STUDENT'S EXPERIENCES OF SIMULATION BASED EDUCATION VS. PROBLEM BASED LEARNING IN EMERGENCY MEDICAL CARE TRAINING

by

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STUDY LEADER: DR J. BEZUIDENHOUT

DECLARATION

I hereby declare that the compilation of this mini-dissertation is the result of my own independent investigation. I have endeavoured to use the research sources cited in the text in a responsible way and to give credit to the authors and compilers of the references for the information provided, as necessary. I have also acknowledged those persons who have assisted me in this endeavour. I further declare that this work is submitted for the first time at this university and faculty for the purpose of obtaining a Magister degree in Health Professions Education and that it has not previously been submitted to any other university or faculty for the purpose of obtaining a degree. I also declare that all information provided by study participants will be treated with the necessary confidentiality.

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Mugsien Rowland

22 Aug 2016 Date

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Mugsien Rowland

DEDICATION

I dedicate this dissertation to my wife, who provided support, inspiration and encouragement thorough out my quest to complete this dissertation. She always remained positive and her love and affection remained my pillar of support throughout the course of this study.

I would also like to dedicate this dissertation to my two children. Without their love and sacrifice this work would not have been possible.

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LIST OF ACRONYMS AND ABBREVIATIONS

ALS	:	Advanced Life Support
CBL	:	Case Based Learning
CHE	:	Council of Higher Education
CPUT	:	Cape Peninsula University of Technology
СИТ	:	Central University of Technology
ECT	:	Emergency Care Technician
EMC	:	Emergency Medical Care
HPCSA	:	Health Professions Council of South Africa
ICT	:	Information and Communication Technology
OBE	:	Outcomes Based Education
PBL	:	Problem Based Learning
SBE	:	Simulation Based Education
SBME	:	Simulation Based Medical Education
SBT	:	Simulation Based Training
TBL	:	Task-based learning
SLE	:	Simulated Learning Environment
UFS	:	University of the Free State
UK	:	United Kingdom
USA	:	United States of America

SELECTED DEFINITIONS AND TERMS

Algorithm: "A systematic process consisting of an ordered sequence of steps, each step depending on the outcome of the previous one. In clinical medicine, a step-by-step protocol for management of a health care problem (The Free Dictionary:Online).

Andragogic: "[T]the art and science of helping adults learn" (Cantillion, Hutchinson & Wood 2003:1).

Emergency care: "[T]the services rendered by members of the health professions for the benefit of a patient" (The Free Dictionary:Online).

Emergency medicine: The International Federation for Emergency Medicine, as cited by the College of Emergency Medicine, UK (2013 Online) defines emergency medicine in 1991 as "a field of practice based on the knowledge and skills required for the prevention, diagnosis and management of acute and urgent aspects of illness and injury affecting patients of all age groups with a full spectrum of undifferentiated physical and behavioural disorders. It further encompasses an understanding of the development of pre-hospital and in-hospital emergency medical systems and the skills necessary for this development."

Formative Assessment: "(Education) ongoing assessment of a pupil's educational development within a particular subject area" (The Free Dictionary:Online).

High-fidelity simulation: A simulation of a clinical condition in which aspects such as injuries, physiological presentation and responses expected in a real patient, as well as the environment, is replicated as far as possible, for the purpose of realism and authenticity (Boulet & Swanson 2004:120).

Paramedic: "A person who is trained to give emergency medical treatment or assist medical professionals" (The Free Dictionary:Online).

Pedagogical: The word 'pedagogy' originates from the Greek words 'paidos' (child) and 'agogus' (leader of) and initially referred to the art and science of educating children but now refers to the art and science of teaching and education in general (Forrest, Mckimm & Edgar 2013:43).

Simulation: The technique of imitating the behaviour of some situation or process (whether economic, military, mechanical, etc.) by means of a suitably analogous situation or apparatus, especially for the purpose of study or personnel training (Forrest, Mckimm & Edgar 2013:12).

Summative Assessment: "(Education) education Brit general assessment of a pupil's achievements over a range of subjects by means of a combined appraisal of formative assessments" (The Free Dictionary:Online).

SUMMARY

Key terms: Simulation Based Education, Problem Based Learning, Emergency Medicine, Emergency Care, Paramedic, Simulation, Pedagogy.

An in-depth study was done into Simulation Based Education (SBE) and Problem Based Learning (PBL) with a view to understanding which method of education is best suited to paramedic education. The researcher performed a survey of students who were studying towards becoming a paramedic at the Free State College of Emergency Care in Bloemfontein.

Paramedic education requires the educator to understand a variety of teaching skills and an understanding to support the needs of the students. As such, the educator's role is critical for learning to occur in the classroom and it requires the educator to have sound knowledge about different teaching strategies, as well as an understanding of which strategies work best with the specific discipline content information.

This study sought to bridge the gap created by the absence of guidelines by the Health Professions Council of South Africa (HPCSA) for curriculum deployment in emergency medical care (EMC) training. With the recent shift from vocationally-based training to higher education in paramedic education a dire need exists to explore student paramedics' perception of the curriculum that is being used in EMC training.

Simulation is currently being used as a summative assessment instrument to measure students' competency, but it does not integrate educational methods which are being used in emergency medicine and in other allied health care education. Universities and other institutions use outcomes-based education and training as set out by the requirements of the South African Qualifications Authority (SAQA). Countries such as the United States and Australia make use of integration of PBL and SBE or Case-based learning (CBL) and SBE. SBE and PBL studies were used to frame and focus the study. This study is situated in the field of Health Professions Education and focused on the profession of EMC.

The research methods comprised analysis of documents that contextualise the use of clinical simulation by emergency care education programmes in South Africa. A review of

scholarship provided a conceptual framework for understanding health care simulation as an educational methodology and its use as an instrument of assessment in EMC. Literature on PBL was also sought in EMC and since no articles could be found locally, articles from Australia, the United States and medicine were used to draw conclusions. Limited articles could be found internationally and even less information was found when the researcher looked within the South African EMC system with regard to different curriculums in use for paramedic education.

A quantitative descriptive design was employed and a questionnaire survey was used as the method of data collection for the empirical phase of the study. All participants was first introduced to SBE and PBL prior the completion of the questionnaire survey. This ensured that each participant knew exactly how each method of education works. Data from questionnaire survey was analysed and interpreted in conjunction with the ICT Department University Free State, and the experience of the researcher, to examine which method of education is preferred by paramedic students' which was the main unit of analysis, and the subunits, namely, how students experienced SBE and PBL.

The data collected from the questionnaire survey was analysed and a description and discussion of the research findings were documented.

Based on the literature review and the responses to the questionnaire, several prominent conclusions were reached. One of the key issues identified is that simulation is employed as a tool of assessment only, and not as an integration of an educational method. PBL also received favourable feedback from students who had never encountered PBL before this session.

These research findings can assist with decisions as to whether future (more comprehensive and potentially more costly) research projects are justified.

Both SBE and PBL prepare the paramedic with knowledge, skills and competence to treat a patient safely and with quality care. SBE should be seen as a method of education that can be integrated with other methods of education such as lectures, PBL and bedside teaching. Understanding the competence of paramedics is an important resource. They transport millions of people to hospitals each year and consequently, the need to measure how they learn is an important task. The study serves to frame the breadth, depth and scope of SBE and PBL in paramedic education in South Africa.

OPSOMMING

Sleutelterme: Simulasiegebaseerde onderwys, probleemgebaseerde leer, noodgeneeskunde, noodsorg, paramedikus, simulasie, pedagogie.

'n Dieptestudie na simulasiegebaseerde onderwys en probleemgebaseerde leer is uitgevoer met die doel om te verstaan watter onderwysmetode die geskikste is vir paramediese onderwys. Die navorser het 'n opname gedoen onder studente terwyl hulle in Bloemfontein, by die Free State College of Emergency Care, studeer het om paramedici te word.

Paramediese onderwys vereis dat die opvoeder begrip het van 'n verskeidenheid onderrigvaardighede, en verstaan hoe om die studente se behoeftes te ondersteun. Gevolglik speel die opvoeder 'n noodsaaklike rol om leer in die lesingsaal te laat plaasvind. Dit vereis doeltreffende onderrig en kennis van 'n verskeidenheid onderrigstrategieë, sowel as 'n begrip van watter strategieë die beste werk vir spesifieke inhoudsinligting van die dissipline.

Die studie het gepoog om die gaping, wat geskep is deur 'n gebrek aan riglyne deur die Gesondheidsberoepe Raad van Suid-Afrika (GBRSA) vir die toepassing van kurrikulum vir noodsorgopleiding, te oorbrug. Met die onlangse klemverskuiwing van beroepsgerigte opleiding na hoër onderwys in paramediese onderwys het 'n ernstige behoefte ontstaan om die persepsies van student-paramedici ten opsigte van die kurrikulum wat vir noodsorgopleiding gebruik word, te ondersoek.

Simulasie word tans gebruik as 'n instrument vir summatiewe evaluering van studente se vaardigheid, maar dit integreer nie onderrigmetodes wat in noodgeneeskunde en ander, verwante gesondheidsorgonderwys gebruik word nie. Universiteite en ander instellings gebruik uitkomsgebaseerde onderwys en opleiding soos dit deur die vereistes van die Suid-Afrikaanse Kwalifikasiegesag (SAQA) uitgeengesit is. Lande soos die Verenigde State en Australië gebruik onderrigmetodes wat probleemgebaseerde leer en simulasiegebaseerde onderwys, of gevat-gebaseerde leer en simulasiegebaseerde onderwys integreer. Hierdie definisies is gebruik om die studie te omskryf en te fokus. Hierdie studie is geleë in die veld van gesondheidsorgprofessie-onderwys en het gefokus op die professie van nood- mediese sorg.

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Die navorsingsmetodes wat aangewend is, het die analise van dokumente wat die gebruik van kliniese simulasie in noodsorg-onderwysprogramme kontekstualiseer, behels. 'n Oorsig van vakgeleerdheid het 'n konseptuele raamwerk verskaf vir 'n begrip van simulasie in gesondheidsorg as 'n opvoedkundige metodologie, en die aanwending daarvan as 'n assesseringsinstrument in noodsorg. 'n Soektog na navorsing oor probleemgebaseerde leer in noodsorg is onderneem, maar aangesien geen artikels plaaslik opgespoor kon word nie, is artikels uit Australië en die Verenigde State, en van geneeskunde, gebruik om gevolgtrekkings te maak. 'n Beperkte aantal artikels is in die buiteland gevind, maar nog minder inligting was beskikbaar toe die navorser ondersoek ingestel het na verskillende kurrikula wat in die Suid-Afrikaanse noodsorgstelsel vir paramediese opleiding gebruik word.

'n Kwantitatiewe beskrywende ontwerp is aangewend, en 'n vraelysopname is gebruik as metode om data in te samel en vir die empiriese fase van die studie. Voordat hulle die vraelys voltooi het, is alle deelnemers eers aan simulasiegebaseerde onderwys en probleemgebaseerde leer bekend gestel. Dit het verseker dat elke deelnemer presies geweet het hoe elke onderrigmetode werk. Data van die vraelysopname is ontleed en geïnterpreteer in samewerking met die IKT Department van die Universiteit van die Vrystaat en aan die hand van die navorser se ervaring, om te ondersoek watter onderwysmetode in noodsorg verkies word - dit was die hoof- eenheid van ontleding - en hoe studente simulasiegebaseerde onderwys en probleemgebaseerde ervaar, wat die subeenhede was.

Die data wat deur die vraelysopame versamel is, is ontleed en 'n beskrywing en bespreking van die navorsingsbevindinge is aangeteken.

Verskeie duidelike gevolgtrekkings is aan die hand van die literatuuroorsig en die response op die vraelyste bereik. Sleutelkwessies wat geïdentifiseer is, is dat simulasie net as 'n assesseringshulpmiddel aangewend is, en nie as 'n geïntegreerde opvoedkundige hulpmiddel nie. Probleemgebaseerde leer is gunstig deur studente, wat dit nog nie voor hierdie sessie teëgekom het nie, beoordeel.

Hierdie navorsingsbevindinge kan help met besluite oor of toekomstige (meer omvattende en potensieel duurder) geregverdig is.

ΧХ

Sowel SBE en probleemgebaseerde leer berei die paramedikus voor met kennis, vaardighede en bevoegdhede om 'n pasiënt veilig en met gehalte sorg te behandel. SBE moet beskou word as 'n onderwysmetode wat met ander onderwysmetodes, soos lesings, probleemgebaseerde leer en onderrig langs die siekbed, geïntegreer kan word.

Begrip van die paramedikus se bevoegdheid is 'n belangrike hulpbron. Paramedici vervoer jaarliks miljoene mense na hospitale; gevolglik is dit belangrik om paramedici se bevoegdheid te verstaan en te meet, en te weet hoe hulle leer. Hierdie studie dien om die breedte, diepte en omvang van simulasiegebaseerde onderwys en probleemgebaseerde leer in noodsorgopleiding in Suid-Afrika te beskryf.

STUDENT'S EXPERIENCES OF SIMULATION BASED EDUCATION VS. PROBLEM BASED LEARNING IN EMERGENCY MEDICAL CARE TRAINING

CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION TO THE STUDY

In this study, the researcher has performed an evaluation of Emergency Care Technician (ECT) students' experience of Simulation Based Education (SBE) and Problem Based Learning (PBL) at the Free State College of Emergency Care. The study only looked at second year students on the ECT program at the Free State College of Emergency Care in Bloemfontein. This was done in order to determine which method of education (PBL or SBE) is preferred by students that under took paramedic training.

Simulation plays a plays a vital role in paramedic education, but there is often not enough time spent with real patients during a student's academic transformation before being declared competent as a paramedic. As such, learning institutions rely on simulation practice (via SBE) to develop competent paramedics. It is in this class room where the student will develop the skills and attitudes to become a self-reflective paramedic. On the other hand, PBL has been used in medical education for more than 20 years (Savery 2006:9). Educators using a PBL approach could develop students' cognitive domain that help them solve problems which in turn develop students critically - that is, it develops emotional, intellectual, and practical independence, which represents some of the qualities needed in paramedic education (Newman 2005:12).

