be sent to the students via WhatsApp ® by their year coordinators. The rationale for this was that perhaps if the students had easier access to the survey link that it would encourage participation.

Strategies to encourage higher rates of participation in the study were considered. One strategy that was considered request ethical clearance from the two universities to make a voucher available for one participant to win after participating in the study.

The anonymity of the study prevented this however, because although Survey Monkey records the IP address of the computer from which the survey was completed, IP addresses are not unique to one device or one internet browser and the IP address can change. For this reason, there was no way of identifying the students who had or had not participated in the study in order to randomly choose a winner of such a voucher. The researcher made the electronic survey available for longer than planned in order to allow as much time for additional responses as possible, but response rates remained low.

3.6 Data analysis

This questionnaire is a true Likert scale questionnaire where the questions are grouped as they pertain to three distinct constructs: debriefing and reflection; clinical learning and; clinical reasoning. Questions 1-9 pertain to debriefing and reflection, questions 10-14 pertain to clinical reasoning and questions 15-17 pertain to clinical learning. In the original SSES, the eighteenth question - that was omitted for this study- pertains to clinical learning.

The data were captured from the questionnaires into a Microsoft Excel spreadsheet after which analysis commenced. For each student that answered that they strongly disagree, the data point was awarded a value of 1. For each student that disagreed the data point value was 2. For neutral responses the data point value was 3. For students who agreed the data point value was 4, and for those who strongly agreed, a data point value of 5 was assigned. This was done because although the responses are seemingly categorical in nature, they also have natural order. These values were then used to calculate a mean value and standard deviation across the respondents for the seventeen questions. Statistical Package for the Social Sciences® (SPSS) software was used to analyse the data. These mean and standard deviation values can be used to gain some insight into the responses of the students.

Although it was not an aim of this study to compare the UJ and NMU students' satisfaction, the statistical analysis software yielded interesting results when Mann-Whitney U testing was done. This study also did not aim to validate the SSES or

calculate the reliability of the tool, however the data were available and as such the analysis was performed.

For the calculation of internal reliability, Cronbach's Alpha coefficients were calculated for each of the three constructs. In order to determine construct validity of the SSES, a statistics software programme EQS 6.2® was used to generate confirmatory factor analysis results. These tests seek to confirm the validity of the three constructs that are being tested in this questionnaire. If two constructs are too similarly described in their wording, the programme would merge the constructs. Thus achieving a three-factor solution is the aim of these tests for this tool. Confirmatory factor analysis was used because this tool has been validated before. Had the tool never been validated before, an exploratory factor analysis could have been used.

The data were reported on using descriptive statistics and appropriate representative graphics that were determined by the results of the data analysis in Chapter four of this dissertation.

3.7 Data management

The survey software website generated the data set in a Microsoft Excel document. Access to the survey software is limited and password protected. The data were only kept by the researcher, and were stored on a password protected laptop. The data were backed up and stored appropriately in a password protected file.

All surveys were completed anonymously and although the IP address that the survey was completed from was recorded, IP addresses are not unique to a device or an internet browser thus rendering the participants unidentifiable.

3.8 Validity and Reliability

The SSES was found to be a validated and reliable questionnaire in 2011 in a cohort of second and third year nursing students. (28) In 2012, Williams and Dousek performed a second validation study in a paramedic student population, where the tool was found to be both valid and reliable when one item of the tool was deleted.(77)

3.9 Ethical considerations

The researcher was known to the UJ students as a clinical co-ordinator and General Pathology lecturer in the University of Johannesburg, Department of EMC.

The lecturer was also involved in examination of the students, but since the researcher will not know which students the responses belong to, the students are not at risk. The students were protected by anonymity as no identifying information was required to complete the survey. The invitation to participate in the study was sent via email to the entire study population, and the researcher did not have any indication of which students participated from the two universities sampled for this study. The participants were required to provide their consent through ticking a “yes” or “no” box before gaining access to the survey.

There were no questions in the survey that are of such a nature that they could harm the participants in any way.

3.10 Risks and benefits for participants

There were no anticipated risks to participating in this study. The benefit of participating in this study was the opportunity for the students to share their perceptions in a safe, anonymous environment.

3.11 Informed consent process

The invitation to participate in this study was sent via email. The participants were informed about the study in an explanatory letter provided to them before completion of the questionnaire. The participants were notified that the study was anonymous and confidential, and that they were allowed to withdraw from the study before completing the questionnaire.

The participants were required to click a tick box that states “yes” or “no” with regard to the following three statements:

- “I confirm that I have read and understand the information sheet dated 18 May 2018 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily”;

- “I understand that my participation is voluntary and that I am free to withdraw from this study at any time without giving any reason and without any consequences to me.”

- “I agree to take part in the above study.”

If the “no” box was ticked for any one of the three abovementioned statements, the participants were not able to proceed to the questionnaire as the software was programmed to close the survey when the “no” option was selected.

3.12 Privacy and confidentiality

All surveys were completed anonymously through an online portal. There was no way that the identity of the participant could be determined from the data that the online survey portal generated.

3.13 Strengths and limitations

The strength of this study was that new knowledge was generated that the two departments can use to improve their current simulation strategy, for the benefit of the students and ultimately the patients that they serve.

The limitations of this study was that the response rates varied between students from the different universities and that the overall response rates were lower than expected. Attempts to improve response rates were made, but the study still yielded low response rates especially from the NMU students. Due to the low response rates the generalisability to the population from both universities is limited. The researcher also considered that the high standard deviation for some of the questions may be attributable to students from different years of study having higher or lower satisfaction

with simulation respectively. Unfortunately the researcher did not foresee this problem beforehand and as such there was no question added to the questionnaire to determine which year of study the research participant was currently enrolled for. Biographical data were also not captured prior to the SSES questions being presented.

3.14 Conflict of interest

The researcher was employed at the UJ at the time that the research was done, where part of the research population were enrolled as students.

CHAPTER 4: FINDINGS

This chapter discusses the results of the SSES that was distributed to students from the NMU and UJ departments of EMC in order to determine the students' satisfaction with their simulation learning experience.

4.1 Population

The population chosen for this study consisted of all students who have completed their first year of EMC training and were registered for the EMC II practical subject, EMC III practical or EMC IV in 2018 at either Nelson Mandela University or the University of Johannesburg. A census was performed in order to determine how many students were registered for each year of study and engaged in EMC practical as a subject in 2018. The population is dispersed as follows:

Table 1. Characteristics of the study population.

Number of registered students:	**NMU**	**UJ**
EMC II	20	23
EMC III	20	21
EMC IV	19	22
Total number of students in population	**59**	**66**

The total number of students in the population is 125. All were approached. 86 people agreed to take part in the survey, but only 81 completed the survey (64%). Of the 59 registered students at NMU, 32 students (54%) participated. Forty nine of the 66 students (74%) registered at the UJ participated. The questionnaire did not collect data regarding the gender of the student or the year of study that the student is currently registered for. Each participant answered every question of the questionnaire.

Table 2. Percentage of participants from each university.

University	**Frequency (%)**
NMU	32 (39.5)
UJ	49 (60.5)
Total	**81 (100)**

4.2 Descriptive Statistics

Data were analysed using parametric tests, using the mean as the measure of central tendency, and using the standard deviation to describe the spread of the data. The cohort specific and the combined cohort mean scores, the standard deviations, as well as the percentages of students that chose the options of strongly agree or agree, for each item of the tool are reported on in the table below:

Table 3. Mean scores, standard deviation and the percentage of participants that selected each option, for all the participants.

* n = Number; SD = Standard Deviation; SA = Strongly Agree; A = Agree;

	Total (n=81)		NMU (n=32)		UJ (n=49)	
Question	**Mean (SD)**	**% SA/A**	**Mean (SD)**	**% SA/A**	**Mean (SD)**	**% SA/A**
The facilitator provided constructive criticism during the debriefing	3.815 (1.141)	75%	2.938 (1.226)	40%	4.388 (0.533)	98%
The facilitator summarized important issues during the debriefing	3.864 (1.069)	79%	3.094 (1.228)	50%	4.367 (0.528)	98%
I had the opportunity to reflect on and discuss my performance during the debriefing	3.840 (0.993)	73%	3.438 (1.216)	57%	4.102 (0.714)	84%
The debriefing provided an opportunity to ask questions	4.062 (1.029)	88%	3.469 (1.319)	69%	4.449 (0.50)	100%
The facilitator provided feedback that helped me to develop my clinical reasoning skills	3.778 (1.084)	75%	3.156 (1.319)	50%	4.184 (0.635)	92%
Reflecting on and discussing the simulation enhanced my learning	4.210 (0.802)	88%	3.813 (0.965)	77%	4.469 (0.544)	98%
The facilitator's questions helped me to learn	3.802 (0.914)	73%	3.313 (1.061)	53%	4.122 (0.634)	86%
I received feedback during the debriefing that helped me to learn	3.802 (0.928)	75%	3.188 (1.061)	47%	4.204 (0.539)	94%
The facilitator made me feel comfortable and at ease during the debriefing	3.469 (1.050)	56%	3.094 (1.174)	43%	3.714 (0.890)	63%
The simulation developed my clinical reasoning skills	3.802 (0.967)	70%	3.344 (1.035)	53%	4.102 (0.797)	82%
The simulation developed my clinical decision-making ability	3.901 (0.995)	77%	3.469 (1.164)	60%	4.184 (0.755)	88%
The simulation enabled me to demonstrate my clinical reasoning skills	4.049 (0.879)	84%	3.750 (1.047)	75%	4.245 (0.693)	90%
The simulation helped me to recognize patient deterioration early	3.444 (0.949)	54%	3.125 (1.070)	44%	3.653 (0.805)	61%
This was a valuable learning experience	3.975 (0.948)	84%	3.625 (1.157)	69%	4.204 (0.707)	94%
The simulation caused me to reflect on my clinical ability	4.037 (0.872)	84%	3.750 (1.078)	77%	4.224 (0.654)	92%
The simulation tested my clinical ability	4.025 (0.880)	83%	3.625 (1.070)	63%	4.286 (0.612)	96%

The simulation helped me to apply what I learned from the case study	3.605 (1.008)	65%	3.313 (1.120)	59%	3.796 (0.889)	69%

For each factor, the grand mean (mean of the means), standard deviation, minimum and maximum is depicted in the table below:

Table 4. The mean scores for each factor in the questionnaire in the total sample (n=81).

Factor	Grand mean	StDev	Minimum	Maximum
Debriefing and Reflection	3.849	0.801	1.56	5.00
Clinical Reasoning	3.835	0.797	1.20	5.00
Clinical Learning	3.889	0.776	1.00	5.00

4.3 Notable findings

The items with the highest & lowest mean score, as well as the highest standard deviation are presented for detailed scrutiny. These are significant because they represent the questions where the students were the most satisfied, the least satisfied and where the responses were the most divided.

The response frequencies are shown in the histograms below.