In Emergency Medical Care (EMC), learning institutions apply Outcomes Based Education (OBE) (SAQA 2001:6) and SBE to their curriculums and spend very little time on PBL as the process is time consuming (Albanese & Mitchell 1993:70; Akter 2011:78). It is estimated that a PBL approach takes 22% more time to cover content which relates to 120 PBL sessions as to 98 sessions in traditional method of instruction; this is because the contact time with students in PBL curriculum is three to four times higher than other educational methods (Albanese & Mitchell 1993:70). The Free State College of Emergency Care does not use PBL, but use a combination of SBE and the lecture-based method to deliver their

mode of education. There is thus no integration of PBL and SBE programmes for ECT students throughout their duration of study. No information could be found in the South African context on PBL or SBE curriculums for ECT students. However SAQA does identify simulation as a tool of assessment in EMC (SAQA 2001:29). In order to get the most out of our students, learning institutions need to assess which method of education is best suited for paramedic education and should follow current trends and practice in paramedic education internationally.

The aim of the first chapter is to orientate the reader to the study. It provides background to the research problem and the problem statement. The research questions, overall goal, aim and objectives are also stated. These are then followed by the demarcation of the study and highlights the significance and value of the study. Thereafter, a brief overview of the research design and methods of investigation is given and diagrammed. The chapter is concluded by a lay-out of the subsequent chapters and a short, summative conclusion.

1.2 BACKGROUND TO THE RESEARCH PROBLEM

The profession of emergency medical care training (Paramedic training) is not new, but the advancement in technology is fairly new in the development of the profession. The development of education and training to facilitate training amongst paramedics is also lacking as limited articles could be found internationally and even less information were found when the researcher looked within the South African EMC system with regards to different curriculums in use for paramedic education. The knowledge in the emergency care profession with regards to SBE and PBL is limited and there is need for more research to add to the body of knowledge in the emergency medical care field. It is accepted by the public that paramedics are competent and that they know how to treat all emergencies that they are faced with. Both SBE and PBL exposes the paramedic student to these emergencies, but neither these methods have not been explored to its fullest in the South African paramedic education system.

The role of the advance life support (ALS) paramedic has become very specialized within the last 15 years - essentially moving away from the "ambulance driver" stigma to a clinician that operate autonomously within their scope of practice. Yet, literature is far and in between in identifying if SBE or PBL is effective or not in paramedic education. This is very strange in a way, because most advancements today in emergency medicine are concentrated on pre-hospital care, yet little time is spent in identifying quality assurance based on training and education in paramedic assessment. The available literature on simulation based training (SBT) that is freely available focus mostly on doctor and nurse assessment, but is lacking in paramedic assessment and their experience with PBL and SBE. Limited articles from Australia have evaluated simulation based assessment but more research is needed to come to a robust conclusion.

The simulated learning environment (SLE) plays an important role in paramedic education. For this reason, it is a necessity of this research to enquire if paramedic students find these SLE's to be beneficial for training purposes. Some of the advantages of SLE's include improving confidence, clinical reasoning, judgement, competence and the preparation for autonomous working (Williams & Dousek 2012:75). With the recent increased emphasis on pre-hospital care, the expectations on paramedics have increased. With the limited time spent on real patients during training, the shift has focused on SLE to prepare paramedics to be competent while drawing on experience and clinical skills to make split second decisions in often uncontrolled environments. Experiences and skills gained to become a competent paramedic are gained from both the SBE and PBL approach where students activate prior knowledge. As such, both these educational techniques plays a vital role in the development of a paramedic which provides them with knowledge, skills and competence to treat a patient safely and with quality care.

With the recent shift from vocationally-based training to higher education in paramedic education, a dire need exists to explore student paramedics' perception of the curriculum that is being used within paramedic education. SBE should be seen as an alternative to real patients where the instructor has control over the environment and the learning experience. SBE should be seen as a method of education that can be integrated with other methods of education such as lectures, PBL and bedside teaching (Ziv, Ben-David & Ziv 2005:193). Research into the investigation of SBE and PBL in paramedic education is limited as such a comparison will be drawn from emergency medicine, nursing and allied health with regards to curriculums they use and then relate this to paramedic education and training.

Curriculums within paramedic education should aim to deliver theoretical knowledge and integrate simulation practice into the education and training. As such, institutions should stay up to date with current advancement in pedagogical approaches to teaching paramedics'. There has been a steady progression of protocols and policies development by the Health Professions Council of South Africa (HPCSA) to keep paramedics up to date with current clinical guidelines (HPCSA :Online). This is vital as education of paramedics' must adapt to current trends in health education and the needs of a community.

The use of PBL and SBE was first described in 1997, where the authors express the importance of these two methods (Jesus & Gomes 2013:29). The authors predicted that these methods of education could prepare health professionals to meet the demands of a particular profession and so influence quality of care. This is taking into account that each student learns differently and as such different educational methods need to be employed to keep up with current trends in health education.

Paramedic programmes within South Africa all operate at separate levels when it comes to theory and practical sessions instead of an integrated approach to paramedic education. Paramedic education needs to adapt a more active approach where current trends in health care are concerned, which include student knowledge and skills. Students' experience with both PBL and SBE is an important issue. Institutions need to deliver competent paramedics that are up to date with current technology and able to instil lifelong learning in their students.

A systematic search and review of literature from published journal articles and conference proceedings, between 1990 and 2011, were investigated. The study looked at PBL, SBE and Case Base Learning (CBL) in the medical field. The study concluded that there is a lack of evidence when comparing learning effectiveness using students' experiences (Jesus & Gomes 2013:28).

1.3 PROBLEM STATEMENT AND RESEARCH QUESTIONS

Limited research could be found that looked at student's experience with PBL and SBE in paramedic education, having established this through a literature review of both educational methods within the South African context. The problem that will be addressed by this study is the absence of clear guidelines of the use of PBL and SBE in paramedic education. The traditional method of education together with SBE is being used at the Free State College of Emergency Care as stated above (cf. 1.1). Diversity of each student with regard to personality, intellect, emotion and their behaviour needs careful consideration when choosing the environment for learning to take place. Williams (2009:434) states that "If a student's learning style is mismatched, then it may negatively affect the student's performance". The current didactic approach at the Free State College of Emergency Care

is to get the student to pass the final exams, but this type of teaching style lends itself only to the cognitive and psychomotor domain, leaving the affective domain unaddressed. As a result, the educator is not able to develop the student as a whole. Paramedic education has to follow current trends in health care education to keep up to date with technology and educational methodologies.

Search engines such as EBSCOHost, Medline, ERIC, Google Scholar, PubMed and Cinahl were used throughout this research project to obtain relevant articles that could answer the stated objectives. The researcher also looked at other disciplines in medical education that use the same approach to teaching and education. There is also a wide variety of books available on both SBE and PBL; these were also consulted to obtain the necessary information. Since simulation has been used extensively in the aviation field, it is necessary to look at the history of the development of simulation and how this has come to be used in health care.

In order to address the problem stated, the following research questions were addressed:

- i. What are ECT paramedic students' experiences with PBL and SBE?
- ii. Which method of education (PBL or SBE) is preferred by ECT paramedic students?

The research was carried out and completed based on these two research questions.

1.4 OVERALL GOAL, AIM AND OBJECTIVES OF THE STUDY

1.4.1 Overall goal of the study

The overall goal of the study was to investigate and evaluate the experiences of ECT paramedic students' with PBL and SBE within the ECT curriculum at the Free State College of Emergency Care. A further extension is that the outcomes may be used to address teaching and learning strategies to enhance paramedic education.

1.4.2 Aim of the study

The aim of the study was to perform an evaluation of ECT students' experiences with SBE and PBL at the Free State College of Emergency Care in Bloemfontein to ascertain which method is preferred.

1.4.3 Objectives of the study

In addressing the research questions, the following objectives were pursued:

- To determine the context and concepts related to the education of paramedics in as far as PBL and SBE are concerned. This objective was addressed by means of a literature study.
- ii. To determine how ECT student paramedics experience PBL and SBE.
- a. This objective addresses research question 'i'. A questionnaire was used to address this objective.
- iii. To identify which method of education is preferred by ECT student paramedics.
- a. This objective addresses research question 'ii'. A questionnaire was used to address this objective.

These objectives addresses the research questions 'i' and 'ii' in view of a holistic and scientific product.

1.5 DEMARCATION OF THE FIELD AND SCOPE OF THE STUDY

The findings of the study may be applied in the application of paramedic education programmes (ECT) within South Africa. This study was done in the field of Health Professions Education and lies in the domain of academic programme development. The study is interdisciplinary as it reaches across Health Professions Education and Medicine. The participants in the questionnaire survey in this study were second year ECT students at the Free State College of Emergency Care (cf. Chapter 3).

In a personal context, the researcher in this study is a qualified Paramedic that is familiar with the educational programmes within the Emergency Medical Care training. The Researcher has more than 20 years' experience within the Emergency Medical Care field. Having also experienced first-hand the different educational methods that students are introduced to, the researcher is very interested in how paramedics learn and which method of education is best suited to EMC. This research will add value to the current ECT education curriculum in South Africa. Current research about the ECT programme with regards to education is lacking. This is an international phenomenon where education and assessment

of paramedic programmes have not received the attention these require based on their vital components in public health. Paramedic practitioners transport millions of people each year, but lack valuable and robust research and evidence on education and training programmes which explore students' experiences in PBL and SBE.

The study was conducted from January 2015 to June 2016, with the empirical phase carried out from March to April 2016.

1.6 SIGNIFICANCE, VALUE AND CONTRIBUTION OF THE STUDY

Very little attention is given to how paramedics learn and which method is best suited for their environment. This was evident from the limited research available that look at paramedic curriculums nationally and internationally. The demands in health care and the need to integrate curriculums in health to improve health outcomes are at a critical momentum, which requires the field of health care education to align their educational curriculums to meet the challenges of the growing needs of patient care. How paramedics learn - especially how they apply adult-based learning concepts in the classroom may provide valuable information that may assist the development of future paramedic curriculums.

This research project will provide information of how ECT student paramedics experience PBL and SBE and which method they prefer. By comparing the two methods of education (PBL and SBE) this research will add to the body of knowledge in paramedic education which is lacking as determined by the literature review. The purpose of this study was to explore student ECT paramedics' experience with PBL and SBE to determine which method of education they prefer.

By doing this, the researcher hopes to shed new light on the evaluation of SBE and how this educational tool influences student paramedics. The knowledge in the emergency care profession with regards to simulation based training and PBL is limited and there is need for more research to add to the body of knowledge in the emergency medical care field. It is accepted by the public that paramedics are competent and that they know how to treat all emergencies that they are faced with. Both PBL and SBE exposes the paramedic to these competencies, but its reliability and effectiveness has not been explored to its fullest in the South African paramedic education system. The research results will provide valuable information with regard to:

- The experience of ECT paramedic students' with PBL and SBE.
- Which method of education (SBE or PBL) is best preferred by ECT paramedic students?

The proposed study will contribute significantly to paramedic education as no study in this field has yet been undertaken that explore ECT students experience of PBL and SBE in the South African system.

1.7 RESEARCH DESIGN OF THE STUDY AND METHODS OF INVESTIGATION

1.7.1 Design of the study

The researcher used a quantitative descriptive design. The researcher has chosen this method as it is the most appropriate method to maximise the validity of the research findings. It also fits the purpose of the study. The methodology also complements available time, money, resources of information and ethical considerations. The researcher and the participants are independent entities, which allows the research to be done without influence or being influenced by the researcher.

The descriptive study used a questionnaire to collect data. This type of study is particularly useful if more information is required in a particular field that aims to answer the research question (Brink 2006:102).

Descriptive research attempts to determine the phenomenon under investigation and is widely used by employing the survey method of collecting data (Singh 2006:104). Descriptive research involves gathering data that describe events and then organizes, tabulates, depicts, and describes the data collection into two areas: studies that describe events and studies aimed at discovering inferences or causal relationships (AECT 2001:Online).

The intent of some descriptive research is to produce statistical information about aspects of education that interest policy makers and educators and which can yield rich data that lead to important recommendations (AECT 2001:Online).

The main objective of descriptive designs are (Singh 2006:105):

- To identify present conditions and point to present needs;
- To study the immediate status of a phenomenon;
- Fact finding; and
- To examine the relationships of traits and characteristics (trends and patterns).

The descriptive survey could be described as being more realistic than experimental research. It is thus oriented towards the descriptive status of the present phenomenon (Singh 2006:105).

The detailed description of the population (cf. Chapter 3), sampling methods, data collection and techniques, data analysis and reporting and ethical consideration are given in Chapter 3.

1.7.2 Methods of investigation

The methods that were used and which formed the basis of the study comprised a literature review and a questionnaire survey.

Again Brink (2006:67) defines a literature review as an organised, written presentation of published research on a given topic. This literature review should be done once the researcher has identified a topic of interest in order to enquire what is known about the topic. This research should be a review of literature that is able to provide in-depth knowledge of what is already known about the topic. This is crucial as a thorough examination of published literature is essential to develop an understanding of the topic of interest (Brink 2006:67).

Based on the findings, the researcher will have a broad idea of what is known about the topic and the knowledge that exists. This review will provide the researcher with insight on how to identify research problems and the research questions. By doing so the researcher will not duplicate research and could make a valuable contribution to the body of knowledge. The above will provide the necessary background and context of the stated problem. It will also form the basis and rationale for performing an evaluation of both SBE and PBL.

In this study, the literature (cf. Chapter 2) review will have the specific aim of describing the history of SBE and PBL and draw to current practise of paramedic education. To achieve this, the researcher made use of electronic databases using keywords to access accredited articles from both national and international journals. Search engines such as EBSCOHost, Medline, ERIC, Google Scholar, PubMed and Cinahl were used throughout this research project to obtain relevant articles that could answer the stated objectives.

Secondly, a clearly formulated questionnaire should address the objectives of the study and the research problem (Brink 2006:146). The researcher should thus have a clear understanding of what he/she wants to achieve from the questionnaire. Questionnaires offer the advantages of being time efficient, less expensive, anonymous (for the participant) and standardised questions.

The survey method collects the following three types of information (Singh 2006:103):

- Of what exists,
- Of what we want, and
- Of how to get there.

Before the questionnaires are handed out the participants will all revisit SBE and PBL. This will be done to ensure that all participants are familiar with both methods of education. The lecturer will explain both methods before the start of any practical sessions. With the results of this research, future frameworks could be developed for curriculum change in paramedic education.