4.3.1 Notable findings – Combined cohort results

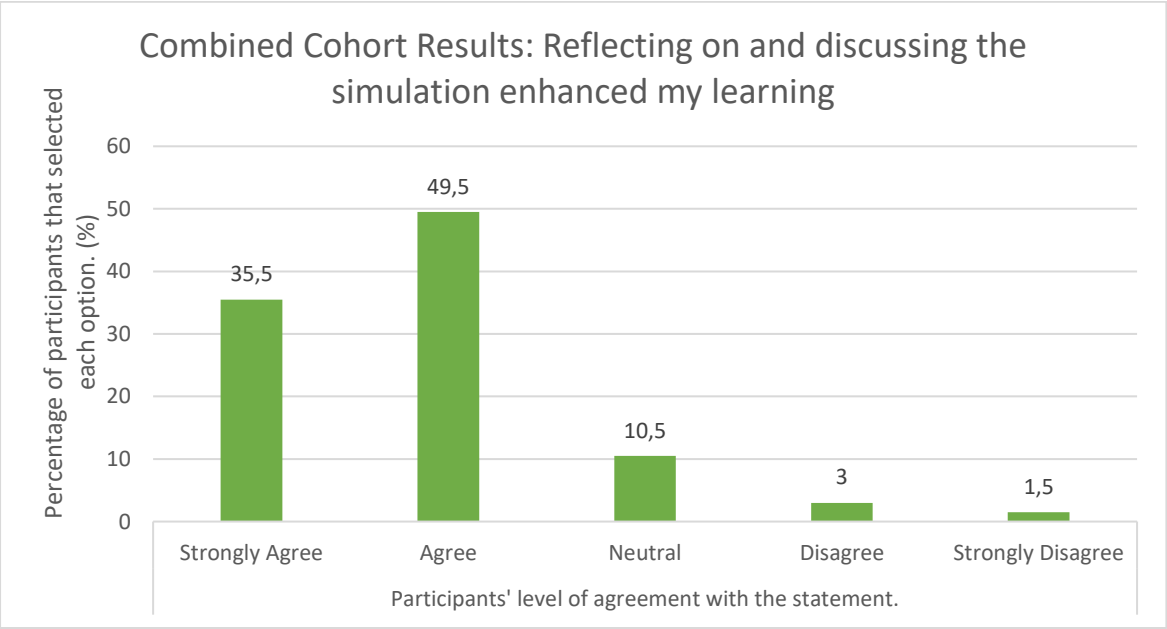

Figure 4. Item scoring the highest mean in the combined cohort (mean = 4.210)

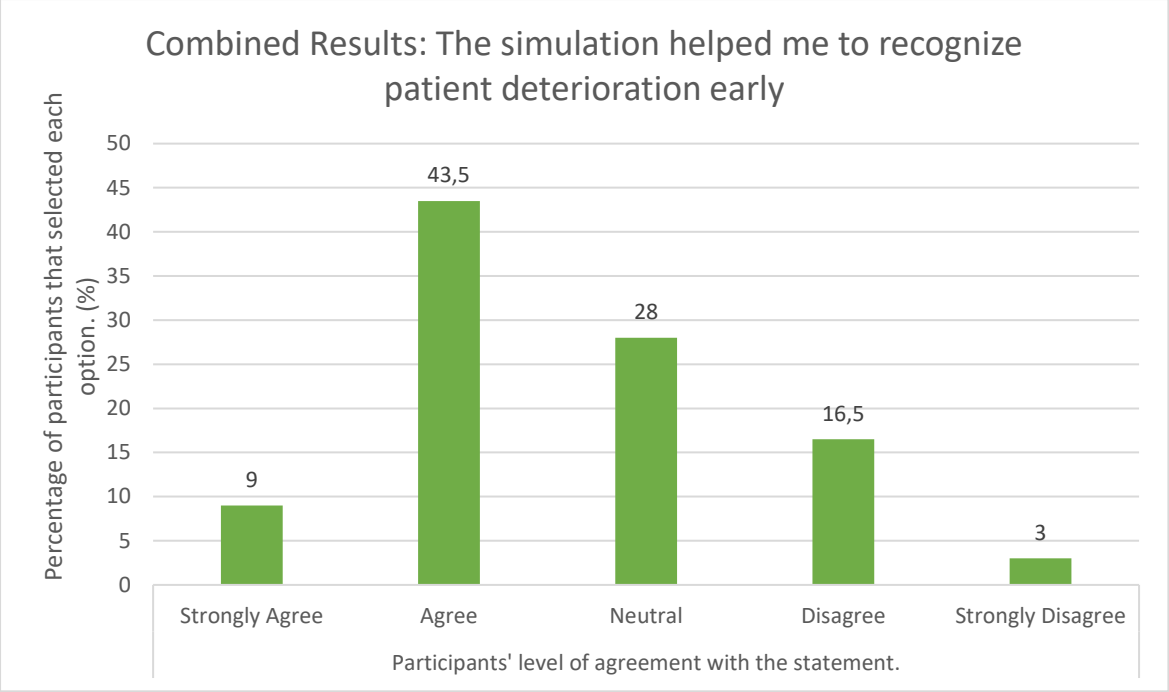

Figure 5. Item scoring the lowest mean in the combined cohort (mean =3.444)

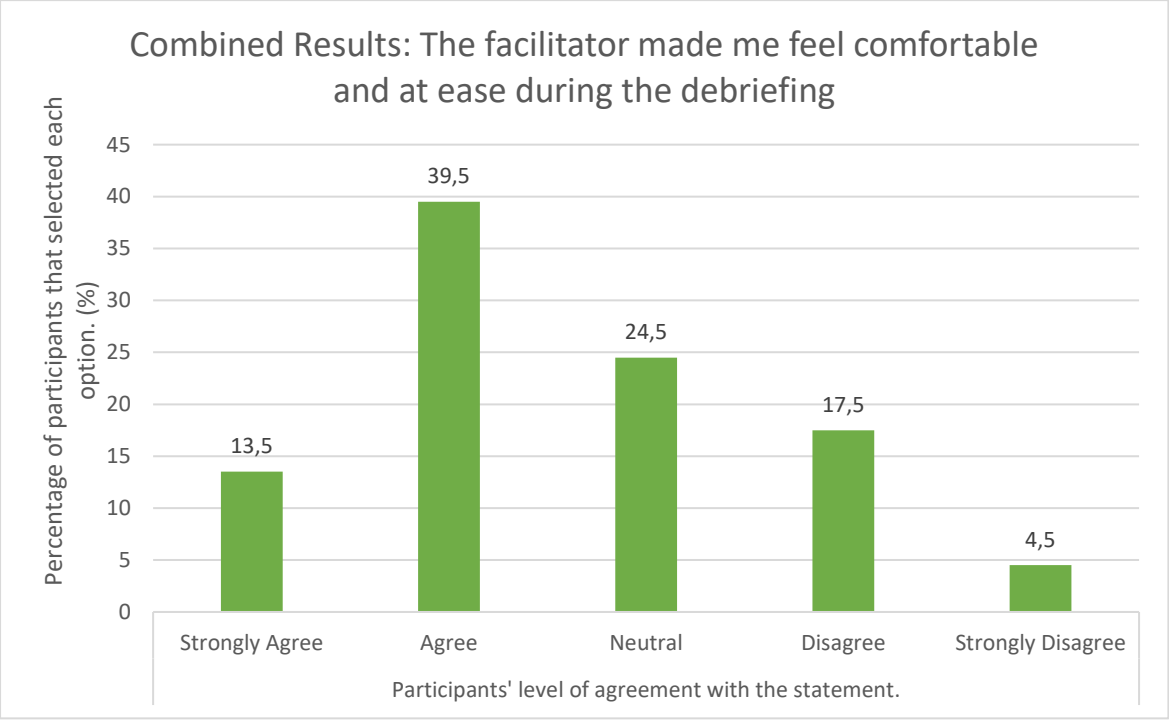

Figure 6. Item with the highest standard deviation in the combined cohort (SD = 1.050)

4.3.2 Notable findings – NMU

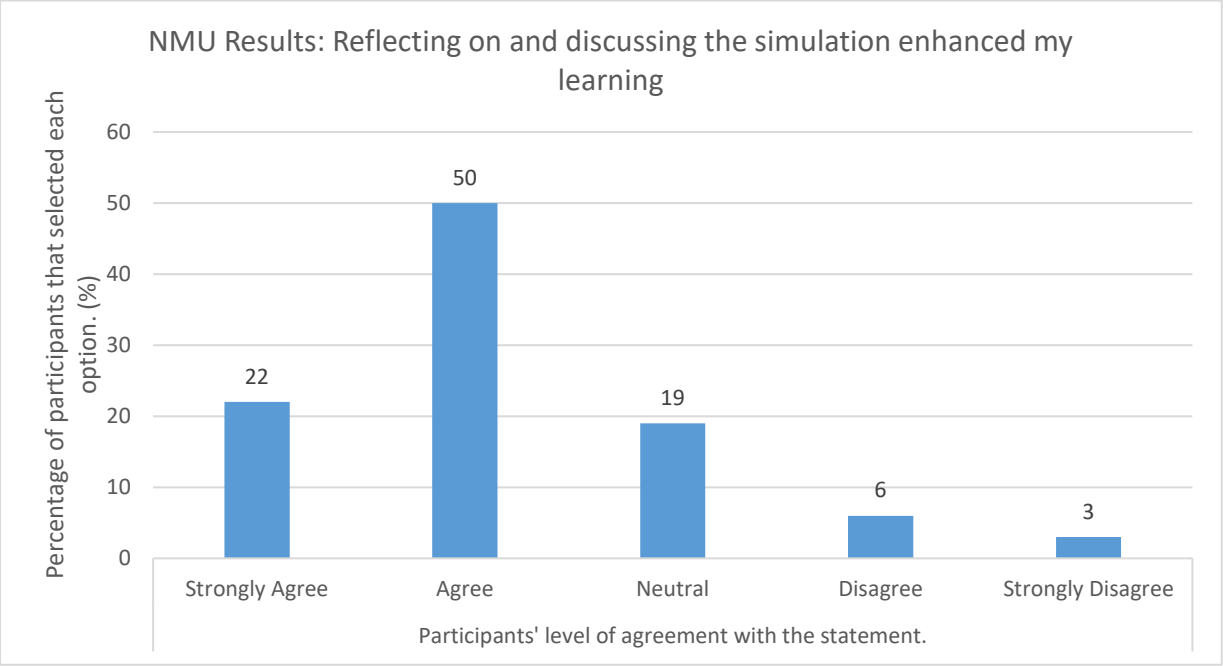

Figure 7. Item scoring the highest mean in the NMU cohort (mean = 3.813)

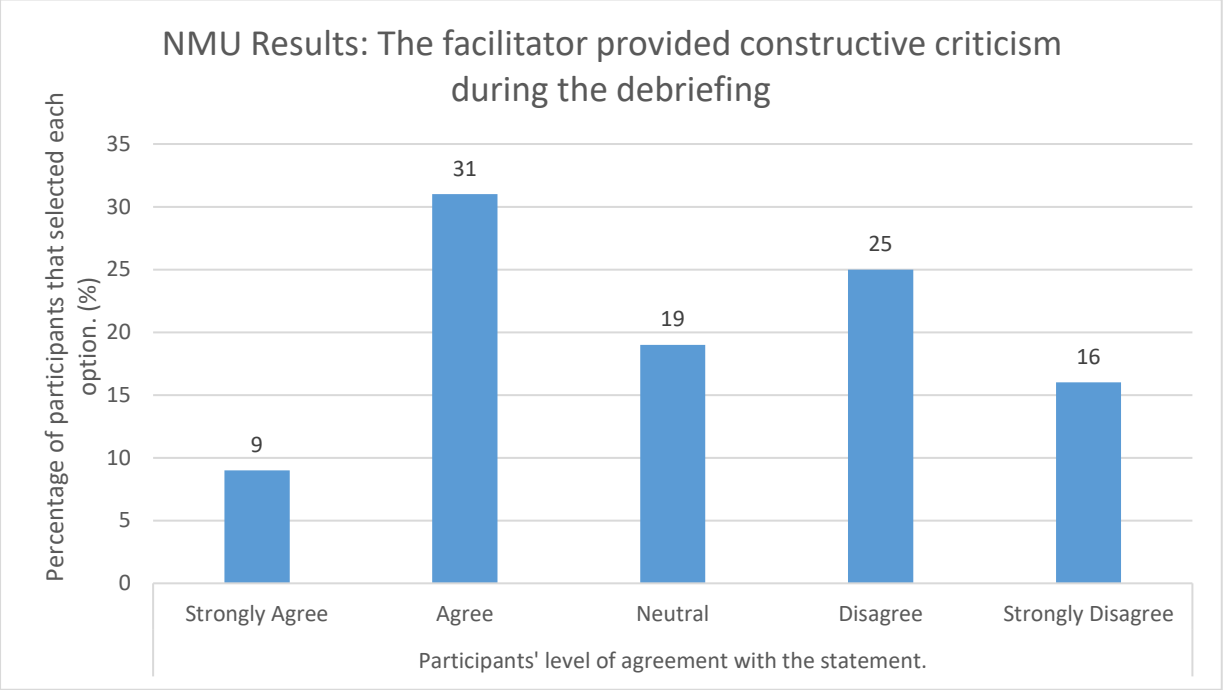

Figure 8. Item scoring the lowest mean in the NMU cohort (mean = 2.938)

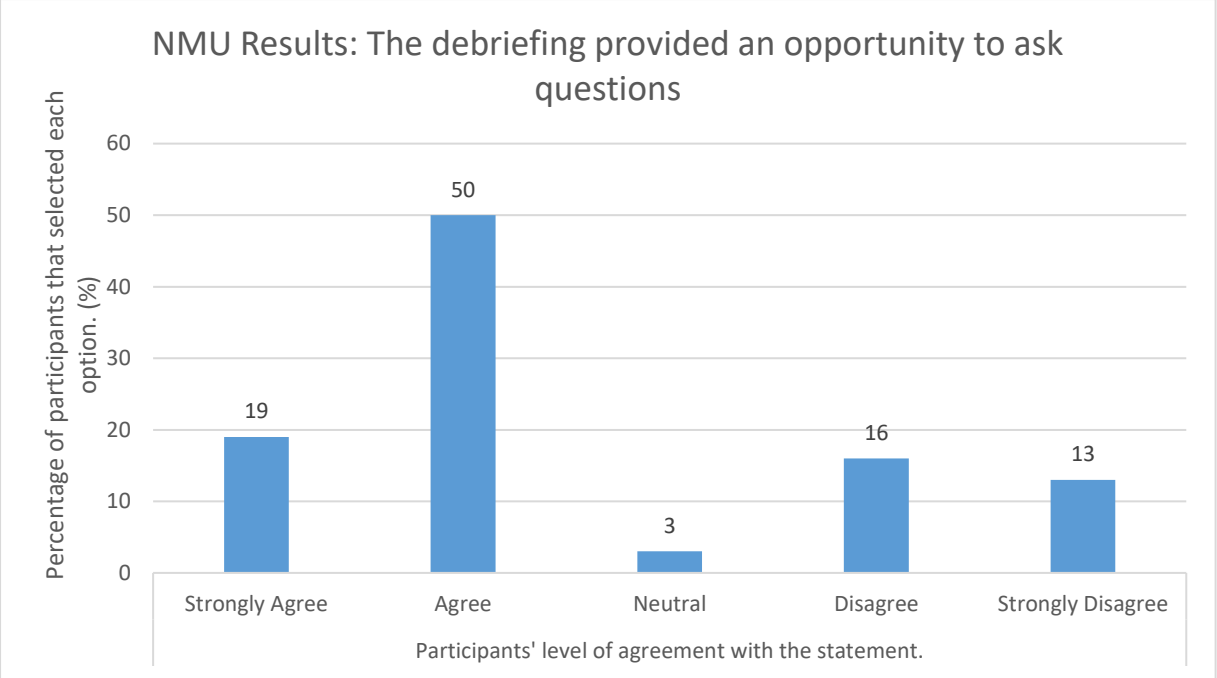

Figure 9.1 Items with the highest standard deviation in the NMU cohort (SD = 1.319)

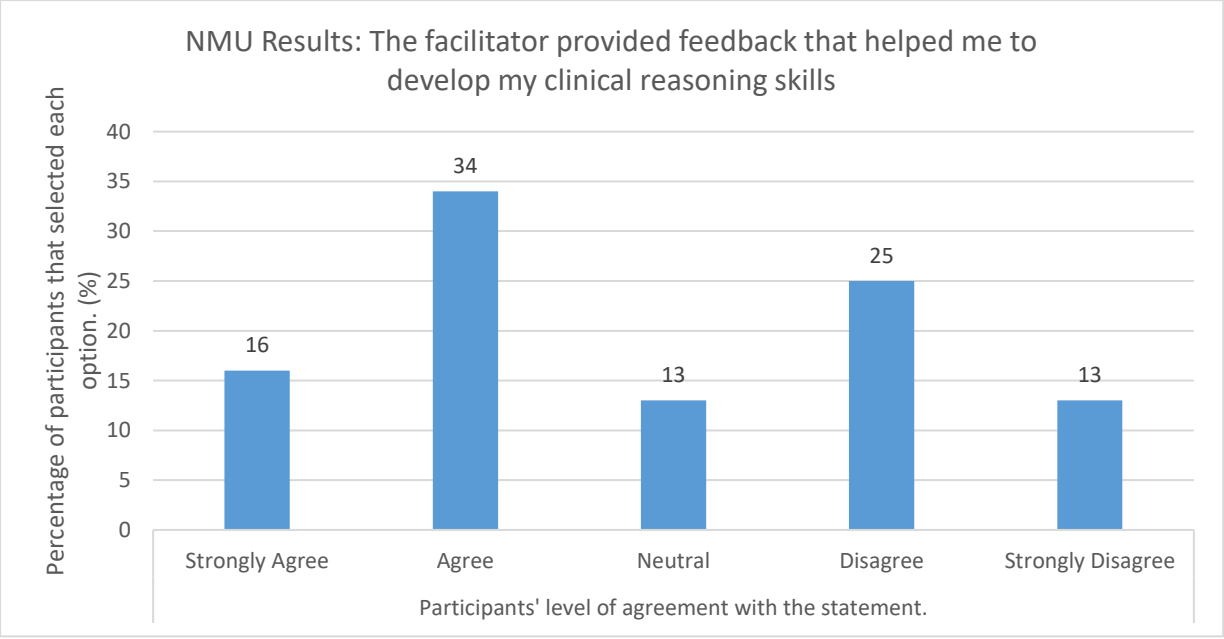

Figure 9.2 Items with the highest standard deviation in the NMU cohort (SD = 1.319)

4.3.3 Notable findings – UJ

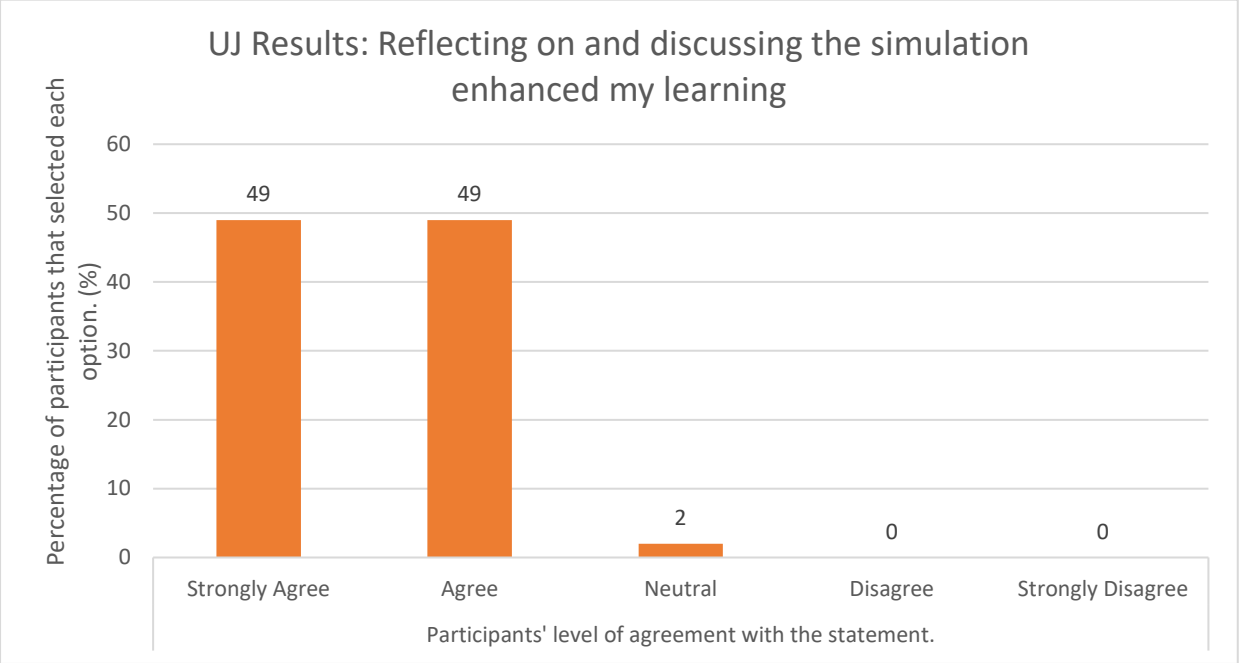

Figure 10. Item scoring the highest mean in the UJ cohort (mean =4.469)

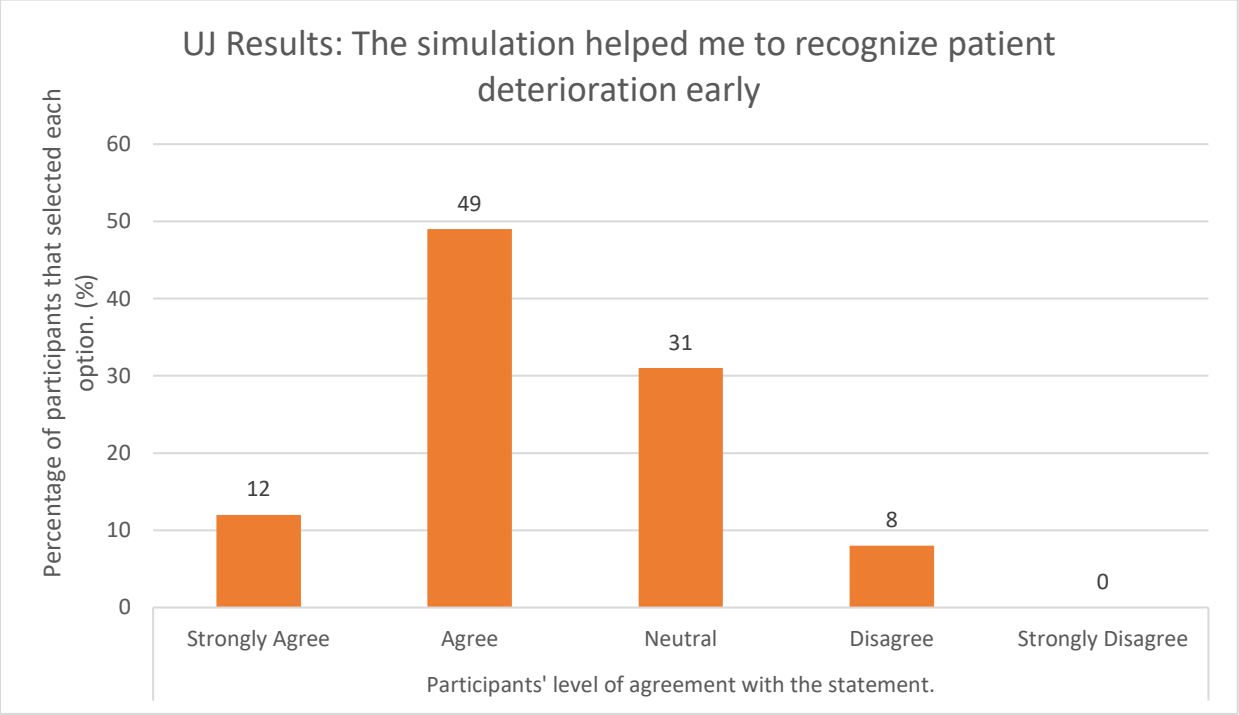

Figure 11. Item scoring the lowest mean in the UJ cohort (mean =3.653)