The questionnaire was unambiguous, understandable and leading questions were avoided (Appendix F). It comprised both closed-ended and open-ended questions. All data were analysed by the Department of Information and Communication Technology (ICT) Services at the University of the Free State. The researcher was also involved in the analysis of the data. The findings were categorised in graph format where deductions were made based on the results and the researcher's own experience. From this, the researcher made preliminary conclusions with regards to the use of SBE and PBL. Analysis of the following categories of variables were done:

- Demographical data.
- Background information with regards to PBL and SBE in paramedic education.

- Questions about PBL which relate to students experiences and thereof.
- Questions about SBE which relate to students experiences and thereof.

Basic descriptive data were reported by means of frequencies and percentages. Comparisons between the two educational methodologies were made using 95% confidence intervals for the difference in proportions (cf. Section 4.5.17). This was done by the Biostatistics Department of the UFS. The detailed description of the population, sampling methods, data collection and techniques, data analysis and reporting and ethical consideration are given in Chapter 3.

1.7.3 Schematic overview of the study



The following figure explains the schematic overview of the study.

Figure 1.1: A Schematic overview of the study (Compiled by the researcher, Rowland 2016)

1.8 IMPLEMENTATION OF THE FINDINGS

This report containing the findings of the research will be brought to the attention of the Department of Health for the Health Professions Council of South Africa (HPCSA).

Focus will be on the needs and preferences of students and how paramedic education in South Africa compare with current teaching practice internationally using SBE and PBL. The research findings will be submitted to academic journals with a view to publication, as the researcher hopes to make a contribution to health professions education.

1.9 ARRANGEMENT OF THE STUDY

To provide more insight into the topic, the methods used to find solutions and the final outcome the study will be reported on as follows:

This chapter, Chapter 1, **Overview and orientation to the study**, presents background to the research problem, the problem statement and research questions, and goal, aim and objectives of the study. This chapter demarcates the field and scope of the study, explains the significance and value of the study, describes the research design of the study and methods of investigation, and refers to the implementation of the findings.

Chapter 2, entitled **Simulation Based Education vs. Problem Based Learning in Emergency Medical Care Training** will provide the theoretical perspectives of the study and set the background for SBE and PBL in paramedic education. It will explain the development of both PBL and SBE and how it progressed to the field of paramedic education.

In Chapter 3, **Research design and methodology,** will provide a thorough description of the design of the study as well as an explanation of the data collection method, the questionnaire. Questions that will be answered are: the purpose of the questionnaire, how this was implemented, the sample population and size. The data collecting methods and data analysis will be discussed. The questionnaire used to gather information of students experience with SBE and PBL will be described.

In Chapter 4, **Results and discussion of findings of questionnaire survey**, the results of the questionnaire as data collecting method employed in the study will be reported and

the findings discussed.

Chapter 5, **Conclusion, recommendations and limitations of the study,** provides an overview of the study, identifies the significance and limitations of the study, and makes suggestions for further studies and research that are needed with regard to the research problem.

1.10 CONCLUSION

Chapter 1 provided an orientation to the study undertaken regarding SBE and PBL in paramedic education. This was achieved by providing an overview of and background to the research problem. The background was followed by a summary of the problem statement and research questions. The overall goal, aims and objectives of the study were then presented. The field and scope of the study was demarcated and the significance and value of the study to the profession and educators summarised. A brief synopsis of the research design and methods of investigation was provided, together with a schematic outline of the study.

The following chapter, Chapter 2, entitled **Simulation Based Education vs. Problem Based Learning in Emergency Medical Care Training,** will present the context, relevant concepts and discussion on the relevant literature and set the background for SBE and PBL in paramedic education. This will form the foundation of the study.

CHAPTER 2

SIMULATION BASED EDUCATION VS. PROBLEM BASED LEARNING IN EMERGENCY MEDICAL CARE TRAINING

2.1 INTRODUCTION

In Chapter 1, **Overview and orientation to the study**, the reader was given a brief background to the research problem, the problem statement and research questions, and goal, aim and objectives of the study. This chapter demarcates the field and scope of the study, explains the significance and value of the study, describes the research design of the study and methods of investigation, and refers to the implementation of the findings.

This chapter will provide the theoretical perspectives of the study and set the background for SBE and PBL in paramedic education. It will explain the development of both PBL and SBE in and how it progressed to the field of paramedic education.

Paramedic education requires the educator to understand a variety of teaching skills and an understanding of how to support the needs of the students. As such, the educators' role are critical for learning to occur in the classroom and it requires the educator to have sound knowledge about different teaching strategies, as well as an understanding of which strategies work best with the discipline-specific content information.

How students feel about an educational strategy is important when there is consideration about changing the educational mode of delivery (Bate, Hommes, Duvivier & Taylor 2014:3). This feeling relates to emotion, conation and cognition (cf. Figure 2.1). Historical literature has revealed that emotion has a definite effect on the cognitive and conation aspect of a student's learning ability (Bate *et al.* 2014:3). The authors also stated that emotion is described as an integral component of the triad of cognition, conation and emotion required for learning to take place (Bate *et al.* 2014:3). The following diagram illustrates the effect that an educational programme has on a student.


Figure 2.1: The association between emotion, conation and cognition (Adapted from: Bate *et al.* 2014:3)

As such, the diversity of each student with regard to personality, intellect, emotion and their behaviour needs careful consideration when choosing the environment for learning to take place. Williams (2009:434) states that "If a student's learning style is mismatched, then it may negatively affect the student's performance". As such, the teacher needs to assess his/her teaching style and environment to adapt to that of the student. Research has also shown that learners alter their learning styles soon after being exposed to PBL (cf. Section 4.4.3), (Williams 2009:434). This is significant, so the results of this study could also identify if this does happen in the learning environment (cf. Chapter 4).

Health outcomes of patients should be regarded as useful indicators that learning has occurred. One method that assesses both the programme and students is Kirkpatrick's four-level model. It is based on patient outcomes, behaviour, learning and reaction (Gjeraa, Møller & Østergaard 2014:776).



Figure 2.2: Kirkpatrick's model for evaluating effects of educational courses (Adapted from: Gjeraa, Møller & Østergaard 2014:776)

In level four, the assessment measures participant's reaction to the programme. Level three assesses the amount of learning that has taken place. In level two, the application of knowledge is assessed based on transfer of that knowledge to the job at hand, whereas level one measures the impact of the training. Education in EMC still makes use of the traditional method of training, as there is so much information that needs to be covered in such a short time. This method delivers information to the student, but it remains a teacher-centred approach with little student involvement.

To understand the competence of paramedics is an important resource. They transport millions of people to hospitals each year, and as such, the need to measure and understand their competency and how they learn is an important task. The domains that usually test competence include psychomotor, cognitive, and affective domains. Both PBL and SBE conform to these requirements. Thus, choosing a method that is best for paramedic education is of utmost importance as educational strategies were adopted from medicine and other allied health programmes that constitute the paramedic curriculum. The current didactic approach at the Free State College of Emergency Care is to get the student to pass the final exams, but this type of teaching style lends itself only to the cognitive and psychomotor domain, leaving the affective domain unaddressed. As a result, the educator is not able to develop the student as a whole. The need in paramedic education reform is to conduct more meaningful research in areas of student development, quality of medical educators, educational theory, assessment, and pedagogical techniques in the context of paramedic education.

In Chapter 1, an overview and outline of the study were given as well as the aim of the study. In this Chapter (Chapter 2), a thorough literature review will justify the underpinning structure of the study. A history of PBL and SBE will be reviewed nationally and internationally if available literature could be found, as there is limited research available of educational methodologies in use for paramedic programmes. As such, literature was taken from emergency medicine and other allied health care curriculums. This chapter will be concluded with a short summary.

2.2 THEORETICAL OVERVIEW OF THE STUDY

To recap, Brink (2006:67) defines a literature review as an organised written presentation of published research on a given topic. This literature review should be done once the researcher has identified a topic of interest in order to enquire what is known about the

topic. This research should be a review of literature that is able to provide in-depth knowledge of what is already known about the topic. This is crucial as a thorough examination of published literature is essential to develop an understanding of the topic of interest (Brink 2006:67). Based on the findings, the researcher will have a broad idea of what is known about the topic and the knowledge that exists. This review will provide the researcher with insight on how to identify research problems and research questions. By doing so the researcher will not duplicate research and could make a valuable contribution to the body of knowledge.

In this study, the literature review will have the specific aim of describing the history of SBE and PBL and draw to current practise of teaching and learning in EMC. To achieve this the researcher used electronic databases using keywords to access accredited articles from both national and international journals. Search engines such as EBSCOHost, Medline, ERIC, Google Scholar, PubMed and Cinahl were used throughout this research project to obtain relevant articles that could answer the stated objectives. There is also a wide variety of books available on both SBE and PBL; these were also consulted to obtain the necessary information. Since simulation has been used extensively in the aviation field, it is necessary to look at the history of the development of simulation and how this has come to be used in health care.

2.3 WHAT IS SIMULATION BASED MEDICAL EDUCATION?

Simulation has been defined as:

"The technique of imitating the behaviour of some situation or process (whether economic, military, mechanical, etc.) by means of a suitably analogous situation or apparatus, especially for the purpose of study or personnel training" (Forrest, Mckimm & Edgar 2013:12). Ziv, Ben-David and Ziv (2005:193) describe Simulation Based Medical Education (SBME) as "any educational activity that utilises simulative aids to replicate clinical scenarios". These simulated events engage students in lifelike scenarios when high fidelity manikins are used.

The aim of SBME is to expose the learner to real-life scenarios, in order to improve health and patient care outcomes, which could result in skill improvement and skill maintenance. Having learners making mistakes and learning from their experience is a powerful tool of assessment. This holds no risk to a real patient. SBE has the ability to improve and boost medical professionals' performance by enhancing patient care and safety (Ziv *et al.* 2005:194). It duplicates the artificial representation of a real-life situation, environment or event that can have a meaningful learning experience for the student (cf. Section 4.5.4). Thus, one can argue by learning from these mistakes; occurrences of real life errors could be reduced if the learner is provided with the proper skills to prevent such mistakes. These training exercises is thus targeted at the student and not the patient, which allows for multiple attempts to gain competence (cf. Section 4.5.3). These continued attempts at learning could result in:

- "Highly motivated learners with good concentration;
- Able to define learning objectives or tasks;
- Can operate at different levels of difficulty;
- Focused, repetitive practice;
- That provide rigorous, reliable measurements;
- That provide informative feedback from educational sources (e.g., simulators, teachers);
- That promote monitoring, error correction;
- Enable evaluation and performance that may reach a mastery standard where learning time may vary but expected minimal outcomes are identical; and
- Allows for advancement to the next task or unit".

(McGaghie, Issenberg, Cohen, Barsuk & Wayne 2011:707)

Within paramedic education, simulation plays a vital role to students, because there is often not enough time spent with real patients during a student's academic transformation before being declared competent as a paramedic. As such, patient simulation creates that link of relativity in the class room where the instructor can control the scenario at no risk to a real patient. Universities in Australia make use of Simulated learning environments (SLE) for paramedic training as it improves confidence, clinical reasoning, judgement, competence, and prepares the paramedic for autonomous work (Williams & Dousek 2012:75). It is in this class-room where the student will develop the skills and attitudes to become a selfreflective paramedic. It is also the preferred method of instruction as it covers the three main teaching-learning domains (cognitive, psychomotor and affective) (Saiboon, Jaafar, Ahmad, Ahmad, Hamzah & Jamal 2011:389).

Simulation is widely used in EMC as a summative assessment tool that measure student's skills and competency at the end of a term. This was also the finding of the SUPER

(Simulation use in Paramedic Education Research) study, which found that simulation use among the paramedic programs in The United States of America (USA) reported a 89% use of simulation for skills instruction only (McKenna, Carhart, Bercher, Spain, Todaro & Freel 2015:5). Not only does this defeat the objective of SBE, but also they fail to recognise how to maximise their use of simulation, which could be integrated into their curriculum. This is the same problem that is being experienced in the EMC programmes in South Africa. These are the challenges facing EMC education despite progress made in recent years, which highlighted inconsistent education, training requirements and scope of practice in EMC education (McKenna, Carhart, Todaro & Freel 2015:7).

When one looks at the way simulation is being used in EMC, three factors emerge: Firstly, psychological fidelity captures real tasks in the environment - which portray reality as perceived by the student. Secondly, environment fidelity reflects how simulation duplicates sensory cues. Thirdly, equipment fidelity has the ability to simulate the experience as being a real event to the student (Power, Henn, O'Driscoll, Power, McAdoo, Hynes & Cusack 2013:14).



Figure 2.3: Typology of simulation fidelity (Power et al. 1995:13)

SBE has the ability to provide a learning experience that is immersive and provides the platform for experiential learning within a controlled learning environment. This is vital in the pre-hospital setting as it can be used to reduce prehospital errors (Boyle, Williams & Burgess 2007:856). SBE has the ability to teach medical professionals error management skills.

These steps include the following:

- "A clinical encounter with a simulated patient or manikin;
- Personal reflection on the manner in which the trainee handled the case and his/her notion of possible causes for errors and suggestions for corrections;
- Students' and professionals' observation of peers coping with a similar scenario to their own;
- A feedback meeting with the simulated patient who acted out the case (if applicable);
- An intimate one-on-one review of the audio-visual documentation of the educational session with experts in communication skills and/or in specific clinical domains. The review focuses on the individual's performance, both in instances of positive coping and particularly when errors have occurred; and
- Group discussions facilitated by an SBME teacher based on video recordings of the participants while handling the simulated case".

(Ziv *et al.* 2005:195)

In recent years, medical education has seen a shift towards early clinical teaching skills to allow students to use these skills competently and confidently on patients (Swamy, Sawdon, Chaytor, Cox, Barbaro-Brown & Mclachlan 2014:2). SBE is seen as a supplement to clinical education where students can practise in a safe and supportive environment without harm to real patients (Swamy *et al.* 2014:2). It recreates that patient experience, which allows students to practice a range of skills in a safe environment. In EMC and emergency medicine, this exposure is vital to students as ad hoc educational sessions are not sufficient to gain competency and produce competent health care professionals (Motola, Devine, Soo Chung, Sullivan & Issenberg 2013:e1525).

Simulation should not be seen as another form of education and training programme. It is no different than PBL or Outcomes-Based Education (OBE) in terms of getting learners to define their learning outcomes and meeting their own learning needs (cf. Section 4.5.5). SBE has a purpose and a huge role to play in ensuring that health care practitioners are safe and competent to practice. In SBE, the focus is on skills that can relate to cognitive, perceptual, procedural, technical, motor, reasoning, problem-solving, decision-making and social interaction in a team (Forrest, Mckimm & Edgar 2013:60). There is repetition of the skills and constant feedback provided by the teacher so that the student can correct his management. SBE should be integrated and complement traditional educational methods such as PBL, lectures and bedside teaching (Ziv *et al.* 2005:193). This is also the view of

McGaghie, Issenberg, Petrusa, and Scalese (2010:55) who recommend that the curriculum should be integrated with other educational events such as clinical experience, lectures, reading, laboratory work and PBL.

The following diagram (cf. Figure 2.4) demonstrates the person-task-context model of learning that has been used to show the interrelatedness of the person, the task and the context, which facilitators need to take into account for assessment and learning needs (Forrest *et al.* 2013:44).



Figure 2.4: A person task-context model of learning (Source: Forrest et al. 2013:44)

In this model "person" relates to the learners where the assessor needs to take cognisance of prior knowledge, skills, attitudes and experience as well as the current state of motivation, alertness and involvement of the student. The "task" relates to the characteristics of the skill to be learned; here it also has a personal perspective which identify that each member in the team may have different roles and responsibilities in the task. The "context" relates to the physical, psychological and social dimensions of the simulation setting. Finally, "learning" relates to the process and how the instructor is able to create the opportunity of learning. Broadly, this model relates to the different educational theories which include behaviourism, cognitivist learning theories, the humanistic perspective, and social learning theories (Forrest *et al.* 2013:45).

Any method of education that could prevent harm to patients and improve health care should be seen as the way forward in medicine. A reduction in medical errors is one of the main objectives of SBME (cf. Section 4.5.6), (Ziv *et al.* 2005:195).

Best Evidence Medical Education Collaboration reviewed the use of high fidelity simulation and identified 10 key features of its effectiveness in medical education:

- "Providing feedback;
- Repetitive practice;
- Curriculum integration;
- Range of difficulty level;
- Multiple learning strategies;
- Capture clinical variation;
- Controlled environment;
- Individualised learning;
- Defined outcomes; and
- Simulator validity".

(Perkins 2007:203)

In 2010, a group of experts had a meeting in Copenhagen, an Utstein style meeting (which is synonymous with reporting guidelines for the resuscitation council) on SMBE and came up with these points as a rationale for using SBT (Forrest *et al.* 2013:27).

The simulation setting:

- "Provides a safe environment where trainees can learn without the risk of harming a patient;
- Provides an environment that is fully attentive to the learner's needs;
- Provides an opportunity for repetitive training;
- Can be adjusted according to learners need;
- Enables exposure to gradually more complex clinical challenges;
- Enables exposure to rare emergency situations where time is an important factor ; and
- Supports experiential learning".

SBE provides opportunities for training of the:

- Individual; and
- Team of health professions.

SBE provides an opportunity for:

- Formative assessment, that includes debriefing and feedback;
- Stimulating reflection;
- Learning how to learn; and
- Summative assessment.

The Harvard Medical School has designed the Simulation Training, Research, and Technology Utilization system, clinical performance pyramid. This is illustrated below in Figure 2.5.



Figure 2.5: Simulation Training, Rescue and Technology Utilization system clinical performance pyramid (Binstadt *et al.* 2007:497)

It was designed to accommodate learners from all medical professions that use interactive learning like simulation assessment. The process represents four domains which assess competence based on hierarchy. The highest level namely 'teamwork' is only attained when such a person can work effectively as a team member. In EMC, this is attained when the experienced paramedic becomes a mentor and provides support and training to junior paramedic staff. This learning model emphasizes individual and team performance, but can only be achieved if goals or outcomes of each team member is highly individually capable of performing their job (Binstadt, Walls, White, Nadel, Takayesu, Barker, Nelson & Pozner 2007:497). The goal of a SBE programme is for a team to work together to achieve a common goal. This has been noticed in the educational community, which is why some medical schools acknowledging the limitations of current curricula like PBL and traditional

methods who now turn to simulation, as students find this innovation highly stimulating (cf. Section 4.5.2), (Binstadt *et al.* 2007:496).

2.4 THE JOURNEY OF SIMULATION IN CLINICAL PRACTICE

The drive towards improved patient safety and communication has led to simulation receiving more favour in medical education. The benefits far outweigh the limitations of this educational strategy of which the aim is to improve student readiness for patient care. This technique is no different from any other form of education method. It also requires that the educator or instructor is skilled in educational theory, as well as in his/her practise and have knowledge about teaching and learning concepts. Thus, also creating learning goals and objectives that the student must achieve in order to achieve competence. The burden placed on these instructors is huge as they need to make sure that health care practitioners are competent and safe to practise on real patients. Simulation can often be challenging, which emphasises the need of the instructor to take cognisance of the group dynamics and to ensure that learning outcomes are achieved. The guidelines released by the National Council of State Boards of Nursing (NCSBN) in 2015 placed so much emphasis on the need for instructor to be qualified in SBE that they recommended the following:

- A call for qualification of lead faculty and simulation lab personnel to assure quality simulation delivery;
- To attend simulation conferences;
- Provide coursework on simulation instruction;
- Have certification in simulation instruction;
- Training by a consultant; and
- Targeted work with an experienced mentor (McKenna, Carhart, Todaro, & Freel 2015:10).

Simulation within the Aviation field has progressed to an extent that time spend within a simulator are deemed equivalent and even superior to actual practise (McGarry, Cashin & Fowler 2014:1140). The first flight simulator was built in 1929 by Edwin Link (Rosen 2008:158). His aim was to create an easier and safer method to learn how to fly. Since then, simulation has expanded into the military field and medicine. It was only in the last two decades that medical simulation has gained favour; this slow progression was due to scepticism, lack of communication and the burden of proof (Rosen 2008:159). The first real progress in medical simulation was in 1960 when the first Resusci Annie was designed by the Leardal company (Rosen 2008:160). By the mid 1960's, Sim One had been built for

the purpose of training anaesthesia residents in the skill of endotracheal intubation as a safety concern to patients (Cooper & Taqueti 2008:i14). By 1968, an improvement to Sim One was the Harvey mannequin who could simulate 27 cardiac conditions. And by 1981 the American Board of Emergency Medicine has been using simulation as a form of assessment for doctors (Lammers 2007:506). Harvey was so effective that a study was done in 1987 among 208 senior medical students. The results showed that students who trained with Harvey did significantly better than those students who only performed bedside interaction with patients (Cooper & Taqueti 2008:i13).

Research from the resuscitation council described simulation as a central training tool in education (Perkins 2007:202). Simulation has thus received world-wide acceptance in medical schools as the shift was based on patient care and safety (Motola *et al.* 2013:e1511). Today, SBME has developed to such an extent that it is being used in other medical disciplines such as radiology, paediatrics, trauma, nursing, emergency medical services and disaster medicine (Saiboon *et al.* 2011:389).

2.5 IMPORTANCE OF FEEDBACK IN SIMULATION BASED EDUCATION

One of the critical components of SBE is feedback. It is regarded as the most cited feature that led to effective learning (Motola *et al.* 2013:e1514). It is regarded as "specific information about the comparison between a trainee's observed performance and a standard, given with the intent to improve the trainee's performance" (Motola *et al.* 2013:e1514). Feedback is normally done after the simulation session in the form of a debriefing session that will explain to the student his/her strengths and weaknesses and how to improve their performance. Feedback also ensures that the student is kept in the loop with regards to his/her performance, which could relate to meeting the objectives of the learning event. Without this feedback, the learner will not know if learning has taken place - which could lead to negative assumptions about the simulated event. The feedback session also allows the instructor to test the learner's knowledge and skills that was observed during the simulation. If this does not take place then there is a chance that the students' learning (Motola *et al.* 2013:e1514). The authors also found that without feedback, the simulated event did not prove to be beneficial to the student in any way (2013:e1514).

For feedback to be successful Motola *et al.* (2013:e1514) explain that it has to conform to the three P's, which is Plan, Pre-brief, Provide feedback/Debrief/Plan:

Plan

The planning of feedback for a simulated event must be done with the learning objectives and outcomes for the session in mind. This could be taken from protocols or guidelines that specify what paramedics need to know to achieve competency for the simulation or scenario.

Pre-brief

An important aspect of the simulation is to prepare the student and set aside rules and regulations. This would allow the students to know what is expected of them in the simulation room. Students should be informed at this time that the learning experience is kept confidential between student and educator.

Provide Feedback

The feedback session should planned and should be done with the learning objectives of the session. It should be done to guide the student to meet stated outcomes of the session. The feedback session takes into account what the students has learnt and recommendations by the educator. The educator should inform the student of both positive and negative findings of the simulation. A comfortable environment should be created for the feedback session where the educator should start with the positive findings and move on to how the student could improve for next time. The feedback is thus more formative as its purpose is to improve the students' ability and builds confidence - rather than summative (which relates to a 'pass' or 'fail'). An example used as a form of feedback or debriefing for formative assessment in SBE is the four-step model:

- Note salient performance gaps related to predetermined objectives;
- Provide feedback describing the gap;
- Investigate the basis for the gap by exploring the frames and emotions contributing to the current performance level; and
- Help close the performance gap through discussion or targeted instruction about principles and skills relevant to performance (McGaghie, Issenberg, Petrusa, & Scalese 2010:54).

2.6 ADVANTAGES AND DISADVANTAGES OF SIMULATION BASED EDUCATION

According to Grenvik, Schaefer and Winter (2004:2549) simulation offers the following advantages over traditional educational methods:

- It provides a safe environment for both "patient" and student during training in risky procedures;
- Unlimited exposure to rare but complicated and important clinical events;
- The ability to plan and shape training opportunities rather than waiting for a suitable situation to arise clinically;
- The ability to provide immediate feedback for reflective learning;
- The opportunity to repeat performance;
- Opportunity for team training; and
- Lower cost, both direct (e.g. through less use of more expensive facilities for training, such as operating rooms) and indirect (e.g. through fewer malpractice insurance claims).

Simulation in health care has received an exponential and enthusiastic adoption within the last 20 years (Motola *et al.* 2013:e1511). Some of the main motivations for this is mainly due to the increased demands on training, which lack patient encounters with a focus on patient safety (cf. Section 4.5.6). Patient safety has been the focus of the twenty-first century in healthcare (Motola *et al.* 2013:e1511). The 'SUPER' study however reported that patient safety and crew safety were the least-frequently reported simulation goals in paramedic simulation (McKenna *et al.* 2015:6). The SUPER study is regarded as one of the landmark studies in EMC, as it answers and investigated how simulation is being used in EMC.

Universities in Australia make use of SLE for paramedic training as it improves confidence, clinical reasoning, judgement, competence, and prepares the paramedic for autonomous work (cf. Section 4.5.12), (Williams & Dousek 2012:75). It is in this class-room where the student will develop the skills and attitudes to become a self-reflective paramedic. It is also the preferred method of instruction as it covers the three main teaching-learning domains of cognitive, psychomotor and affective domain (Saiboon *et al.* 2011:389). Within EMC, the use of simulation is also being used for regular training to simulate rare procures and incidents like disaster management situations. This regular training is key to building successful team dynamics and could improve patient outcomes.

Some of the disadvantages of simulation training is mostly related to the cost of a highfidelity mannequin and maintenance thereof. Coupled to this is the operating cost to maintain and update the mannequins (Issenberg & Scalese 2008:34). These mannequins are also very bulky and lack portability, which limits it movements to environments where it can be used to simulate a real clinical setting.

It would only be natural that some students may find it difficult to relate to the simulated environment and thus fail to behave naturally. Realism of simulation lies within the level of fidelity of the mannequin, the simulated event should only imitate the important elements of the learning environment and not necessary duplicate reality (Lammers 2007:506).

2.7 WHAT IS PROBLEM BASED LEARNING?

By definition, PBL is learner-centred learning that empowers learners to conduct research, integrate theory and practice, and which allows them to apply that knowledge and skills to a defined problem (Savery 2006:9). PBL combines multiple educational principles to deliver this method of instruction, which is aimed at enhancing and optimizing the educational outcomes of a learner-centred approach that can result in the collaborative, contextual, integrated, self-directed, and reflective learning of the student (Gwee 2009:232). PBL is a student-centred approach that rely on the student to learn by solving problems rather than passively absorbing the information. Typically, students will work in teams or groups (8-10 students) that are guided by the tutor to solve problems. The objectives would be to develop group-learning practices and assist students in how PBL could be used as part of their professional lives. Working in small groups encourages students to identify and overcome group conflict; this promotes and develops communication skills, which in turn develops ideas and solve problems (cf. Section 4.4.2), (Hughes & Lucas 1997:79). PBL uses case-based scenarios to acquire knowledge to develop decision-making and problemsolving skills that allow students to be prepared for the workplace in order for them to apply knowledge and skills across contexts (Beaumonta, Savin-Badenb, Conradic, & Poultonc 2014:126).

PBL is an education strategy that can be defined by three elements: problems, tutors and students (Azer, Mclean, Onishi, Tagawa & Scherpbiers 2013:806). As such, these three elements form an integral part of the success of PBL. Group discussion form the basis of a PBL session. The success of such a session depends on the following according to Azer *et al.* (2013:806):

- Providing hands-on tutor training;
- Providing tutors with a case guide and resources;

- Providing on-going support to PBL tutors in terms of facilitation skills, administration and group management issues;
- Ensuring that tutors have addressed group management issues in the first two to three tutorials;
- Introducing students to the PBL process and developing their self-directed learning skills;
- Ensuring that PBL cases are authentic and written by teams of experts; and
- Ensuring that each case is presented and discussed in a briefing session, a few days before case implementation.

The PBL process is guided by seven stages, namely: "clarify terms and concepts; define the problem; analyse the problem; make a systematic inventory of the explanations which emerged in the analysis; formulate targets for the learning objectives; acquire knowledge in relation to the learning need; and synthesise and check the newly acquired information and knowledge" (Hughes & Lucas 1997:79). This is achieved by allowing students to work through a problem led by an instructor. It is essential that the problems presented are relevant and topics are well researched to activate student's prior knowledge of the topic. But it must also trigger gaps in their knowledge which allow them to do self-study.