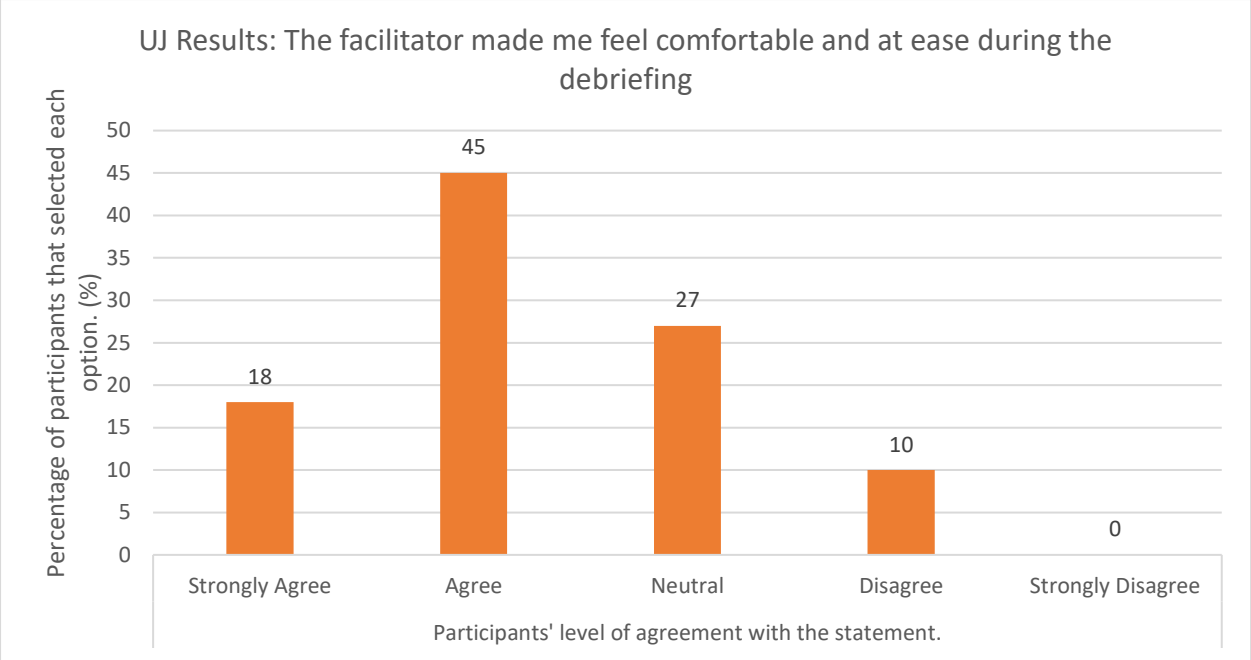

Figure 12. Item with the highest standard deviation in the UJ cohort (SD =0.890)

4.5 Descriptive Analysis of Factors

The mean score for each construct was also calculated for each university. This depicts areas where satisfaction in a particular construct was higher or lower at each university. A mean value of five would indicate high levels of satisfaction, whereas mean scores that are closer to one indicate low levels of satisfaction. The table below provides the mean scores per construct per university.

Table. 5 Comparative mean values for each construct per university.

Construct	NMU Mean	UJ Mean	Total Mean	P Value
Debriefing and Reflection	3.2778	4.2222	3.8491	0.000
Clinical Reasoning	3.4625	4.0776	3.8346	0.002
Clinical Learning	3.5625	4.102	3.8889	0.005

These mean scores are telling as one can see that the mean scores for NMU across all three constructs are below 3.6, whereas the lowest mean score for the UJ constructs is 4.07. This indicates that the UJ students demonstrate higher levels of satisfaction across all three constructs that were tested using this tool, than the students from NMU. The total mean is the average between the two universities with

mean scores of 3.85 for debriefing and reflection, 3.83 for clinical reasoning and 3.89 for clinical reasoning. P-Values of < 0.05 indicate a statistically significant difference.

4.6 Comparison of Factors by NMU and UJ

Due to the small sample size in this study, non-parametric testing was required for purposes of comparison. Mann-Whitney U testing was used to compare the results of two groups of students. This is a measure of differences between two independent groups on a continuous measure. The Mann-Whitney U test revealed significant statistical difference between the levels of satisfaction with all three constructs.

Debriefing and reflection for the NMU (Md = 3.5; n=32) and UJ (Md = 4.2; n=49) students, U = 291, z = -4.772, p = 0.000, r = 0.5.

In the clinical reasoning construct for the NMU (Md=3.6; n=32) and UJ (Md = 4.0; n= 49) students, U = 461, z = -3.140, p=0.002, r = 0.3.

For the clinical learning construct for the NMU (Md=3.7; n=32) and UJ (Md = 4.0; n= 49) students, U =498, z = -2.825, p=0.005, r = 0.3.

4.6 Assessment of Internal Consistency

The Cronbach's Alpha value was calculated for each of the three factors in order to determine the internal consistency. A Cronbach's α value of 1.0 would indicate the maximum internal consistency. The table below indicates the internal consistency of the three constructs assessed in this questionnaire.

Table 6. Cronbach's Alpha values for each factor in the questionnaire.

Construct	**Cronbach's α value**
Debriefing and Reflection	0.928
Clinical Reasoning	0.896
Clinical Learning	0.794

4.7 Confirmatory Factor Analysis

Confirmatory factor analysis yielded a three factor model where one factor was debriefing and reflection, one was clinical reasoning and one was clinical learning. Multiple fit statistics were used for this analysis using a maximum likelihood procedure. NNFI = 0.903; CFI = 0.901 and RMSEA =0.067 (0.038-0.092). These values all indicate evidence of three factors.

CHAPTER 5: DISCUSSION

5.1 Main Findings

Of the 59 registered students at NMU, 32 (54%) participated. Forty nine of the 66 students (74%) registered at UJ participated. The low percentage that participated in the study could be attributed to the fact that the NMU students have recently been exposed to a number of invitations to participate in research.

When considering the mean values for each of the three constructs that the tool measures, the values for the combined results of the two universities showed that the students had a moderate level of satisfaction. This is indicated by the fact that the mean values are close to, but below 4.0 (3.85 for debriefing and reflection, 3.83 for clinical reasoning and 3.89 for clinical learning respectively). If the mean values for each construct were higher than 4.0 then one could deduce that the average response for that construct was agreement with the statements in that construct.

Across the three realms, the NMU students scored consistently lower than the UJ cohort. The NMU results show relatively low levels of agreement with the statements in two of the constructs and moderate levels of agreement in the third. This is evidenced by the mean values of 3.28 for debriefing and reflection, 3.46 for clinical reasoning and 3.56 for clinical learning. The students at NMU are not highly satisfied with their simulation learning experience. The UJ students' results demonstrated means of 4.22 for debriefing and reflection, 4.08 for clinical reasoning and 4.10 for clinical learning. Since these values are all higher than 4.0 they indicate agreement with the statements in all three realms. This indicates that overall, the students at UJ are satisfied with their simulation learning experience. If the students had primarily chosen the option of "strongly agree" the mean values would have been closer to the maximum value of 5.0. A mean value of 5.0 would have indicated that the students are highly satisfied with their simulation learning experience. Since neither group of students' data generated mean values that are close to 5.0 we can infer that neither group of students is highly satisfied with their simulation learning experience.

For the NMU students, debriefing and reflection yielded the lowest mean whereas, the lowest mean score for the UJ students was for the construct of clinical reasoning.

The item that scored the lowest mean for the NMU group was “the facilitator provided constructive criticism during the debriefing. The mean value for this item of 2.938 indicates that the NMU students err on the side of overall disagreement with this statement. This mean value is interesting however as it is not indicative of the experience of all students at NMU. In fact, 40% of the students agreed or strongly agreed with this statement. This indicates that some of the students at NMU are having a very different experience of simulation learning than other students.

The item that had the lowest mean value at UJ was “the simulation helped me to recognize patient deterioration early”. The mean value for this item was 3.653. Although this doesn’t indicate disagreement with the statement, it also doesn’t indicate strong agreement with the statement. Sixty one percent of the students agreed or strongly agreed with this statement. This indicates that although the majority were satisfied in this realm, 39% of the students were dissatisfied or not particularly satisfied with this element of simulation. This item speaks to transferability into the real world. If students don’t feel that their simulation experiences are helping them to recognise patient deterioration early, then one could argue that one of the primary goals of simulation learning is not being met.

The highest mean for the NMU cohort was 3.813 for the item “reflecting on and discussing the simulation enhanced my learning”. This indicates that the students are almost in unanimous agreement with the statement, but some students still have reservations regarding this item, with only seventy two percent of the students agreeing or strongly agreeing with the statement.

This item also yielded the highest mean for the UJ cohort. The UJ cohort scored a mean value of 4.469 for this item indicating high levels of satisfaction in this area. Interestingly 49% agreed with this statement, 49% strongly agreed and 2% were neutral. This indicates that some students are more satisfied than their peers at UJ with regard to this item. Since debriefing and reflection are considered one of the most important aspects of simulation learning as whole (74), these data indicate success on the parts of both departments’ staff in their simulation learning curricula.

Both the UJ and NMU cohorts had an interesting result in terms of the item that showed the highest standard deviation. The NMU cohort had two items that showed the same standard deviation values. The NMU cohort had a standard deviation of 1.319 for both

“the debriefing provided an opportunity to ask questions” as well as “the facilitator provided feedback that helped me to develop my clinical reasoning skills”. UJ had a standard deviation of 0.89 for “the facilitator made me feel comfortable and at ease during the debriefing”.

A high standard deviation occurs when there is low agreement amongst the research participants within their cohort. This is further demonstrated by the fact that for the item “the debriefing provided an opportunity to ask questions” 29% of the NMU students disagreed or strongly disagreed, 3% were neutral and 69% agreed or strongly agreed. For the item “the facilitator provided feedback that helped me to develop my clinical reasoning skills” 50% of the NMU students agreed or disagreed, 13% were neutral, while 38% disagreed or strongly disagreed. This too says that the students who took part in this study did not all have the same experience of simulation learning.

The highest standard deviation amongst the UJ cohort was not as high as that of the NMU cohort. This indicates that the UJ students are closer in opinion of their experience of simulation learning than the NMU students are. One can still see areas amongst the cohort where the students had varying opinions. When one considers the statement “the facilitator made me feel comfortable and at ease during the debriefing” we see that although no students strongly disagreed with the statement, ten percent disagreed and twenty seven percent were neutral. For the item “the simulation helped me to apply what I learned from the case study” 69% of the students from the UJ cohort agreed or strongly agreed, indicating that 30% percent of the students did not feel as satisfied as their peers.

5.2 Satisfaction with simulation learning in an African context

Satisfaction with simulation learning has been explored in many countries and in the context of a variety of healthcare students, albeit that few of these studies are African. In 2001 Treadwell and Grobler explored medical students’ perceptions of simulation learning through focus group interviews at the University of Pretoria in South Africa.(86) This study touched on some aspects of the medical students’ satisfaction with their simulation learning, although this was not the primary objective of the study.

The aspects of satisfaction that were explored did not delve into the three concepts of clinical practice, clinical reasoning and debriefing and reflection deeply. The students in this study raised concerns regarding the availability of equipment to practice with, that too much theory was covered during the simulation and that too little time was spent on physical assessments. This indicates some dissatisfaction with aspects of their simulation learning. There were however other aspects that the students were satisfied with such as simulation learning assisting them to bridge the gap between theory and clinical practice, it solidifying basic concepts and improving their familiarity with clinical skills.(86) These focus group discussions shed light on the level of simulation learning that took place in this context. The comments do not indicate that high level clinical decision making was tested, that debriefing and reflection was a particular focus in the simulations, and that the clinical learning that took place was not linked to high level skills. These factors indicate that the study population had a very different simulation learning experience to that of the ECP students from NMU and UJ in that their experience was linked to learning skills as opposed to practising clinical scenarios.

In 2015 Archer described the learning experiences of first year medical students from Stellenbosch University.(64) These students answered six questions on a Likert scale regarding their experience. The 294 participants were randomised into three groups and exposed to three different teaching methods for the skill of manual defibrillation of a patient in ventricular fibrillation. These questions that the participants answered related to the student's confidence in treating the manikin or a patient; whether they felt that simulation enhanced their learning of skills; whether they felt that the feedback they received was adequate; and two questions related to whether they had enough time and opportunity to practise the skill.(64) These six questions lightly touch on the concept of satisfaction, but do not deeply explore the students' satisfaction with their simulation experience. The mean scores across the participants for all questions showed high levels of agreement except for the question about whether the students would be confident to perform the skill on a real patient and whether the time allocated for the session was adequate, which both indicated moderate agreement.(64) This study also focussed on students' experiences of simulation that taught a skill as opposed to clinical scenario simulation with high level clinical decision making.

Botma described the perceptions of student nurses at the University of the Free State after exposure to a series of high-fidelity simulations and simulations using standardized patient actors.(63) This qualitative study yielded discussion regarding elements of the simulations. Amongst these some comments were made regarding debriefing, clinical reasoning and clinical learning.(63) Comments like “feedback was valuable” indicate a level of satisfaction with the debriefing process.(63) The theme of theory-practice integration emerged in this study, with the students’ comments suggesting that they appreciated the clinical learning aspect of their simulations.(63) In terms of clinical reasoning, the comment was made that the simulations “enable students to think critically and apply current knowledge”.(63) Although none of these statements directly indicate a quantitative measure of satisfaction, they show that the students had a positive learning experience with simulation learning.(63) These simulations were much closer to the type of simulation learning that ECP students experience as they were scenario based.

In 2015 Nel and Stellenberg reported on the perceptions of postgraduate primary health care students of simulation learning.(62) These students expressed some dissatisfaction with certain aspects of their simulation learning however all the students in this study agreed that it should be used in the curriculum.(62) The aspects that the students were dissatisfied with were limitations related to the mannequin. They said that since communication is important in primary health care, they found it difficult that they did not have reciprocal communication from the mannequin.(62) They also commented that a mannequin does not provide feedback when you are not handling it gently enough like a real person would.(62) Some of the students reported practising the techniques they had learned on family members at home so that they were exposed to human interaction before they entered a clinical setting.(62) The results showed that simulation learning was partially effective for this group of students, but that there were aspects of primary health care that were not well suited to simulation learning that used a mannequin for teaching.(62)

In 2012 a group of researchers explored the use of simulation in a group of thirty four student midwives in Zambia.(79) This is the only study that the researcher came across that used a validated tool to quantitatively measure satisfaction with simulation in an African context.(79) In this study the researchers used the Student satisfaction and self-confidence in learning scale (SSSL) developed by Jeffries and Rizzolo in

2006.(61) The SSSL has five items that measure student satisfaction on a 1 = strongly disagree to 5 = strongly agree Likert scale.(61) In this study the five items regarding simulation were added together to get a score out of twenty five.(79) The mean score was 20.93. This demonstrated a reasonably high level of satisfaction amongst the midwifery students.(79) The questions in this tool are however quite limited in comparison the SSES and as such these results are not particularly comparable to those from the South African study in which the SSES was used.

5.3 Comparison of results to other studies that used the SSES

Several studies have used the SSES to measure satisfaction. The grand means from these studies are tabulated below:

Table 7. The grand means for each construct for all the cohorts that have been tested with the SSES to date.

Construct	NMU ECP Students	UJ ECP Students	Levett-Jones' et. al. Australian nursing students	Dousek et. al. Australian paramedic students	Yoou et. al. Korean Paramedic Students	Williams et. al. Australian paramedic students	Williams et. al. Jordan Paramedic Students
Debriefing and Reflection	3.278	4.222	4.473	4.246	4.650	4.296	3.794
Clinical Reasoning	3.463	4.078	4.362	4.234	4.660	4.264	3.656
Clinical Learning	3.563	4.102	4.544	4.417	4.660	4.398	3.868

The original study by Levett-Jones et. al. showed that the Australian nursing students enjoyed high levels of satisfaction with simulation. The study was conducted amongst second and third year students in Australia in a regional school of nursing that offers a Bachelor of Nursing program across three campuses. The Australian nursing students that participated in the 2011 study were more satisfied than either the UJ or NMU cohorts.

Some distinct differences between the South African study and the Australian study exist. In the 2011 study by Levett Jones et. al. students were allowed an opportunity to revise their knowledge of fluid balance (the focus of the simulation) using either an online or paper-based case study prior to commencing the simulation. The simulation that followed was a 20-minute scenario requiring students to use their clinical

reasoning ability to identify and respond to a deteriorating ‘patient’ with hypervolaemia and pulmonary oedema followed by a 20-minute debrief. In the South African study, the participants didn’t have a single simulation like the Australian students did, that they needed to base their satisfaction on. Due to the fact that the South African students are regularly exposed to simulation learning experiences, they were prompted with the following message on the screen before starting the survey: “When you are answering the following questions about simulation, consider your experience of simulation teaching, learning and assessment as a whole during your university career so far”. The South African students also did not have one specific case study that their simulation was based on, but had been taught about many case studies throughout their time at university, some of which were also linked to simulation learning experiences.

The fact that the South African students were considering their combined experiences of simulation instead of considering only one simulation learning experience, may account for some of the variance between the South African and Australian students.

Williams and Dousek published a validation study for the SSES in paramedic students.(77) These students were also from Australia.(77) This study did not describe the students’ type of exposure to simulation learning prior to using the tool to measure their satisfaction, so one is unsure whether these students had been exposed to multiple simulations prior to the tool being used. What is described however, is that paramedic student simulated learning experiences “usually consists of a group of persons acting as patients, bystanders or paramedics. The patients act out the symptoms of a particular presentation, while the paramedics perform an assessment and provide the appropriate management. This format allows the patients to represent clinical presentations thus consolidating their knowledge of clinical symptomology, provides an opportunity for the paramedics to practice their diagnostic procedures, clinical skills and patient management, and any observers can view and constructively critique both.” (77)

In 2015 Yoou and Kwon used the SSES to measure the satisfaction of Korean paramedic students after the completion of their professional cardiac resuscitation simulation training.(108) The tool was used after 15 weeks of ACLS training.(108) These students were highly satisfied with their simulation learning experience.(108)

In 2016 Williams et. al looked at two culturally different groups in order to compare their levels of satisfaction. The Australian paramedic students demonstrated higher levels of satisfaction than the Jordanian students.(29)

The data demonstrate that the UJ cohort reported similar levels of satisfaction to the Australian students from the study by Dousek et. al. and the Australian paramedic students in the cross-cultural study by Williams et. al. whereas the cohort with results most similar to the NMU students, were the students from Jordan in the 2016 study.

5.4 Statistical tests performed and their outcomes

In order to test the internal reliability of the tool for this cohort of South African ECP students the Cronbach's Alpha values were calculated for each construct. A Cronbach's Alpha value of more than 0.8 indicates that the internal consistency of the tool is appropriately high. The construct of clinical learning has the lowest internal reliability at 0.794, but the Cronbach's Alpha value for this construct is only just lower than 0.8. This indicates that this tool is reliable for this cohort of participants. The reason that the Cronbach's Alpha value for the construct of clinical learning is lower could potentially be due to the fact that the construct only had three questions in this study because one item from the clinical learning realm in the original tool was deleted for this study: "The simulation helped me to recognise my clinical strengths and weaknesses". In the case of three items being measured, a single low scoring item affects the mean Cronbach's Alpha coefficient for that construct more than in would if the construct was tested through several questions in the way the debriefing and reflection is tested in this tool.

The other test that yielded telling results was the Mann-Whitney U testing which demonstrated a p value of 0,000 for the construct of debriefing and reflection. A p value of 0,002 for clinical reasoning and 0,005 for clinical learning. This indicates that the differences between the two cohorts of students was statistically significant. This implies that the UJ ECP students are more satisfied with their simulation learning experience than the ECP students from NMU.

5.5 Possible causes of the results

The results indicate the NMU students are not entirely satisfied with their simulation learning experience and the UJ students, although satisfied, are not highly satisfied with simulation. This could be attributable to a number of variables. This study did not capture the data regarding which year of study the research participant was in. This data may have been valuable in distinguishing between years and seeking trends that may indicate that students from one year of study are more, or less satisfied than their peers.

The fact that the highest mean value was recorded for the item “Reflecting on and discussing the simulation enhanced my learning” in both cohorts is an indication that the discussion that takes place at both universities post-simulation is having a positive effect on the satisfaction of the students. This also indicates that the time provided for reflection after a simulation is probably adequate.

The item with the lowest mean in the UJ cohort could be attributable to a lack of transferability. “The simulation helped me to recognize patient deterioration early” may have been recorded as a lower mean due to the students not feeling that the simulated cases that they are exposed to in class are the same cases that they treat when they are in a real clinical setting. This may be due to the fact that much of the literature available regarding emergency medical care is foreign literature that is not necessarily relevant to the South African context. If educators are using foreign literature to guide their educational practices, they may be focusing on cases that are reflected in the clinical case load that the South African students are seeing.

Educators within the South African Emergency Medical Care programmes communicate with one another regarding educational methods and as such knowledge sharing occurs, however these educators do not necessarily get input from other health care providers who also use simulation learning as an educational tool. The data are scant on inter-professional collaboration in South Africa regarding improving simulation learning. The researcher feels there is much to be gained from learning from how other fields in health care are using simulation learning effectively.

It is worth reporting that many of the educators at the University of Johannesburg are self-taught with regards to how to use simulation learning as an effective tool. This

may be due to the lack of simulation learning training available in South Africa. The University of the Free State runs a workshop on simulation learning for health care providers (109) but further than that, formal training still has limited availability in South Africa.

One of the things that the University of the Free State suggests using during simulation is a confederate. These are actors that provide the student with information, so that they do not need to ask the prompter.(110) The confederate could act as the mother of a sick child, thereby providing information regarding the history of the illness.(111) Use of a confederate is very rare at UJ and the researcher was not made aware that it is currently used at NMU despite having been used at NMU in the past. Using a confederate improves fidelity (110) and could thus improve the students' experience of the simulation.

Hoadley suggests that high fidelity simulation improves student satisfaction with simulation learning.(101) Simulation fidelity is something that staff at the UJ have started to prioritise in the past few years and as such the simulation experience of their students may be better due to the high fidelity environment. The UJ simulation lab is decorated to visually represent hospital wards, and the back of an ambulance. Furthermore Moulage is used for some simulations in order to increase fidelity, as well as emergency procedures being carried out in full in order to improve realism. This is likely to positively contribute to the satisfaction levels that the UJ students report with their simulation learning.

Design characteristics of simulations can also have an effect on student satisfaction.(61) Clearly defined objectives and an understanding of what is expected during the simulation learning process improve student satisfaction.(61) It is important that these aspects are communicated to the students. The educators and NMU and UJ should clearly define the outcomes and objectives of their simulations before engaging in a student simulation learning session. This requires thought and planning, which may be time-consuming, but it is vital to ensure an effective process.

Considering the significant difference between the satisfaction scores of the NMU students and those of the UJ students, one could postulate that the age of the programmes may have an effect. The NMU programme took their first intake of students in 2014. UJ has been running their Bachelor programme since 2006 and

before that they ran the National Diploma programme. Many of the educators who are currently working at UJ have been working at the UJ since 2008 and as such, they have had exposure to simulation learning in education for many years. The staff at NMU are likely to still be in the process of refinement of their simulation learning curriculum.

Another consideration is that the language of instruction may have an impact on a student's level of satisfaction with their learning experience. South Africa has 11 official languages. Students at NMU and UJ are instructed in English, but this is unlikely to be their first language due to vast amounts of cultures that are prevalent in South Africa. Brock-Utne is quoted as saying "Having English as the language of instruction does not promote understanding of what is learnt in the majority schools in the so-called anglophone Africa".(112) Although Brock-Utne was referring to school children, the fact that some of the students enrolled at South African universities may still lack command of English, indicates that the students' level of satisfaction may be impacted by the fact that they are being taught in English, as they may not have a deep understanding of what is being taught. For those students with average English comprehension and knowledge instead of excellent English skill, the simulation learning experience may prove to be significantly more difficult.