Figure 2.6: Summary of the key features and conceptual basis of PBL (Newman 2005:13)

Sir William Osler recommended in 1899 that the use of lectures in medical education should be abolished to allow students more time for self-study in order for teachers to help students develop clinical skills, improve observational and reasoning skills (Koo 2003:401). PBL does conform to these recommendations as it allows students to take control of their own learning by doing self-study to understand a problem than rather to memorise and forget it. PBL has been described by many authors as the best learning and teaching strategy in producing critical, reflective and analytical thinkers (Billings & Halstead 2005:304). Therefore, PBL is not just practical but it prepares students to perform better in the workplace which integrate knowledge and the ability to solve problems using critical thinking (cf. Section 4.4.7).

AWARENESS (ACTIVE LISTENING)	PERSONAL LEARNING PREFERENCE	DEFINING REAL PROBLEMS (GOALS, MISSION, VISION)
Problem solving	Learning skills (laws, theories, concepts, etc.)	Look back and extending experience (recognizing fundamentals in a given situation)
Strategy (planning)	Creativity	Decision making
Stress management	Time management	Group and chairperson skills
Managing change	Interpersonal skills	Coping creatively with conflict
Reasoning critically and creatively	Adopting a more universal or holistic approach	Practicing empathy, appreciating the other person's point of view
Collaborating productively in groups or teams	Self-directed learning	Self-directed lifetime learning
Self-assessment	Obtaining criteria	

Table 2.1: Capabilities that PBL develops (Adapted from: Newman 2005:13)

Within paramedic education, students are responsible for their own learning, by ensuring they know concepts and terminology to be able to acquire knowledge to understand different clinical scenarios. PBL is grounded in cognitive psychology, which uses clinical scenarios, provides active learning, and build on epistemic curiosity. This allows for activating prior knowledge, and drawing on previous experiences. These could all be useful in understanding the clinical scenario and making use of integration of knowledge. This could in turn lead to collaborative learning which promote student motivation, increase reasoning skills and elaborate deep learning.

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Current curricula in use within the EMC in South Africa uses an OBE approach as OBE is the educational methodology adopted by SAQA (SAQA 2001:6). The limited use of PBL in EMC could be due to a lack of staff or the high cost of running a PBL curriculum.

2.8 THE EVOLUTION OF PROBLEM BASED LEARNING IN MEDICAL EDUCATION

PBL has been used in the United Kingdom (UK) within the Medical and Health sectors since 1980's; this was a time where students worked in groups and was led by an instructor. PBL has also been used in North America for the last 30 years as the medium of education in medical schools (Savery 2006:9). Medical schools moved away from the traditional medical curriculum to PBL as there were fears that students were disenchanted with their medical education and becoming overloaded with scientific information (Bate *et al.* 2014:2). Thus, PBL was introduced at a time where it was expected of doctors to integrate their knowledge in terms of diagnoses, treatment and having knowledge about the different domains of learning as well as social and behavioural sciences (Stevens & Goulbourne 2012:e686). It was seen as a paradigm shift from teacher to learner where students was able to integrate their knowledge and not merely be passive. As a result, PBL was introduced not because it was the best method, but as a result of pressure due to modernization to move away from the pedagogical, lecturer-centred approach to education to a more and ragogic selfdirected and innovative adult approach. PBL was first used in 1969 at McMaster University in Canada (Akter 2011:77). It was seen as an alternative pathway to teach medicine and was seen as a new trend in education. Since then, there has been wide-spread concerns regarding the benefit of PBL as literature cannot come to a conclusion as it has both pros and cons in medical education.

The introduction of PBL also came at a time where there was widespread concern over current curriculums that hold major limitations given the traditional approach, such as: (Gwee 2009:232):

- Information overload resulting from student acquisition of abundant content knowledge (`...information that taxes the memory but not the intellect");
- Development of rote-learning habits by students through MRR (memorize, recall, regurgitate)—often abetted and intensified by tests on recall of factual content knowledge (information);
- Teaching inputs as the primary focus of instruction with little attention to student learning outcomes;

- High dependency of students on teachers for their learning needs, including what, how, and when to learn; and
- Inadequate attention to student acquisition of more enduring educational process and life skills, including: higher-order cognitive (intellectual) skills (critical thinking, reasoning, and problem-solving); and some generic "soft" skills in the attitudes (affective) domain of learning (interpersonal, communication, teamwork, and leadership).

A study that assessed PBL, found that students who favour PBL is more likely to desire a practical approach (cf. Section 4.4.5) (Newman 2005:18). The results would have been more interesting if it had to make a differentiation between Emergency Medicine and Family Medicine. As is it assumed that a paramedic provides similar treatment to the patient as a Doctor working in an Emergency Room, both professions require out-of-the-box thinking and to make critical decisions which do require a hands-on approach. An earlier study on PBL found that Doctors who preferred PBL was more inclined to do family medicine (cf. Section 2.1) (Albanese & Mitchell 1993:67).

South Africa still has a fragmented system due to the division in society that was legislated under the apartheid policy. As such, PBL within the ECT program is still new, but in Australia the concept of paramedic education was taken to the next level where they used PBL as part of their curriculum to ensure that graduate paramedics entering the work force is work ready (Thompson, Grantham & Houston 2015:1).

2.9 ADVANTAGES AND DISADVANTAGES OF PROBLEM BASED LEARNING

Key to PBL success are effective communication skills, which are culturally defined when dealing with cultures with different group dynamics that require a collaborative effort (Stevens & Goulbourne 2012:e686). Within these cultural barriers, the group first needs to feel a sense of belonging to be able to recognise, analyse and synthesize problems which are the requirements of PBL. To overcome this, students need to feel secure within their group and the teachers need to feel confident with the different group dynamics (Hughes & Lucas 1997:80). In these groups, students are guided by a tutor that uses clinical scenarios that increase the intrinsic motivation of the student. Learning is thus not separated from practice as the context of the learning should be authentic and should relate to clinical practice (cf. Section 4.4.15). This activates prior knowledge of the given scenario

and identifies gaps needed to understand/solve the clinical problems, enhancing their clinical reasoning strategies (Bate *et al.* 2014:2).

Within a PBL curriculum students need to understand and know concepts and terminology of their profession to be able to succeed in a PBL curriculum. PBL is grounded in cognitive psychology, which uses clinical scenarios, provides active learning, and builds on epistemic curiosity. This allows for activating prior knowledge, and drawing on previous experiences. These could all be useful in understanding the clinical scenario and making use of integration of knowledge, which could in turn lead to collaborative learning - which promotes student motivation, increases reasoning skills and encourages deep learning (Bate & Taylor 2013:95).

Table 2.2: Objectives and key characteristics of PBL (Adapted from: Prosser & Sze2014:113)

OBJECTIVES	KEY CHARACTERISTICS
Structuring knowledge for use in clinical	Learning is student-centred
contexts	
Developing an effective clinical reasoning	Learning occurs in small groups
process	
Developing effective self-directed learning	Teachers are facilitators or guides
skills	
Increasing motivation for learning	Problems used as the organising focus and
	stimulus for learning
	Problems are a vehicle for the development of
	clinical problem-solving skills
	New information is acquired through self-directed
	learning

Some of the advantages of PBL according to the students, are that they felt better prepared in interpersonal skills; graduates are better problem solvers; and it increases retention of knowledge, enhancement of integration of basic science concepts into clinical problems, the development of self-directed learning skills and the enhancement of students' intrinsic interest in the subject matter (Bate *et al.* 2014:3).

PBL is student-centred, it allows for active learning and problem based sessions that activate prior knowledge (Akter 2011:80). It also provides for real-life competence and increases motivation of students (Batdi 2014:348).

Bate *et al.* (2014:1) explain that PBL has the following advantages:

- PBL is a learning process that requires students to be actively involved in collaborative group work;
- PBL is an active and immersive process in which the students must take significant responsibility for their learning;
- PBL helps students develop into competent reflective practitioners. Learning has motivational and emotional components, and PBL groups can foster (or hinder) these depending on the skills of the facilitator; and
- The key to a successful outcome (achieving educational objectives) is for students and faculty to understand the process of learning and their role in it.

The disadvantage of PBL is that it is very time consuming and expensive, and so requires a lot of preparation and educational props which increases the logistics and cost of maintaining a PBL curriculum (Albanese & Mitchell 1993:70; Akter 2011:78). As was pointed out earlier, it is estimated that a PBL approach takes 22% more time to cover content which relates to 120 PBL sessions as to 98 sessions in traditional method of instruction; this is because the contact time with students in PBL curriculum is three to four times higher than other educational methods (Albanese & Mitchell 1993:70).

Other disadvantages of PBL according to Eshach and Bitterman (2003:495) include:

- "Practitioners might be tempted to use old cases blindly, relying on previous experience without validating it in a new situation;
- Practitioners might allow cases to bias them too much in solving a new problem; and
- Often practitioners-, especially novices, are not reminded of the most appropriate sets of cases when they are reasoning"

2.10 THE EVIDENCE: PROBLEM BASED LEARNING VS. SIMULATION BASED EDUCATION IN EMERGENCY MEDICAL CARE TRAINING

2.10.1 Problem Based Learning

A study done at the national University of Singapore found that students' experiences with PBL were much more enjoyable than traditional lectures. The study found that PBL had improved their reasoning ability, communication skills and ability to work in small groups (cf. Section 4.4.16), (Koo 2003:404). It is also believed that PBL students felt better

prepared in interpersonal skills, such as communicating with patients, co-operating with other health professionals and managing patients with psychosocial problems and tended to be better problem solvers (Bate *et al.* 2014:3). The same authors also found that students in a PBL curriculum performed better at clinical examinations and were better prepared than non-PBL students (cf. Section 4.4.14), (2014:3). A meta-analysis that spans from 1972-1992 in medical schools using a PBL curriculum found that students enjoyed a PBL curriculum and they even performed better at clinical examinations than students not in a PBL curriculum (Akter 2011:79). This information clearly demonstrates that SBE is not the best educational method in medicine or for paramedics for that matter and that this research could add to the body of knowledge that explores students' experiences with PBL and SBE. Yet, a study done by Eshach and Bitterman (2003:491) concludes that there is not enough evidence, that PBL, despite the additional investments in time, money, and manpower, improves clinical performances of medical students.

The results from the study (cf. Section 2.8), Newman (2005:18) and Albanese & Mitchell (1993:67), clearly indicates that SBE is not the only method of education that provides for a practical approach to medicine and paramedic education. This furthers the need to evaluate ECT student's response and experience of SBE and PBL.

2.10.2 Simulation Based Education

In Malaysia, SBE was introduced for the first time in 2009 as part of their medical curriculum. The results of the study showed that 84% of the students agreed that SBE was found to be useful and that they feel more confident in working in an Emergency room (Saiboon *et al.* 2011:389). When a study was done on seventy-nine first-year medical students, as many as 96% of them agreed that that SBE increased their confidence and that it enhanced their learning experience (cf. Section 4.5.12) (Swamy *et al.* 2014:1). Another study that compared group discussion to SBE found that students were more satisfied with simulation and showed a small improvement in learning as compared to group discussion (Ten Eyck, Tew & Ballester 2009:1).

A study that was done from 1991-1992 and involved 182 medical students found that 96% of the students agreed that simulation based training improved their bedside skills (Gordon, Issenberg, Mayer & Felner 1999:35). A recent meta-analysis that spans over 20 years found that SBE is superior to traditional medical education, but the study failed to look at evidence that evaluate PBL in medical education (McGaghie *et al.* 2011:708). It is also

accepted that SBE improved experiential learning and it enhanced the performance of medical students (Nuzhat, Salem, Al Shehri & Al Hamdan 2014:S69). A study that evaluated students and educators on simulation based training found that both groups agreed that simulation should be a compulsory part of their training (Gordon, Wilkerson, Shaffer & Amstrong 2001:471). The study concluded that 85% of students and educators found high-fidelity simulation as positive and excellent.

A performance-based assessment was done comparing SBE and traditionally trained residents to assess the effectiveness of simulation and whether there is knowledge transfer from the SLE to bedside patient treatment. The study revealed that residents that trained using the SLE scored 82.5% as to 74.8% in the traditional method of education for bed skills assessment (cf. Section 4.5.13), (Schroedl, Corbridge, Cohen, Fakhran, Schimmel, Mcgaghie & Wayne 2012:219.e10). A comparative study was also done on fourth-year medical students in emergency medicine based on simulation based curriculum and case-based group discussions (Mclaughlin, Fitch, Goyal, Hayden, Yang Kauh, Laack, Norwick, Okuda, Palm, Pozner, Vozenilek, Wang & Gordon 2008:1119). The study concluded that a simulation based curriculum was the preferred method of instruction.

A systematic search and review of literature from published journal articles and conference proceedings, between 1990 and 2011 were investigated. The study looked at PBL, SBE and Case Base Learning (CBL) in the medical field. The study concluded that there is lack of evidence when comparing learning effectiveness using students' experiences (Jesus & Gomes 2013:28).

It is clear from the research that no single teaching method offers the panacea of paramedic education, but the need to recognise and embrace change within medical education about the different ways students learn and then how to accommodate them. What is even more concerning is the lack of evidence in SBE within EMC, given the fact that it has been used for clinical assessment. This was also a finding and a concern in the 'SUPER' study which state that there is a clear gap in literature and knowledge in EMC with regards to SBE (McKenna *et al.* 2015:7). The next concern was that because of this lack in literature, researchers make use of other health care fields to look for findings and relate this to EMC, this is also what this researcher has done. The 'SUPER' study also recommended that attempting to translate these findings from other health care specialities is a concern, as EMC has s unique set of challenges and more research is needed in this field to develop a body of knowledge specific to EMC in SBE (McKenna *et al.* 2015:7).

2.11 CONCLUSION

In Chapter 2, the researcher completed a literature review which looked at the concepts and meaning of both PBL and SBE. This was followed by a brief history of both methods and how this was introduced to medical education. The researcher also looked at both the advantages and disadvantages of SBE and PBL (cf. 2.6 and 2.9). This was followed by current research in emergency medicine as it relates to PBL and SBE.

In the next chapter, Chapter 3, entitled **Research Design and Methods,** a thorough description of the design and methods used for the study will be discussed. It will also provide an explanation how the validity, reliability, trustworthiness and rigour of the study was ensured.

CHAPTER 3

RESEARCH DESIGN AND METHODS

3.1 INTRODUCTION

As mentioned in Chapter 1, the aim of the study was to perform an evaluation of ECT students' experiences with SBE and PBL. In this chapter, the theoretical perspectives on the research design and methods selected for use in this study will be discussed. This is followed by a description of the methods used in this study, namely, the literature study, the questionnaire survey and the pilot study. The chapter concludes with an explanation of the way validity, reliability, trustworthiness of the study were ensured as applicable to the study.