5.6 Limitations

This study was limited by the fact that demographic data were not captured from the two cohorts involved in the study. These data, such as current year of study, may have indicated why there were certain questions that yielded such different answers from students who study at the same university.

Further limitations included the small sample size of 81 participants. Although the sample size is small, a large portion of the population participated in the study, improving the generalisability of the information. With a sample of 81 participants of 125 people in the population, the margin of error is 6.5% at a 95% confidence interval.

The sample only included students from two of the four universities that offer training to ECP students in South Africa. This study aimed to delve into the satisfaction of students with simulation of a similar type so as to not contaminate the data with too

many variables. The way in which simulation is performed at DUT and CPUT vary from that way it is done at UJ and NMU as they do not run the same curriculum as UJ and NMU do.

This study removed one question from the original tool due to the validation study that was performed using paramedic students, which suggested that three factor solution was obtained when one item was deleted. Since the researcher wanted to investigate the students' satisfaction across the three realms, it was deemed important to use the tool in a way that would generate three factors.

CHAPTER 6: CONCLUSION

Simulation is a powerful educational technique when used correctly. The three areas of debriefing and reflection, clinical learning, and clinical reasoning are important realms to consider when using simulation learning as an educational technique.

The data from this study show that the students from UJ are satisfied with simulation learning, and enjoy a similar level of satisfaction with simulation to Australian paramedic students, but are not as highly satisfied as students from Korea or Australian nursing students. The data also show that students from NMU are moderately satisfied with simulation and have similar levels of satisfaction to Jordanian students.

This indicates that within the three realms of clinical reasoning, clinical learning and debriefing and reflection, educators at UJ and NMU could be using simulation learning more effectively. These educators could focus on the literature available to guide them in their simulation learning sessions in order to improve their students' satisfaction. Students from UJ are however, significantly more satisfied with simulation learning than students from NMU. At NMU the area that demonstrated the lowest level of satisfaction was debriefing and reflection, whilst at UJ clinical reasoning was the realm that scored the lowest mean,

The data from this study were not comparable to data from South African studies that commented on the simulation experiences of other health care provider students as the studies did not look at the same elements of simulation as this study did. The type of simulation learning that the various health care students engaged in, also varied from the type of simulation learning that ECP students engage in.

CHAPTER 7: RECOMMENDATIONS

This study found that students from NMU were moderately satisfied with simulation and students from UJ were satisfied but not highly satisfied with simulation. It is therefore recommended that the educators from both the University of Johannesburg and Nelson Mandela University consider revisiting their simulation learning strategies in order to improve the satisfaction of their students.

The area that is noteworthy in the results is debriefing and reflection. The educators at both universities should consider doing fewer simulations in one class session with longer debriefing sessions after the simulation, in order to allow ample time for reflection.

The educators should also look at the fact that “the simulation helped me to recognize patient deterioration early” did not score highly. Low levels of agreement with this statement indicate that educators need to focus on creating simulations that help students to recognize patient deterioration in real humans. Increasing fidelity may help to achieve this.

Fidelity can be increased through the use of a confederate and as such the researcher suggests that the use of a confederate be implemented where possible in order to assist fidelity.

It is also recommended that the educators from both universities attend the simulation learning training workshop for educators that is presented by the University of the Free State each year in order to improve their simulation education skills.

The researcher further recommends that a study be done to measure the satisfaction of the students at the two other universities that teach ECP students in South Africa using the SSES. A qualitative study using the same students from this sample will yield deeper information regarding what the students appreciate and dislike about the simulation learning at their respective universities.

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APPENDICES

Appendix 1. Mean scores, standard deviation and the percentage of participants that selected each option for the UJ participants.

*N = Number; StdD = Standard Deviation; SA = Strongly Agree; A = Agree; Neither agree nor disagree; D = Disagree; SD = Strongly Disagree

	Descriptive Statistics (n=49)		Percentage of participants that selected this option				
Question	**Mean**	**StdD**	**SA**	**A**	**N**	**D**	**SD**
The facilitator provided constructive criticism during the debriefing	4,39	0,53	41	57	2	0	0
The facilitator summarized important issues during the debriefing	4,37	0,53	39	59	2	0	0
I had the opportunity to reflect on and discuss my performance during the debriefing	4,10	0,71	29	55	14	2	0
The debriefing provided an opportunity to ask questions	4,45	0,50	45	55	0	0	0
The facilitator provided feedback that helped me to develop my clinical reasoning skills	4,18	0,63	29	63	6	2	0
Reflecting on and discussing the simulation enhanced my learning	4,47	0,54	49	49	2	0	0
The facilitator's questions helped me to learn	4,12	0,63	27	59	14	0	0
I received feedback during the debriefing that helped me to learn	4,20	0,54	27	67	6	0	0
The facilitator made me feel comfortable and at ease during the debriefing	3,71	0,89	18	45	27	10	0
The simulation developed my clinical reasoning skills	4,10	0,80	33	49	14	4	0
The simulation developed my clinical decision-making ability	4,18	0,75	35	53	8	4	0
The simulation enabled me to demonstrate my clinical reasoning skills	4,24	0,69	37	53	8	2	0
The simulation helped me to recognize patient deterioration early	3,65	0,80	12	49	31	8	0
This was a valuable learning experience	4,20	0,71	31	63	4	0	2
The simulation caused me to reflect on my clinical ability	4,22	0,65	33	59	6	2	0
The simulation tested my clinical ability	4,29	0,61	35	61	2	2	0
The simulation helped me to apply what I learned from the case study	3,80	0,89	20	49	20	10	0

Appendix 2. Mean scores, standard deviation and the percentage of participants that selected each option for the NMU participants.

* N = Number; StdD = Standard Deviation; SA = Strongly Agree; A = Agree; N = Neither agree nor disagree; D = Disagree; SD = Strongly Disagree

	Descriptive Statistics (n=32)		Percentage of participants that selected this option				
Question	**Mean**	**StdD**	**SA**	**A**	**N**	**D**	**SD**
The facilitator provided constructive criticism during the debriefing	2,94	1,27	9	31	19	25	16
The facilitator summarized important issues during the debriefing	3,09	1,23	6	44	19	16	16
I had the opportunity to reflect on and discuss my performance during the debriefing	3,44	1,22	19	38	22	13	9
The debriefing provided an opportunity to ask questions	3,47	1,32	19	50	3	16	13
The facilitator provided feedback that helped me to develop my clinical reasoning skills	3,16	1,32	16	34	13	25	13
Reflecting on and discussing the simulation enhanced my learning	3,81	0,97	22	50	19	6	3
The facilitator's questions helped me to learn	3,31	1,06	9	44	19	25	3
I received feedback during the debriefing that helped me to learn	3,19	1,06	6	41	25	22	6
The facilitator made me feel comfortable and at ease during the debriefing	3,09	1,17	9	34	22	25	9
The simulation developed my clinical reasoning skills	3,34	1,04	9	44	22	22	3
The simulation developed my clinical decision-making ability	3,47	1,16	19	41	13	25	3
The simulation enabled me to demonstrate my clinical reasoning skills	3,75	1,05	19	56	13	6	6
The simulation helped me to recognize patient deterioration early	3,13	1,07	6	38	25	25	6
This was a valuable learning experience	3,63	1,16	19	50	16	6	9
The simulation caused me to reflect on my clinical ability	3,75	1,08	22	50	16	6	6
The simulation tested my clinical ability	3,63	1,07	19	44	25	6	6
The simulation helped me to apply what I learned from the case study	3,31	1,12	6	53	16	16	9

Appendix 3. Tools measuring student satisfaction with simulation learning experiences published from 2004 onwards.

Year Published	Tool	Validity/Reliability	Author/s	Designed for	Notes:
2004	Student Satisfaction Survey (107,113)	Not Validated. No comment on Reliability.	Feingold Callaluce Kallen	Nursing students	19 Items Pertaining to transferability, realism and value of the simulation. Four point Likert scale. Tool was used after five 1 hour simulation sessions in the original study.
2006		Reliability for the sample was 0.86. Subscale reliability was 0.41 for realism; 0.78 for transferability and 0.69 for value.	Abdo Ravert		
2004	Unnamed tool (114)	No mention of validity or reliability.	Mc Causland Curran Cataldi	Nursing students	Ten item Likert-type questionnaire. Answers range from Not at all to very much so. Questions pertain predominantly to value of the simulation and realism.
2004	Unnamed tool (92)	No validity or reliability discussed.	Mole McLafferty	Newly qualified nurses	Structured questionnaire with room for free responses as well as four Likert-type response questions pertaining to aims of the simulation.
2006	Simulation Design Scale (94)	Cronbach's Alpha was 0.92. Subscale of satisfaction with	Dobbs Sweitzer Jeffries	Nursing students	30 items pertaining to satisfaction with the

		teaching methodology was 0.94. Self confidence in learning was 0.85. Self-perceived judgement performance was 0.92. Validity checked by three experts.			teaching methodology, self-confidence in learning and self-perceived judgement. Five point Likert scale.
2006	Unnamed tool (115)	Content was deemed valid, but construct validity and reliability were not established.	Schoening Sittner Todd	Nursing Students	Ten items on a four point Likert scale. Three questions pertain to the satisfaction of the students.
2006	Student satisfaction and self-confidence in learning scale (61,116)	Content validity ensured by 10 experts in nursing and medicine. The 13-item Student Satisfaction and Self-Confidence in Learning Scale has reported Cronbach's alphas of 0.94 for the Satisfaction sub- scale and 0.87 for the Self-Confidence subscale.	Jeffries and Rizzolo	Nurses	Thirteen Items, 5 pertain to satisfaction. Likert scale from strongly disagree to strongly agree.
2011	Satisfaction with simulation experience scale (SSES) (28,77)	Content validity ensured by an expert panel of nine academics. Construct validity was achieved through EFA. Cronbach's Alpha values of 0.935 for debriefing and reflection, 0.855 for clinical reasoning and 0.850 for clinical learning were achieved.	Levett-Jones	Nursing Students	Eighteen items on a Likert scale questionnaire ranging from strongly agree to strongly disagree. Three constructs: debriefing and reflection, clinical learning and clinical reasoning.

2012		Validated and reliable in the student paramedic population.	Williams Dousek	Paramedic Students	One item was deleted from the original tool for three factor solution to be achieved.
2012	WebEx student survey instrument (117)	Not Validated.	Hayden Navedo Gordon	Medical Students	Seven questions regarding one simulation experience.
2012	Escala de Satisfaçâo com as Experiências Clinicas Simulatas (118)	Validated in Spanish in 2014. Cronbach's alpha of 0.951 for the overall tool.	Baptista Martins Pereira Mazzo	Nursing students	Seventeen items regarding three subsets: practical satisfaction, realism and cognitive satisfaction.
2016	Satisfaction of high fidelity simulation experience (SESAF)(97)	Content validated in Italian. Construct validity yielded 7 factors. Reliability coefficient of 0.97 reported.	Calamassi Nanelli Guazzini Rasero Bambi	Doctors and nurses	Forty items on a five point Likert scale pertaining to seven factors. A further eight questions on a scale of 1 to 10.

Appendix 4. A description of simulation at Nelson Mandela University

The researcher asked had informal discussions with the HOD and staff of NMU's Department of EMC in order to determine how simulation learning is structured at NMU. It was felt that this was necessary in order to provide context to the results so that the results of the survey are better understood.

EMC students at NMU start with simulation learning in their first year of study. NMU students are introduced to simulation learning in a similar way to which students at the UJ are, starting with skills based trainers first, and then moving into simple patient scenarios at a later stage during their first year. The skill based OSCEs are continued throughout the four years with more complicated, higher acuity skills being taught each year.

Debriefing at NMU is done differently by each lecturer in each year. The second year lecturer provides key feedback points to the student, and then allows the student who performed the simulation's peers to provide some feedback to one another. The third year lecturer facilitates a debrief session where the student who performed the sim starts the debrief session with their own thoughts, then the student's simulation partner adds comments, after which the simulation facilitator and finally the student's classmates add additional comments. If the peer comments spark debate, the facilitator regulates the debate. The fourth year lecturer allows the students' peers to provide the feedback after the simulation. The fourth year students also have access to a video of their simulation for self-reflection purposes.

Simulation learning frequency varies from year to year. The second year students have clinical simulations sessions once per week for 70 minutes. They also have several longer clinical simulation sessions during the year. These longer sessions are six hour sessions and these occur approximately six times per year. The second year students spend an equal amount of time in clinical simulations as OSCE practice. The class is split into two groups, with one group practising the OSCE skills whilst the other group performs clinical simulations. This is to ensure that the facilitator to student ratio does not exceed 1:15. This ratio of facilitators to students is maintained throughout all years of study. The third year students have approximately six hours of clinical simulations every second week. The schedule for the third year students' practical time is not as strictly defined as that of the second year students, and the students

may therefore engage in more time practising OSCE skills than doing clinical simulations. The fourth year students engage in approximately eight hours of clinical simulations per week.

In second and third year the clinical simulations are of shorter duration, taking approximately 30 minutes for the simulation and debrief. Third year simulations may only take thirty minutes but often lead to lengthy theory discussions relating to the simulation afterwards that mean that fewer simulations are done within the practical session. Fourth year simulations may take from one to two hours. This is due to the fact that the simulations are more complex and the debriefing is more extensive.

Clinical simulations are used as assessments across all years of study. NMU uses a system for second year whereby there are three clinical simulations throughout the year as assessments and one clinical simulation that is a final examination. Third year students have four simulations during the year and their final examination. Fourth year students have two paediatric emergency simulation assessments and three intensive care transport simulations.

NMU use two brands of simulation mannequins, namely the Laerdal and Gaumard products. For the paediatric simulations, the high fidelity Gaumard Hal ® and Gaumard Tory ® mannequins are used. The other clinical simulations are medium fidelity, as the Laerdal Mega Code Kelly ® mannequins are able to mimic physiological responses in terms of blood pressure, pulses and breathe sounds. Moulage and stage props are not widely used at NMU to increase the fidelity of the simulations.

At NMU, most simulation learning takes place in the simulation laboratory, although at times when the laboratory is not available for use, a classroom is used. The simulation laboratory is pictured below:

Figure 6. A view of NMU's Simulation laboratory

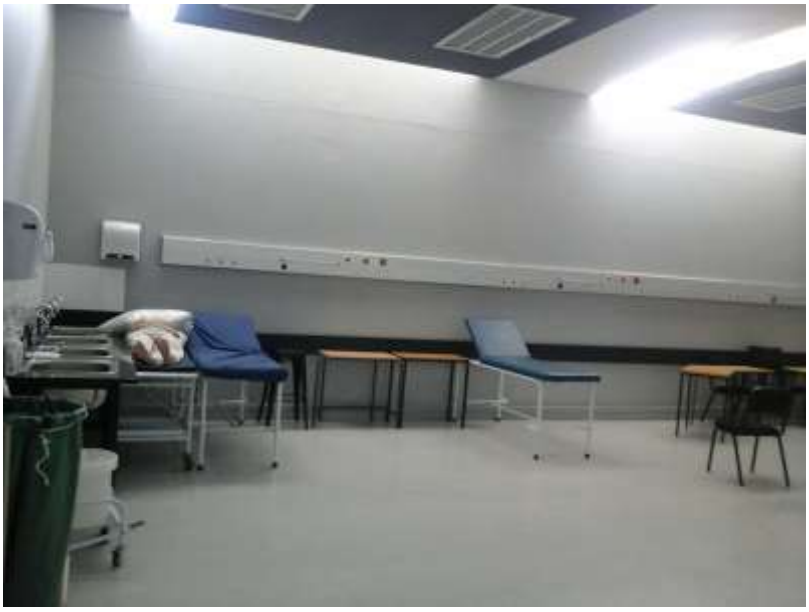


Figure 7. NMU's Simulation laboratory

Figure 8. Storage area of NMU's Simulation laboratory

Appendix 5. A description of simulation at the University of Johannesburg

At the UJ, simulation learning is introduced in the first semester of the first year of study on the B.EMC degree programme.

It is introduced in its most simple form – through the use of skills trainers. For the first term of first year, students at the UJ are taught a number of basic skills on skills trainer simulators, such as CPR, intramuscular injection and bag-valve-mask ventilation. Other skills such as use of an oxygen cylinder, or placement of a Thomas traction splinting device are taught using real equipment with no mannequin required.

Figure 1. A Laerdal airway management skills trainer.

Figure 2. An intravenous catheterisation skills trainer.

In term 2 of first year, the students are introduced to clinical scenario simulation. In first year, these remain extremely basic, with clinical decisions that are expected of them being things such as whether to deliver oxygen to a patient or not. As the student progresses to second, third and fourth year, the clinical scenarios that are simulated become more complicated and more challenging. Clinical simulations are performed during class time, with the lecturer facilitating the session as the prompter. The clinical simulation scenarios are most often done using the high fidelity mannequins such as the Laerdal Sim Man 3G or Laerdal MegaCode Kelly. The fourth year students use Sim NewB, Sim Baby or Sim Junior for their paediatric emergency simulations. Sim Mom is used to simulate obstetric emergencies which are covered in the third year of study.

The EMC practical classes take place for four to six hours per week for students from each year of study. The student will have a classmate act as their partner, and the rest of their classmates will watch the simulation as it is practised. Once the clinical scenario has run its course, the prompter will start the debriefing process. Sometimes

the lecturer will stop midway through a simulation to highlight something important that needs to be debriefed, but this is very rarely the case. The debriefing is structured in such a way that feedback is first positive, then critical and then positive again. This is based on the educational principle of sandwiching the feedback. (71)

When simulation is used for teaching and learning, a two hour-long EMC practical lesson is limited to three to four simulations for first year students, as opposed to one to two simulations for second, third and fourth year students. This way, ample time is allocated for the simulation as well as reflection and debriefing. Sometimes the debriefing process takes longer than the actual clinical simulation did.

Debriefing is structured in the same way across all four years of study. During the debriefing, the lecturer guides the student through every action that they performed during the simulation, and evaluates whether it was correct or not for that patient. Senior students' clinical scenario simulations are only facilitated, prompted and debriefed by experienced clinicians and educators. Peer commentary on simulations is allowed, but the comments are moderated by the facilitator in order to ensure that the peer's comments are accurate and provide appropriate guidance.

The UJ is fortunate to have received funding that allowed them to build a world-class simulation laboratory facility. The facility has two rooms that simulate the back of an ambulance, one EC room, one ICU, and a room with ten cubicles each containing a plinth. All of the students' simulation activities take place in the simulation laboratories that are pictured below:

Figure 3. One of the ten UJ simulation laboratory skill station cubicles.

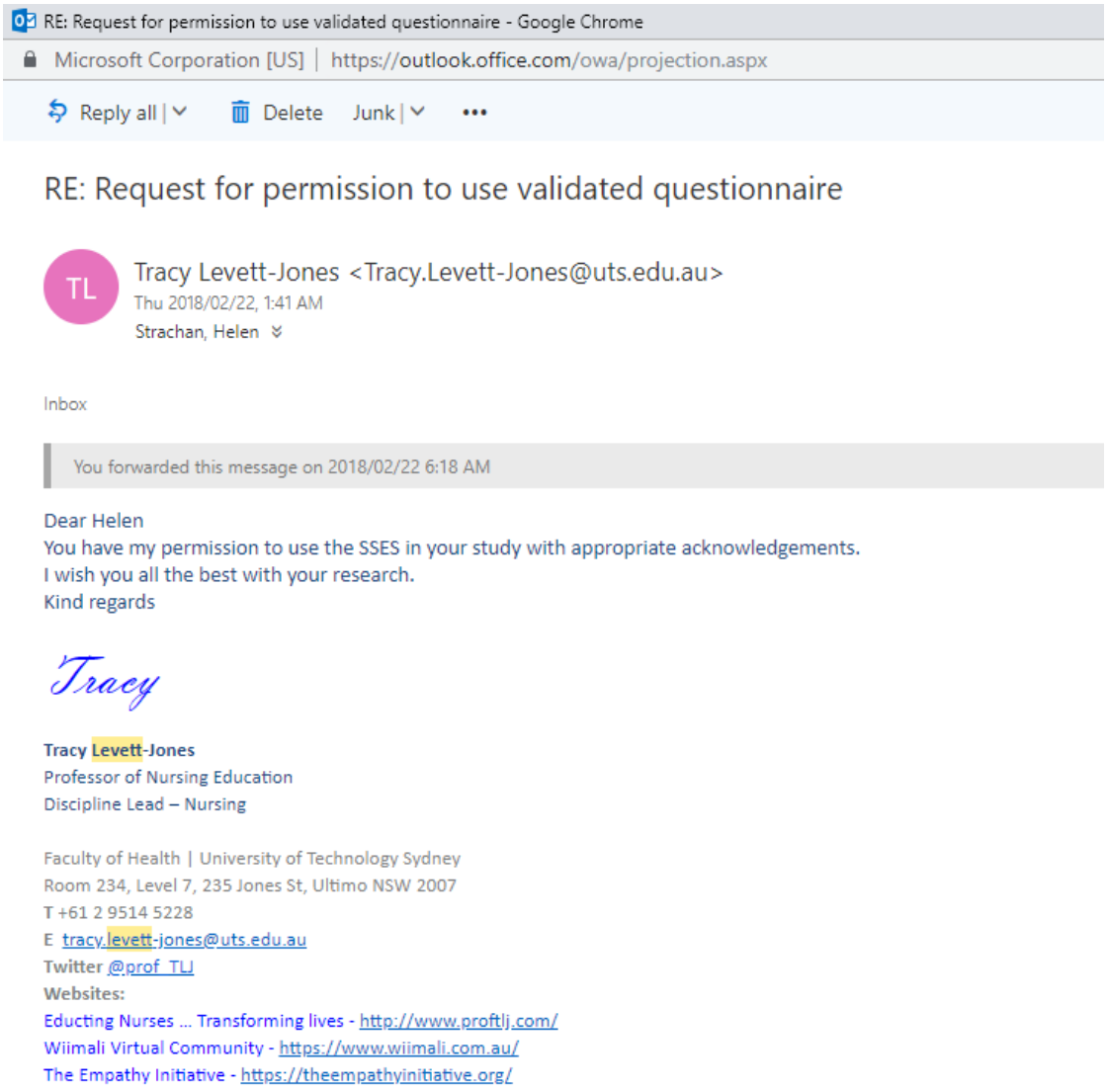
Figure 4. A view of the UJ Emergency Centre simulation laboratory.

Figure 5. A view of the UJ ICU simulation laboratory.