3.2 THEORETICAL PERSPECTIVES ON THE RESEARCH DESIGN

3.2.1 Theory building

Theory is defined as "a set of statements that makes explanatory or causal claims about reality" (Mouton 2001:177). It refers to the relationship between the theoretical part of the study and empirical aspects of the study. Gay and Weaver (2011:24) state that "Consequently, issues such as definition, criteria, and purpose reflect an a priori commitment to certain pre-suppositional assumptions about what constitutes knowledge (epistemology), reality (metaphysics), the nature of being or existence (ontology), values (axiology), and other basic philosophical issues". Here concepts are specified to create a theoretical framework.

According to Creswell (2014:86), a theory in quantitative research "is an interrelated set of constructs (or variables) formed into propositions, or hypotheses, that specify the relationship among variables (typically in terms of magnitude or direction)". The aim is thus to explain the phenomena; in this case, it relates to how ECT student paramedics experience SBE and PBL.

Quantitative research uses theory deductively and places it toward the beginning of the proposed study. The aim here is testing or verifying the theory rather than actually developing it, but the researcher does collect the data to test its results (Creswell 2014:93).

As such, the literature study, will form the basis of the theoretical framework, as discussed in Chapter 2. The empirical part of the study is represented by the questionnaire (cf. Appendix F).

3.2.2 Strategy of inquiry and research approach

A critical component of any research is to select an appropriate research design. Creswell (2014:3) defines a research approach as "plans and procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis and interpretation." The three main research designs are quantitative, qualitative and mixed method research. Table 3.1 tabulates the differences between qualitative and quantitative research methods.

CHARACTERISTIC	QUANTITATIVE RESEARCH	QUALITATIVE RESEARCH
Purpose	Prediction	Description
Focus	Give voice to silenced people	Generalize to large population
	and groups	
Methods	Deductive analysis of units	Inductive analysis of "texts"
	(individual, corporations, etc.)	
Criteria for Truth	Statistics, replication, and	"Aha" criterion; adequate and
	cumulative findings	realistic

Table 3.1: Qualitative and Quantitative research (Vanderstoep & Johnston 2009:167)

A third research paradigm has also emerged known as **Mixed-Methods** research. Mixedmethods research is defined as a class of research where the researcher mixes or combines both qualitative and quantitative techniques in a single study (Creswell 2014:32).

After having considered the above approaches the researcher decided to use a quantitative descriptive design. The researcher has chosen this method as it the most appropriate method to maximise the validity of the research findings. It also fits the purpose of the study. Descriptive research attempts to determine the phenomenon under investigation and is widely used by employing the survey method of collecting data (Singh 2006:104). The objectives described in Chapter 1 (cf. 1.4.3) attempted to gain an understanding of underlying reasons, opinions, motivations and insights into the problem or helps to develop ideas or hypotheses for potential quantitative research. These objectives successfully addressed the research questions (cf. Section 4, 4.5.16).

Quantitative research methods and designs see the researcher as completely separate from the phenomenon under investigation. This means that the researcher does not try to

influence the outcomes of the research with his/her feelings or experiences. The researcher assumes that knowledge is "out there" and needs to be discovered and can be observed by a trained researcher (Vanderstoep & Johnston 2009:165). As such, quantitative research is used:

- To describe variables;
- To examine relationships among variables; and
- To determine cause-and-effect interactions between variables (Burns & Grove 2005:23).

Quantitative data collection methods produce results that are easy to summarize, compare, and generalize. Quantitative methods are deductive, while qualitative methods are inductive, which is one of the distinguishing features of quantitative research (Vanderstoep & Johnston 2009:168). It employs empirical methods and empirical statements, for which the sample under study will reflect a more accurate population from which the sample was drawn (Vanderstoep & Johnston 2009:7). These empirical methods determine to a certain degree how to evaluate how a programme or policy performs or does not perform. So, in the context of using a quantitate research approach to determine how students experience SBE and PBL fits well with the design of the study.

Creswell (2014:20) identifies a research problem as a "real-life problem". This is how the researcher came up with the research question (cf. Chapter 1), having experienced difficulty in understanding various educational methods employed in EMC as a student. The researcher is currently an educator wishing to improve students' experience with education in EMC. A paradigm is defined by Guba and Lincoln (1994:105) as "the basic belief system or worldview that guides the investigator, not only in choices of method but in ontologically and epistemologically fundamental ways".

3.2.3 Research design

According to Singh (2006:77) the research design is a "choice of an investigator about the components of his project and development of certain components of the design". It is how the researcher plans to execute his research in a systematic fashion keeping in mind the research objectives (cf. 1.4.3). A research design includes the following components:

- Research method or research strategy;
- Sampling design;

- Choice of research tools; and
- Choice of statistical techniques.

(Singh 2006:77)

To best address the specific aims and objectives of this particular study, the researcher decided to make use of a quantitative descriptive design. A questionnaire survey was used to address the study's objectives and aims (cf. Appendix F). This type of study is particularly useful if more information is required in a particular field that aims to answer the research question (Brink 2006:102). Descriptive research attempts to determine the phenomenon under investigation and is widely used by employing the survey method of collecting data (Singh 2006:104).

The main objective of descriptive designs are:

- To identify present conditions and point to present needs;
- To study the immediate status of a phenomenon;
- Fact finding; and
- To examine the relationships of traits and characteristics (trends and patterns).
- (Singh 2006:105)

The descriptive survey could be described as more realistic than experimental research. It is thus oriented towards the descriptive status of the present phenomenon (Singh 2006:105). The author also states that "the survey dealing with curriculum courses help us in obtaining information not only about the strength and weaknesses of the current curriculum but also can elicit recommendations for change" (2006:102). This is in line with the aim and objectives of the study (cf. 1.4.3) in determining which method of education is preferred by the ECT students'. Descriptive surveys is thus useful for evaluating how people feel or to measure human behaviour, which is also in line with the aim and objective of the study. But more importantly, Descriptive studies are helpful in planning various educational programmes, school census, educational planning, solve the problems of various aspects of school i.e. school plants, school maintenance, teaching staff, *curriculum, teaching methods* and learning objectives (Singh 2006:102).

Some of the advantages of a questionnaire survey:

It permits wide coverage at a minimum expense of both money and effort; and

The validity of questionnaire data also depends in a crucial way on the validity and willingness of the respondent to provide the information requested.

But also a disadvantage of the questionnaire survey is misinterpretation of the questions which could affect data and results (Singh 2006:108). This was one of the observations the researcher made, as some of the answers did not relate to the question (cf. Section 4.3, 4.4 & 4.9).

The research problem was formulated based on a lack of literature nationally and internationally on SBE and PBL in paramedic education (cf. Section 2.10.2). The researcher took it upon himself to establish an overview of the problem as the relevance of paramedic education is critical to the outcomes of patient care. This contextualisation of the research problem was achieved by analysing relevant documents that refer to these premises (cf. Chapter 2). The importance of the study was emphasised by the lack of research articles and information about PBL and SBE in EMC within the South African context. The literature review and the questionnaire survey was used to gather the data, which were used to achieve the objectives, ultimately leading to accomplishment of the aim.

3.2.4 Description of methods

3.2.4.1 Literature study and document analysis

To recap Brink (2006:67) defines a literature review as an organised, written presentation of published research on a given topic. This literature review should be done once the researcher has identified a topic of interest in order to enquire what is known about the topic. This research should be a review of literature that is able to provide in-depth knowledge of what is already known about the topic. This is crucial as a thorough examination of published literature is essential to develop an understanding of the topic of interest (Brink 2006:67). Based on the findings, the researcher will have a broad idea of what is known about the topic and the knowledge that exists. This review will provide the researcher with insight on how to identify research problems and research questions. By doing so, the researcher will not duplicate research and could make a valuable contribution to the body of knowledge.

In this study, the literature review analysed the history of SBE and PBL and draw to current practise of teaching and learning in EMC (cf. Chapter 2). This was achieved by making use of electronic databases using keywords to access accredited articles from both national and

international journals. Search engines such as EBSCOHost, Medline, ERIC, Google scholar, PubMed and Cinahl. A wide variety of books that were available on both SBE and PBL were also consulted to obtain the necessary information. Since simulation has been used extensively in the aviation field, it was necessary to look at the history and the development of simulation and how this has come to be used in health care (cf. Section 2.4).

After reviewing the limited literature on educational methodologies in EMC within the South African context, the researcher conducted an in-depth analysis of existing documents that spoke to the design and structure of the curriculums currently in practice at EMS educational institutions. Other documents included emergency medical care programme curricula published by South African Qualifications Authority (SAQA), Cape Peninsula University of Technology (CPUT) and Durban University of Technology (DUT).

Both the literature review and document analysis was aimed at describing the history and current state of educational curriculums in use as pertaining to SBE and PBL (cf. Chapter 2). This provided the necessary background and context to the stated problem. From this, the rationale and basis for the questionnaire survey was developed (Appendix F).

3.2.4.2 *The questionnaire survey*

A clearly formulated questionnaire should address the objectives of the study and the research problem (Brink 2006:146). The researcher should thus have a clear understanding of what he/she wants to achieve from the questionnaire. As pointed out earlier, questionnaires offer the advantages of being time efficient, less expensive, anonymous (for the participant) and standardised questions.

The survey method collects the following three types of information:

- Of what exists;
- Of what we want; and
- Of how to get there.

(Singh 2006:103)

Based on this, the researcher decided that a questionnaire survey would be adequate for this research (cf. Section 3.2.3). Other methods were also considered such - as interviews, but was not chosen due to the practicality of the research. The cost involved in traveling

to interview participants would have been enormous as the researcher is not working within South Africa.

McMillan and Schumacher (2001:34) explain that a questionnaire is especially useful for gaining information on the nature of the needs of a specific target population. Questionnaires also have the advantage of keeping the participants anonymous.

The purpose of this questionnaire survey was to determine how students experience SBE and PBL as part of their EMS training. The questionnaire was compiled in English as the language of instruction at the Free State College of Emergency Care is offered in English. Questionnaires were circulated after both methods of education, namely SBE and PBL were explained to the target population, followed by a practical session. The practical session involved the management of an asthmatic patient. Here the participants was shown by the lecturer the management of a patient with asthma then the participants were to do the same. The same criteria were used for the PBL case. Again the scenario of an asthmatic patient was used, where the lecturer first demonstrated how this should be done as PBL revolves around group work and discussions, which was followed by a practical session. At the end of the day, all participants were distributed.

Questions were kept as simple as possible so as to minimise any impact that could have a negative effect on the results of the study. The questionnaire also informed the participants that by completing the questionnaire, they were giving informed consent. The questionnaire survey was a quantitative study that consisted of both closed and open-ended questions. Where clarity was needed, participants were asked to explain their answers in more detail. This was done so that the researcher could get an understanding why the participant had chosen a particular method of education over the other. This meant there was no speculation, and thus reflected the true value of the questionnaire. The options on the questionnaire were strongly agree, agree, undecided, disagree and strongly disagree.

The researcher's contact details were also provided to the participants for further clarification. Further discussion on the questionnaire survey is available in Chapter 4 (cf. 4.2).

3.3 SAMPLE SELECTION

3.3.1 The questionnaire survey

3.3.1.1 Target population

In this study, the target population was represented by all second-year students enrolled in the Emergency Care Technician (ECT) programme at the Free State College of Emergency Care. The reason for only using the second year students' on the ECT program is because the ECT course is a two year program. The ECT students' would thus have had some exposure to the different educational methodologies during year their first year of study. The Central University of Technology (CUT) could not be used at the time of the study as there were issues with the accreditation process of the institution. The total number of students enrolled in the second-year programme at the Free State College of Emergency Care was 44 students.

3.3.1.2 Survey population and sample size

Sampling methods have also been referred to as "sampling schemes" and defined as "specific techniques that are utilized to select units" (Onwuegbuzie & Leech 2007:239). This refers to the specific pool of cases/participants that the researcher wants to include in the study (Neuman 2012:151). From the 44 students in the ECT course only 16 students were available on the day of the study. As CUT could not be used in the study due to accreditation issues with the HPCSA, the only other institution was the Free State College of Emergency care. These are the only two institutions that offer paramedic education in Bloemfontein that is governed by the Council on Higher Education of South Africa. Due to unforeseen logistics, some of the students on the day had to attend to practical sessions either on the road or at clinics. The only students that were left on the day were 16 participants. Because the researcher does not reside in South Africa, another trip to Bloemfontein would not be possible due to available time and budget constraints. This left the study with only a sample size of 16 participants.

3.3.1.3 Sample description

A detailed analysis of survey participants is presented in Chapter 4 (cf. Section 4.2) to clarify demographic profile, qualification and experience relevant to the study. All participants

who completed the questionnaire survey were in enrolled in the ECT programme at the Free State College of Emergency Care.

3.3.1.4 *Pilot Study*

To ensure that the questionnaire was correct and to determine the time needed to complete the questionnaire, a pilot study was done. This also ensured that the content of the questionnaire was clear. Feedback from the pilot study was to create more space for explaining of the open-ended questions. These were rectified and again sent to the two participants of the pilot study.

The pilot study was carried out by sending the questionnaire survey to two students who met the criteria as stated in the target population. These two students did not form part of the sample. They were students at another University in Abu Dhabi who are also on a paramedic programme. The feedback from the participants were positive as they could read the questionnaire with ease and were able to understand and complete the questionnaire with ease. It took approximately 45 minutes to complete the questionnaire survey. The results of the pilot was not included in the study as agreed by the researcher and the study leader. The researcher wanted to get a true reflection of the students in a South African content. The University in Abu Dhabi uses both PBL and SBE as an integration to their curriculum. Included in the results from the two pilot studies would have given a false positive results as students in the Middle East is very much familiar with PBL and SBE.

3.3.1.5 Data collection

An information document explaining the research study and requesting participation in the study was given to all participants. Prior to this, consent was obtained from the Free State College of Emergency Care Head of Department to conduct the research.

The questionnaire survey was conducted after both SBE and PBL sessions were concluded (cf. Section 3.2.4.2). Participants were given the questionnaire survey after receiving an explanation of both SBE and PBL, which lecturer used 45 minutes to explain each methodology separately to the participants. They were also given the opportunity to take part in practical sessions about SBE and PBL. The PBL group was divided in two groups consisting of eight students each. They were then given the problem to solve and come up with a practical solution to treat a patient with asthma. The SBE group were divided

into four groups of four each to practice the treatment of an asthmatic patient. Each session lasted one hour, where after the groups changed roles so that every student could experience PBL and SBE. The completed questionnaires were collected by the educators of the Free State College of Emergency Care.