For assessment purposes, simulated cases are performed as described above, but the student does not perform the simulation in front of their classmates. The student

performs the simulation in front of two or three examiners (who are qualified ECPs), and their lecturer who acts as a prompter for the simulation. The student will have their partner available to them as they usually would during teaching and learning. The simulation takes place in the simulation laboratory and is video-recorded so that any queries can be assessed by the moderator. The student is scored using a weighted allocation matrix tool called the simulation assessment tool for limiting assessor bias (SATLAB) by the examiners. This tool enables the examiners to score various elements of the simulation on a scale of minus two to three, in order to generate a final mark for the student. The tool was developed by Mr Andrew Makkink from the UJ.(119)

Appendix 6: Permission from Prof. Levett-Jones to use the SSES



RE: Request for permission to use validated questionnaire - Google Chrome

Microsoft Corporation [US] | https://outlook.office.com/owa/projection.aspx

Reply all | Delete Junk | •••

RE: Request for permission to use validated questionnaire

TL

Tracy Levett-Jones <Tracy.Levett-Jones@uts.edu.au>
Thu 2018/02/22, 1:41 AM
Strachan, Helen

Inbox

You forwarded this message on 2018/02/22 6:18 AM

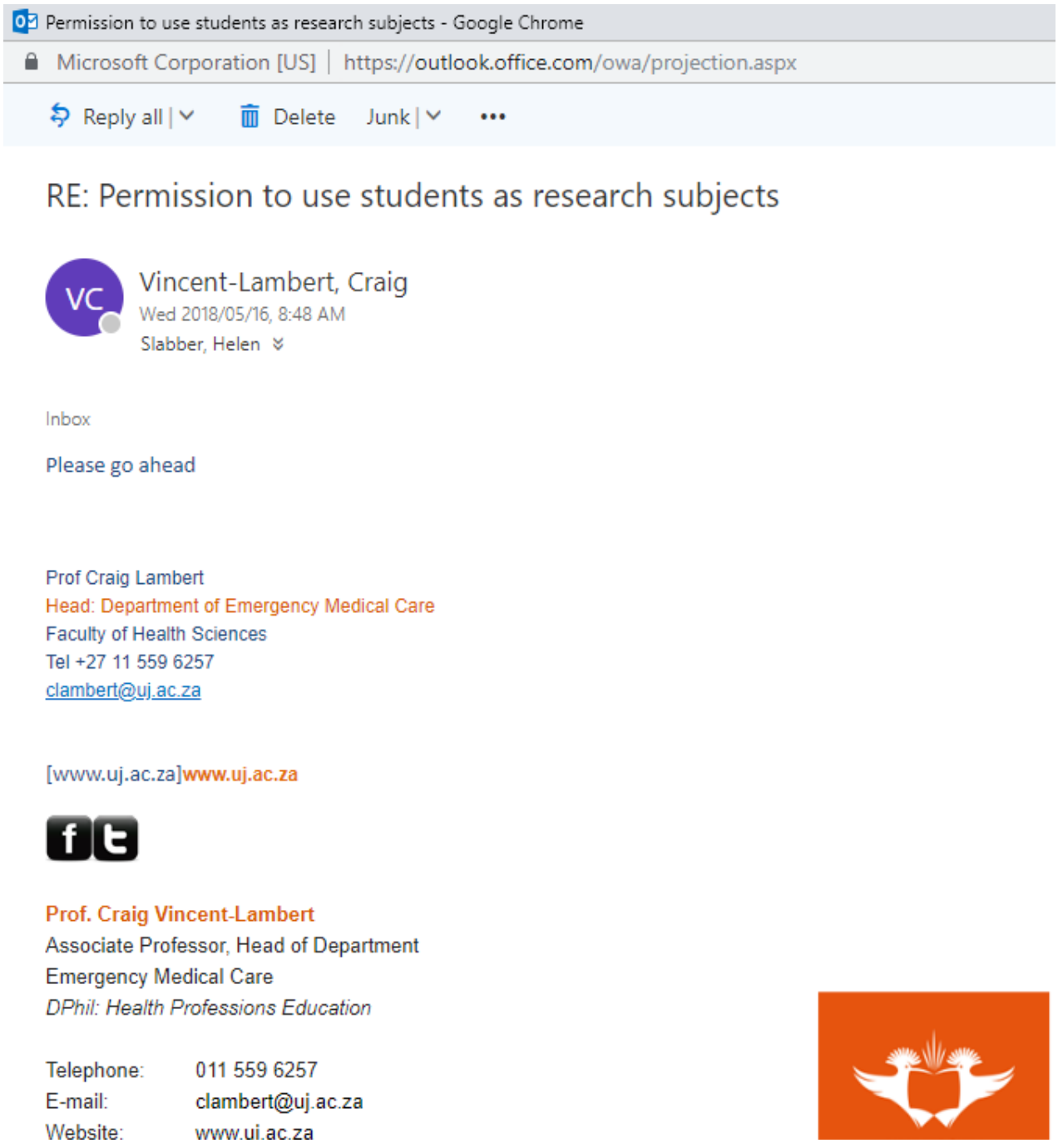
Dear Helen
You have my permission to use the SSES in your study with appropriate acknowledgements.
I wish you all the best with your research.
Kind regards

Tracy

Tracy Levett-Jones
Professor of Nursing Education
Discipline Lead – Nursing

Faculty of Health | University of Technology Sydney
Room 234, Level 7, 235 Jones St, Ultimo NSW 2007
T +61 2 9514 5228
E tracy.levett-jones@uts.edu.au
Twitter @prof_TLJ
Websites:
Educting Nurses ... Transforming lives - http://www.proftlj.com/
Wiimali Virtual Community - https://www.wiimali.com.au/
The Empathy Initiative - https://theempathyinitiative.org/

Appendix 7: Permission from the University of Johannesburg Head of Department to use EMC students as study participants.



Permission to use students as research subjects - Google Chrome

Microsoft Corporation [US] | https://outlook.office.com/owa/projection.aspx

Reply all | Delete Junk | •••

RE: Permission to use students as research subjects

VC

Vincent-Lambert, Craig
Wed 2018/05/16, 8:48 AM
Slabber, Helen

Inbox

Please go ahead

Prof Craig Lambert
Head: Department of Emergency Medical Care
Faculty of Health Sciences
Tel +27 11 559 6257
clambert@uj.ac.za

[www.uj.ac.za]www.uj.ac.za

Prof. Craig Vincent-Lambert
Associate Professor, Head of Department
Emergency Medical Care
DPhil: Health Professions Education

Telephone: 011 559 6257
E-mail: clambert@uj.ac.za
Website: www.uj.ac.za

Appendix 8: Permission from Head of Division for Institutional Planning, Evaluation and Monitoring to use University of Johannesburg students as study participants.

FW: Permission to use students as research subjects - Google Chrome

Microsoft Corporation [US] | https://outlook.office.com/owa/projection.aspx

Reply all | Delete Junk | •••

From: Fourie, Cornelius
Sent: 15 May 2018 02:22 PM
To: Slabber, Helen <hstrachan@uj.ac.za>
Cc: Lee Wallis <lee.a.wallis@gmail.com>
Subject: RE: Permission to use students as research subjects

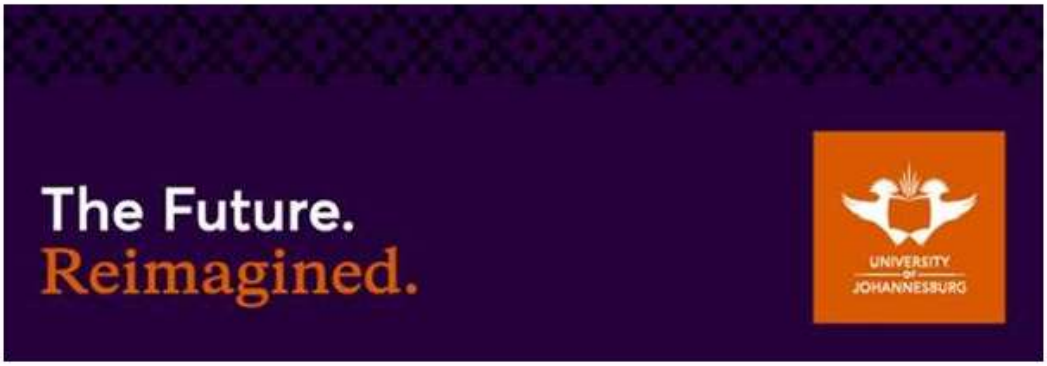
Dear Helen,

Your request for permission to conduct part of your research using UJ-students is approved.

Please notify me if you need a formal letter, or is this email adequate for your purpose?

Regards

Prof CM (Neels) Fourie
Head: Institutional Research and Planning Unit
Division for Institutional Planning, Evaluation and Monitoring (DIPEM)
Tel +27 11 559 2093
nfourie@uj.ac.za



Appendix 9: Permission from Nelson Mandela University Head of Department to use EMC students as study participants.

NELSON MANDELA
UNIVERSITY

Ocean Sciences Campus
Department of Emergency Medical Care
Faculty of Health Sciences
Tel . +27 (0)41 504 2964 Fax. +27 (0)41 504 9033
Nico.louw@mandela.ac.za
12 October 2017

To: Ms Helen Slabber

From: Mr Nico Louw
HOD: EMC
Nelson Mandela University

Re: REQUEST FOR PERMISSION TO CONDUCT RESEARCH

Your request to conduct research, by circulating an online questionnaire amongst the B(EMC) students, on the topic of "EMERGENCY CARE PRACTITIONER STUDENTS' SATISFACTION WITH SIMULATION ACROSS TWO UNIVERSITIES IN SOUTH AFRICA", is approved.

Feel free to let me know where I can be of further assistance.

All the best.

Regards

Signature Removed

Mr Nico Louw
HOD: EMC
Nelson Mandela University

Appendix 10: Ethical Clearance certificate from the University of Cape Town.

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E52-24 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 404 7682
Email: noel.baima@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

24 April 2018

HREC REF: 253/2018

Prof L Wallis
C/o Colleen Saunders
Emergency Medicine
F51, Old Main Building

Dear Prof Wallis

PROJECT TITLE: EMERGENCY CARE PRACTITIONER STUDENT'S SATISFACTION WITH SIMULATION ACROSS TWO UNIVERSITIES IN SOUTH AFRICA (MPhil-candidate-H Slabber)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 April 2019.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

We acknowledge that the student Mrs H Slabber will be involved in this study.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval before the research may occur.

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Yours sincerely

Signature Removed

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical

Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI),and Declaration of Helsinki (2013) guidelines.

The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

Appendix 11: Ethical Clearance certificate from the University of Johannesburg.

FACULTY OF HEALTH SCIENCES

RESEARCH ETHICS COMMITTEE

NHREC Registration no: REC-241112-036

REC-04-25- 2019

14 May 2019

TO WHOM IT MAY CONCERN:

Researcher: **SLABBER, M**

TITLE OF RESEARCH PROJECT: Emergency Care Practitioner Students' Satisfaction with Simulation across two Universities in South Africa

DEPARTMENT OR PROGRAMME: NON – DEGREE PURPOSES

SUPERVISOR: Prof L Wallis **CO-SUPERVISOR:** -

The Faculty Research Ethics Committee has scrutinised your research proposal and confirm that it complies with the approved ethical standards of the Faculty of Health Sciences; University of Johannesburg.

The REC would like to extend their best wishes to you with your postgraduate studies.

Yours sincerely

Signature Removed

Prof C Stein

Chair : Faculty of Health Sciences REC

Tel: 011 559 6564

Email: [redacted]

Appendix 12: Ethical Clearance certificate from Nelson Mandela University.

NELSON MANDELA
UNIVERSITY

PO Box 77000, Nelson Mandela University, Port Elizabeth, 6031, South Africa www.mandela.ac.za

Chairperson: Research Ethics Committee (Human)
Tel: +27 (0)41 504 2295
Chairnan.Cilliers@mandela.ac.za

Ref: [H18-HEA-EMC-EAP-001]

Contact person: Mrs U Spies

10 May 2018

Dear Prof Wallis

TITLE: **Emergency care practitioner student's satisfaction with simulation across two universities in South Africa**
REF NR: **HREC 253/2018**

Your application for ethics approval to conduct research at Nelson Mandela University has been considered by the REC-H on the basis that the study has been duly vetted and approved by the University of Cape Town's Ethics Committee.

Kindly use the following ethics reference number **H18-HEA-EMC-EAP-001** together with your University's ethics clearance number in any correspondence with gatekeepers and participants at the University. Please inform the REC-H, of any changes that may arise during the execution of the study, particularly to the methodology.

It must be noted that the Nelson Mandela University assumes that the Research Ethics Committee responsible for providing the original ethics approval/clearance has undertaken both ethics and scientific review of the protocol according to the National Health Research Ethics Committee (2014) Guidelines, and assumes primary responsibility for oversight with regard to any ethical issues that may arise in the course of the study. The Nelson Mandela University would also wish to be provided with an executive summary of the findings from the research.

We wish you well with the project.

Yours sincerely

Signature Removed

Prof C Cilliers
Chairperson: Research Ethics Committee (Human)

cc: Department of Research Capacity Development