3.3.1.6 Data analysis

The data were analysed by researcher in consultation with the University of Free State ICT services. Thus the data analysis was controlled by an independent body to ensure reliability and validity of the data. All the date were given to the ICT department from where they compiled frequencies, percentiles and histograms. Comparisons between the two educational methodologies were made using 95% confidence intervals for the difference in proportions by the Department of Biostatistics at the University of the Free State (cf. Section 4.5.17). This was the only input the Department of Biostatistics had by comparing the 95% confidence intervals.

The aim of the analysis was to look for trends and patterns about the preference of students and how they experienced SBE and PBL. The researcher did carefully read and make deductions from the data about the questions from the SBE and PBL, where it could be linked to the aim and objectives of the study. In this study, the researcher made use of the insights obtained during the literature review together with his own prior knowledge and expertise as an educator in the field to extract, interpret and present the main findings as seen in Chapter 4.

3.4 ETHICAL CONSIDERATIONS

3.4.1 Ethical approval

Approval was obtained from the Ethics Committee of the Faculty of Health Sciences, UFS, ethics approval number ECUFS NR 167/2015 (cf. Appendix G). The study did not involve any patients nor were any invasive procedures done. However, ethical approval and permission was also sought and granted by the Free State Department of Health to conduct the study (cf. Appendix H). Permission was also sought from the Head of Department at the Free State College of Emergency Care for participation of their students to conduct the study (cf. Appendix I).

3.4.2 Informed consent

Participants were provided with a brief written overview of the study and its purpose and an explanation of what is required of them, including details about the questionnaire survey. Participation in this study was voluntary and participants were provided with a background to the study and invited to participate (cf. Appendix A). There were no costs involved to the participant in participating in the study. There were also no remuneration whatsoever in cash nor any risks involved by participating in the study. Participants were free to withdraw from the study at any time during the course of the study. Willingness to participate was confirmed by the submission of a signed consent form by participants. Contact details of the researcher, the study leader and the secretary of the Ethics Committee were provided.

3.4.3 Privacy policy

To ensure confidentiality and anonymity, participants were asked not to include their name on the questionnaire survey. Each of the questionnaires received a number from one to sixteen; this then ensured that the participants were completely anonymous. Participants were informed of the voluntary nature of participation and were given the freedom to withdraw from participation at any point during the study. The researcher is convinced that all possible measures were taken to ensure that the study complied with high ethical standards. The information collected by means of the questionnaire survey were dealt with in a strictly confidential manner and no names nor personal information were made known.

3.5 VALIDITY AND RELIABILTY

3.5.1 Validity

Validity seeks to ascertain the extent to which the instrument accurately measures what it purports to measure or how truthful the research results are (Brink 2006:159). Validity is concerned with the soundness and effectiveness of the research tool while reliability is the consistency with which the measuring instrument performs (Leedy 1997:32-34). An instrument would then be declared valid after it has been satisfactory tested, repeatedly in the population for which it was designed (Bowling 2002:150). According to Katzenellenbogen, Joubert and Karim (2007:117), validity is an indication of the truth or

accuracy of the measurement; to what extent an instrument measures what it is intended to measure.

In this study, it was important to ensure that the way in which the questionnaire was set up, in order to document, analyse and interpret the data to be both valid and reliable. This avoided bias, which speaks to the validity of the study.

3.5.2 Reliability

Reliability is defined as the extent to which a questionnaire, test, observation or any measurement procedure produces the same results on repeated trials, or the degree to which the instrument can be depended upon in order to attain consistent results if used repeatedly given the same situation (Brink 2006:163).

The reliability in this research was therefore established by means of well-constructed questions for the questionnaire survey and piloted and reviewed by the researcher and the study leader.

Mays and Pope (1995:110) recommend the following steps to ensure rigour in a study:

- Systemic and proper research design to ensure congruence between research questions and methods used;
- Independent, but direct data collection with appropriate sampling mechanisms;
- Concurrent data analysis and plausible interpretation to ensure intimate understanding of theory and the research setting; and
- Communication of the results presented with evidence from the actual data gathered

The steps above were used to ensure reliability and validity together with a well-constructed questionnaire survey in order to ensure rigour.

3.6 CONCLUSION

Chapter 3 provided theoretical perspectives on the research design, explanation of the quantitative research design and the method used to conduct the study. These methods included a literature review and a questionnaire survey. The chapter concluded by

discussing the ethical aspects related to the study as well as how validity, reliability and trustworthiness were ensured.

In the next chapter, Chapter 4, entitled **Results, analysis, interpretation and the discussion of the findings of the questionnaire survey,** these aspects will be presented in the form of graphs, and will be discussed accordingly.
CHAPTER 4

RESULTS, ANALYSIS, INTERPRETATION AND THE DISCUSSION OF THE FINDINGS OF THE QUESTIONNAIRE SURVEY

4.1 INTRODUCTION

In Chapter 3, the methodology used in the research project and the theoretical aspects thereof were discussed. In this chapter, the researcher will present the results obtained from the questionnaire survey and then discuss each section in line with the objectives stated in Chapter 1 (cf. Section 1.4.3). The results will be presented in graphs, followed by a short discussion to elucidate the results obtained and will conclude by a short summary.

4.2 THE SURVEY PROCESS AND FEEDBACK

The project consisted of a questionnaire survey to determine ECT student's experiences of simulation based education vs. problem based learning in paramedic education.

The reason for choosing the questionnaire survey as the method of data collection was explained in Chapter 3 (cf. Section 3.2.4.2).

Approval was obtained from the Ethics Committee of the Faculty of Health Sciences, UFS, ethics approval number ECUFS NR 167/2015. The study did not involve any patients nor was there invasive procedures done. Permission was also granted by the Free State Department of Health to conduct the study. Permission was also sought from the Head of Department at the Free State College of Emergency Care for participation of their students to conduct the study.

Prior to conduct the survey, pilot study questionnaires were completed by two students who met the same criteria as in the target population. The feedback from the participants were positive as they could read the questionnaire with ease and were able to understand and complete the questionnaire with ease. It took approximately 45 minutes to complete the questionnaire survey.

The questionnaire was compiled in English as the language of instruction at the Free State College of Emergency Care is offered in English. Questionnaires was circulated after both methods of education, namely SBE and PBL was explained to the target population which was followed by a practical session. The practical session involved the management of an asthmatic patient. Here the participants was shown by the lecturer the management of a patient with asthma then the participants were to do the same. The same criteria was used for the PBL case. Again the scenario of an asthmatic patient was used, where the lecturer first demonstrated how this should be done as PBL revolves around group work and discussions which is followed by a practical session. At the end of the day all participants received tutoring and practical sessions of both SBE and PBL before the questionnaires were distributed. In March 2016 the research was concluded with a total of 16 participants.

4.3 DEMOGRAPHIC INFORMATION

In this section the participant's demographic information is interpreted and displayed in graphs. Information regarding the participant's ages, genders and their interaction or familiarisation with SBE and PBL were recorded.



4.3.1 Age of participants

Figure 4.1: Age of participants (n=16)

The average age of the respondents was 34.06 years, with a median of 34. The ages of the respondents ranged from 25 to 41 years at the time of the completion of the survey. The largest number of the respondents were in the age group 31 to 40 years of age (62.5%), followed by the age group 20 to 30 years of age (31.3%); there was only one participant that was 41 years of age (6.3%).

4.3.2 Gender of participants



Figure 4.2: Gender of participants (n=16)

The gender profile comprised 59.8% (9) male and 40.2% (7) female respondents.

4.3.3 Studying to become a paramedic?



Figure 4.3: Studying to become a paramedic? (n=16)

All participants was at the time of the study busy studying to become a paramedic at the Free State College of Emergency Care.



4.3.4 Encounters with PBL

Figure 4.4: Have you encountered PBL prior to this session? (n=16)

From the 16 respondents, 10 had previous encounters with PBL (62.5%) while the rest, six (37.5%) never experienced PBL until the day of the study. This previous encounter were not clearly explained by the respondents, but comments were based on experience from school and some mixed experience at the Free State College of Emergency Care.

If the respondents answered yes to previous PBL encounters, then the respondents were asked to explain where this took place. Below, Table 4.1 provide these explanations. Only 12 respondents answered this section.

Table 4.1: Encounters with PBL, if yes, please explain (n=12)

No1	We normally have group work where it is expected of us present the work we done.
No2	Adult school there for only facilitators not tutors. We want tutors.
No4	Because simulation are stressing we just forget the important not exactly but we don't
	know them but we are scared
No5	We did 17 before in class
No6	Everything was fine
No9	Be student, in class full-time is a challenge
No11	I think according to me I have a problem with this one because I hate to talk or explain
No12	Questioning method in other module gives problem
No13	We did not have enough study material
N014	Group work in class but not very often
N015	As a student we are not as fast learners as others, some of the students have to be given
	time to understand some of the things to go on.
N016	It has been done several times and its very helpful as we are stimulated to think and
	learn on ourselves

The feedback to this questions was clear that the participants never really had a full PBL experience prior to this research study. They may have experienced group work at school or as some participants say 'it does not happen all the time that they have group work sessions'.



4.3.5 Encounters with SBE

Figure 4.5: Have you encountered SBE prior to this session? (n=16)

A total of 12 respondents (75%) have had previous contact with SBE while four (25%) respondents said they did not have any experience of SBE prior to this study. This is slightly confusing as all the respondents should have had some exposure to SBE either in their first year of study or during the second year of study as they have to perform simulation training to be deemed competent in certain skills. But when the researcher looked at the comments, one student said that the way the SBE was done on the day of the study was completely different from what he/she was used to. From this, the researcher came to the conclusion that based on the literature on simulation that SBE is only being done as part of skills assessment and not as part of the curriculum (cf. Section 2.3).

If the respondents answered yes to previous SBE encounters, then the respondents were asked to explain where this took place. Below, Table 4.2 provides these explanations.

No1	Towards the end of each year we do simulated scenes on the mannequins
No2	We supposed to teach before you go to approach simulation.
No5	Asking relevant questions to the sim given
No6	Because what I saw or learned was much better
No9	Get confused to things you know very well and end up failing simulation - Not having self-confidence
No10	It was asthma simulation - it was very interesting
No11	I think simulation is better than PBL, because I like physical thing.
No13	Asthma simulation
No14	Mostly towards finals for preparations
No15	Sometimes it's not like you don't know something that thing of evaluation scared you and you know where you are good and where is your weak point.
No16	it's very stressful and I end up forgetting the management of the patient standing there next to the doll

Table 4.2: Encounters with SBE, if yes, please explain (n=11)

The feedback here is also conflicting as four of the participants said they never experienced SBE prior to this study. This could not be true as they are being assessed on certain skills using SBE. The method of SBE may not have been as comprehensive as done in the study, but they do learn the foundations of SBE. The researcher was also very comprehensive about both methods of education and how it should be presented.

Table 4.3: What is your personal opinion with regards to PBL in EMC? (n=16) (Table continues on next page)

No1We do many modules, so problem based learning is not a good thing when your focus is
not on one module.No2We must learn and teach how method training of approaching simulation

No3	None
No4	I personally think it will help us a lot because of the experience we have on the field of EMS
No5	Give students tasks to work in groups all can participate
No6	Is that what we've learn or been taught. Is not benefitting at all
No7	It will develop the employees enhancing better treatment of patients
No8	Lecturer was professional to us
No9	Be student and parent. To have someone to counsel or have counselling session as part of studying hours maybe once per week
No10	Information is very poor
No11	I think explaining according to me is more difficult than doing practical
No12	At the end of the course many ask about question that are new in the program. Relation to what my taught.
No13	To learn under pressure
No14	It stimulates our thinking one there is a lot of improving happening and I am doing most of it.
No16	It motivate you to learn, get out and find out about everything. Keeps thinking process active all the time

Table 4.4: What is your personal opinion with regards to SBE in EMC? (n=16)

No1	At least with simulation based learning, you get a change to get information from someone and confirm it by reading afterwards.
No2	Lecturing us about how to approach simulation and how to manage patient and how to treat it.
No3	Sims are good
No4	I think Simulation are not properly managed because some of the facilitator's are there to obstruct the student with their agenda
No5	Give more time to practice
No6	Is that what I've learn is more relevant that what I see or learn in our class
No7	It should be done more often
No8	The lecturer can show us what he need us to do when we do Sim.
No9	You can make simulation on other side of room, like room of simulation can have something to share the room(divide) so as not to see your assessors while performing your simulation
No10	We must give a permission at hospital to perform any skill on patient and sign off
No11	Simulation based education is better for me cause I can treat and ask question at same time.
No12	This will help us to improve in learning methods
No13	To refresh our mind
No14	It's very stressful
No15	It's all about acting and not all of us are good in acting but you can still treat the patient according to the theory that you have done.
No16	I get so stressed and confused while doing it not because I don't know what to do, but it is stressful.

4.4 QUESTIONS ON PROBLEM BASED LEARNING



4.4.1 This course has helped me to develop my problem-solving skills?



From the 16 respondents only one (6.3%) was undecided, while 15 (93.8%) respondents agreed that the session on PBL improves problem-solving skills (cf. Section 2.7).



4.4.2 This course has helped develop my ability to work as a team member?

Figure 4.7: This course has helped develop my ability to work as a team member? (n=16)

The majority of the respondents (56.3%) agreed that PBL could develop their ability to work as a team member, while 31.3% strongly agreed and two respondents (12.5%) were undecided (cf. Section 2.7). No reasons were provided by the two respondents for their decision.



4.4.3 PBL is a valuable learning experience

Figure 4.8: PBL is a valuable learning experience (n=16)

Surprisingly, eight respondents (50%) agreed that PBL is a valuable learning experience since 37.5% of the respondents replied that they never encountered PBL before (cf. Section 4.3.4), while 25% strongly agreed and 18.8% were undecided, and only one respondent did not agree. This finding validates literature about PBL, where students alter their learning style after experiencing PBL (cf. Section 2.1).



4.4.4 PBL is a relevant educational strategy

Figure 4.9: PBL is a relevant educational strategy (n=16)

When asked about PBL as an education method, seven (43.8%) of the respondents strongly agreed, while six respondents (37.5%) agree and only three (18.8%) respondents were undecided about the relevance of PBL as an educational strategy. Here again a total of 13 participants agreed that PBL is relevant, where at the beginning of the study (cf. Section 4.3.4) six of the respondents never had a PBL session prior to this study.



4.4.5 PBL offers similar advantages to SBE?

Figure 4.10: PBL offers similar advantages to SBE? (n=16)

Given the fact that only six respondents never had previous contact with PBL (cf. Section 4.3.4), a total of 12 respondents (43.8% agreed and 31.3% strongly agreed) now agreed that PBL offers similar advantages to SBE. Only one respondent (6.3%) was undecided. Literature supports this claim that PBL and SBL offer similar advantages (cf. Section 2.3).



4.4.6 PBL may contribute to increased patient safety

Figure 4.11: PBL may contribute to increased patient safety? (n=16)

Half of the respondents agreed that PBL could contribute to increase patent safety, while 31.3% strongly agreed, and 12.5% disagreed; only one (6.3%) responded was undecided. No evidence could be found about patient safety using a PBL approach; there is, however, an abundance of literature about SBE with regards to patient safety outcomes (cf. Section 2.6).

4.4.7 This session was effective while helping me to integrate theory into practice?



Figure 4.12: This session was effective while helping me to integrate theory into practice? (n=15)

An important part of paramedic education is to transfer the knowledge learnt into practical sense. It was assuring that 13 (53.3% agreed and 33.3% strongly agreed) of the 16 respondents thought that PBL could transfer knowledge from class into practical lessons. Two of the respondents (13.3%) were undecided and one did not provide and answer to the question. This pertains to the advantages of PBL (cf. Section 2.9).

4.4.8 PBL training is a very stressful experience, but relevant for clinical practice?



Figure 4.13: PBL training is a very stressful experience, but relevant for clinical practice? (n=16)

Assessments of any kind produces elevated stress levels. Part of paramedic education is to get the student to become comfortable in dealing with stressful situations and how they react to this. A total of 12 of the respondents (56.3% agreed and 18.8% strongly agreed) felt that PBL could be relevant in clinical practice; only three respondents (18.8%) were undecided and one (6.3%) respondent disagreed.



4.4.9 PBL could reflect real patient care

Figure 4.14: PBL could reflect real patient care? (n=16)

Within a PBL curriculum, students are given a theoretical explanation of a topic and then this is demonstrated on a student or actual patient. The idea is to expose the student to a more realistic approach to patient care. As the results revealed 68.8% of the respondents agreed while 12.5% strongly agreed that PBL could reflect real patient care. Only three (18.8%) of the respondents were undecided. PBL prepares the student with the skills that allow students to be work ready (cf. Section 2.7).

4.4.10 I have understood the technical material of the course better than if it had been presented in the form of SBE?



Figure 4.15: I have understood the technical material of the course better than if it had been presented in the form of SBE? (n=16)

When students were asked about the preference or mode of education, the results were somewhat undecided. The majority (37.5%) agreed to PBL, and one strongly agreed to a PBL approach, but a total of 31.3% were undecided on the use of PBL versus SBE, and 25% disagreed that SBE is better than PBL.



4.4.11 I think I have learnt as much technical material as compared to SBE?

Figure 4.16: I think I have learned as much technical material as compared to SBE? (n=16)

When students were asked about the technical aspects of PBL and SBE, the results showed that 10 respondents (43.8% agree and 18.8% strongly agree) thought that PBL is similar to SBE (cf. Section 2.3), while 18.8% were undecided and another 18.8% disagreed that PBL is similar to SBE.

4.4.12 This session helped you develop confidence to use what you have learned in class in the clinical setting?



Figure 4.17: This session helped you develop confidence to use what you have learned in class in the clinical setting? (n=16)

Again students were asked if they could translate PBL sessions into practical terms in the clinical setting, 15 respondents (93.8%) said that PBL sessions could impact positively, while only one (6.3%) respondent said 'no'.

Respondents were asked to explain their answers. The explanations are listed below in Table 4.5.

Table 4.5: This session helped you develop confidence to use what you have learned in class in the clinical setting? Please Explain (n=16)

No1	Practicing what you have. Learning theoretically give you confidence to practice in the clinical settings
No2	Yes because list taking is very important preparation done, simulation done.
No3	Because what we have learn or thought in the class, it is simple when you put them in a practical way
No4	Because what we have learn or thought in the class, it is simple when you put them in a practical way
No5	Training patient, accessing giving diagnose
No6	Because what I've learn in class is not well prepared, that's why I mostly find that this session is giving more confidence.
No7	Most of the information was helpful and sharpened my knowledge of Asthma
No8	Like it was likebecause we did write FFA's with this subs etc.
No9	Something you may think you know but after session you realise you need to search information by yourself
No10	Help a lot to start up looking patient in different way and treatment also
No11	But it helped to the people we are care. I hate talking or explaining.
No12	To stand perform by yourself - help to build confidence.
No13	To build up my confident
No14	The questioning after presentation and having to do some research
No15	I can do what I have taught in the field even if I haven't done the simulation, sometimes you can pass that simulation by fooling.
No16	With the patient we had been given per day I learned not only to expect the pharma logical treatment to work as you desire with all patients. Think around the box and treat what you get.

4.4.13 PBL made me relate to feelings that are similar to what I have encountered in clinical practice?



Figure 4.18: PBL made me relate to feelings that are similar to what I have encountered in clinical practice? (n=16)

The researcher wanted to know if students can relate the practical sessions of PBL to real patient care. The majority (81.3% of the respondents) thought that this is true, while only 18.8% said this is not true.

Again the researcher wanted clarity why the students chose 'yes' or 'no'; The responses can be seen in Table 4.6 below.

Table 4.6: PBL made me relate to feelings that are similar to what I have encountered in clinical practice? Please Explain (n=15)

No1	Combination of both PBC and Simulation based education I think made me relate to feelings I have encountered in clinical practice
No2	Group discussion were done and we work together in management of patient.
No4	If you discuss something in a group form it will be difficult for you to forget that thing. I think PBL is the right way to go.
No5	Converting theory into practical
No6	Is more relevant
No7	Little information about Asthma can lead to misdiagnosis, Little more
No8	When doing Sim you become stressful and loose everything you know.
No9	You may know only one method but this session elaborate better
No10	Apply what you think but don't harm the patient
No11	Yes it does but it takes long. By Simulation it makes things easier.
No12	As your keep on reporting something it will help to learn more.
No13	Is to makes me comfortable in clinical practice
No14	He is more comfortable
No15	Because now I know what to do to help the patient than before, can do the difference about what know now, instead of know, but not helping due to waiting for someone, while you know what to do.
No16	As challenging as PBL can be it cannot compare to clinical practice. What it does is to prepare you for the patient.

4.4.14 PBL is relevant for practicing and teaching guidelines and algorithms for patient care (Asthma, Anaphylaxis, MI, etc.)



Figure 4.19: PBL is relevant for practicing and teaching guidelines and algorithms for patient care (Asthma, Anaphylaxis, MI, etc.) (n=16)

A big part of paramedic education is to remember different algorithms for different disease processes. It is a systematic flow of events that the paramedic follow in order to treat the patient in an orderly fashion. Again the researcher wanted to know if this can be done with a PBL approach, and all the respondents agreed that this could be done with PBL. The explanations by the respondents are given below in Table 4.7.

Table 4.7: PBL is relevant for practicing and teaching guidelines and algorithms for patient care (Asthma, Anaphylaxis, MI, etc.) Please Explain (n=15)

No1	Is relevant because what you have learnt theoretically is important to practical application
No2	We learn how we can manage Asthmatic patient
No4	Yes, cause discussing the patient is like teaching the patient in a different way because of the experience we have in this field of EMS
No5	Everyone is competing when doing PBL. That's where I evaluate myself to where to improve.
No6	Because it gives a light
No7	Asthma
No8	You know where to start and knows why you want to give it
No9	It is true
No10	N/A
No11	It helped only with the research but not with what you have to do on scene
No12	Practical work helps to solve problems
No13	Asthma
No14	It allows you to research and gives a broader picture for disease process
No15	Because you can still referring or consult to what you have taught before it's just that you haven't been exposed to some of the situation.
No16	By preparing you for any type of disease and making you aware of all different approach to a similar problem

4.4.15 Was this session effective in helping you to integrate theory into practice?



Figure 4.20: Was this session effective in helping you to integrate theory into practice? (n=16)

All of the respondents agreed that they could use PBL in the clinical setting. The majority of the respondents (more than 80%) agreed that PBL is effective when it is used for clinical applications (cf. Sections 4.4.12, 4.4.13, and 4.4.14). All these questions relate to the

application of PBL in the clinical setting, from which can be concluded that there is good knowledge retention (cf. Section 2.7). Their explanation for this is listed below in Table 4.8

Table 4.8: Was this session effective in helping you to integrate theory into practice? Please Explain (n=15)

No1	We started with simulation and then theory (PBL). Knowing theory is important to manage practically.
No2	Was helped a lot because we done theoretical and simulation time
No4	Yes, because what I have learned in the class was something that I have put in practical & it help me a lot to understand the concept
No5	Very much we still have to work on our nerves to calm down and do what we're taught.
No6	Because you now see a huge difference
No7	In patients emulating from one scenario to the other needs good pace and understanding
No8	It was like Cause first year it was a sim of Asthma
No9	As I have explain before
No10	Is little difficult to apply to what you read to a real patient.
No11	Yes it does but I like practice than theory
No12	With you perform Sim all what you
No13	By simplified my theory into practice
No14	It gave me a broader picture of what to expect on a real patient.
No15	Because I have to act as quickly as possible using critical thinking based on what best for the patient of that time and do no harm to anyone
No16	Looking at a disease from all angles with one goal at the end of the day - helping the patient. Help and prepare you for when you come across the patient you looked at the disease from all angles and you know more or less what to expect with any approach you will take.

4.4.16 Did working in groups mean that you learned from one another?





Group work plays a big role in PBL. The majority of time spent in class is around group work and how students interact with one another. This means that there is much role play. As such, all the respondents felt that group work offered them the opportunity to learn from one another. This is what PBL is all about, so this result came as no surprise that all the

respondents felt that PBL favour group work. Their explanations are listed below in Table 4.9

Table 4.9: Did working in groups mean that you learned from one another? Please Explain (n=15)

No1	We understand things differently and interpret things differently, so group work offers those closed gates.
No2	We learn from each other group work for us very well.
No4	Because in a group discussion it is where you understand one another rather than listening to a facilitator
No5	That's where I evaluate myself where to improve, whom to ask for help
No6	Because we share some points
No7	Didn't know you had to check bicarbonate levels in respiratory acidosis
No8	May you understand something in when you It gives you time to rectifies where you strayed
No9	To share ideas
No10	Different ideas to treat the patient and you can never know everything.
No11	Yes working in groups we learn from each other
No12	Cause with simulation the mistakes can be corrected. You learn from
No13	As group we come in different views
No14	Hearing different answers gave me a broader picture and something were simplified in the process
No15	Sometimes you can say you are right but you realise that when we work as team you can understand.
No16	Different approaches from different individual helps in determining the best and less complicated approach.

In attempting to understand how students perceive PBL vs SBE the researcher asked students to explain if the role of the educator is different in SBE when compared to PBL. The feedback here was that the respondents felt that the lecturer was more interactive in PBL than in the SBE. Learning in PBL is not separated from practice as the context of the learning should be authentic and should relate to clinical practice. This activates prior knowledge of the given scenario and identifies gaps needed to understand/solve the clinical problems, enhancing their clinical reasoning strategies (cf. Section 2.9). Their explanations is tabulated below in Table 4.10.

Table 4.10: How was the lecturer's role different from teaching SBE? (n=16) (Table continues on next page)

No1	Reading and explanation what he presented.
No2	The lecturer were good and he gave good skill with learning to simulation.
No3	Good
No5	Lecturer's teach by the book, but in the field is different (Life patients reacts differently)
No6	Was good and was nice, because you now see where I am lacking
No7	Very professional and passionate about his work

No8	Fell like the lecturer was doing the way we did like correcting everything in It was going to be easy.
No9	Simulation you do things practical and understandable unlike teaching
No10	It was different and were understandable quickly.
No11	On Simulation I had to think more carefully before I treat patient.
No12	He show us different ways of how to approach the problems
No13	The lecturer was making the problems be simple and understandable for us.
No14	There was more interaction amongst students than with SBE
No15	They approach things differently. When they teach simulation they differ and confuse
	us.
No16	Simulation has what I can call routine and first steps to follow and with PBL we look at broader picture and lecturer is there to facilitate and guide.

4.5 QUESTIONS ON SIMULATION BASED EDUCATION



4.5.1 This course has helped me to develop my problem-solving skills?

Figure 4.22: This course has helped me to develop my problem-solving skills? (n=16)

Ten of the respondents (62.5%) agreed while another four (25%) respondents strongly agreed that SBE helped them to develop problem solving skills; only one (6.3%) was undecided and one disagreed.





Figure 4.23: This course has helped me develop my ability to work as a team member? (n=16)

Team work is vital in paramedic education, so it was to be expected that the majority of the respondents (15) agreed (75% agreed and 18.8% strongly agreed) that SBE developed team work with only one respondent (6.3%) who strongly disagreed.



4.5.3 SBE is a valuable learning experience?

Figure 4.24: SBE is a valuable learning experience? (n=16)

In terms of getting to understand if the participants think that SBE is valuable for clinical scenarios, the question above was asked to get more clarity. This was clearly the case as 11 of the respondents (68.8%) thought that SBE is valuable, while three respondents (18.8%) were undecided and two (12.5%) disagreed.



4.5.4 SBE is a relevant educational strategy for my current training?

Figure 4.25: SBE is a relevant educational strategy for my current training? (n=16)

The relevance of an education method is very important (cf. Section 2.1). This will inform us if the student is in favour of the method and if learning is taking place similarly the educator has to ensure that the environment is conducive to learning based on this. Ten of the respondents (62.5%) believed that SBE is relevant with another one respondent (6.3%) who strongly agreed. Four (25%) were undecided, and one strongly disagreed.



4.5.5 SBE offers similar advantages to PBL?

Figure 4.26: SBE offers similar advantages to PBL? (n=16)

The researcher also wanted to know if SBE could have similar advantages to that of PBL, since the group had the opportunity to experience both methods on the day of the study. A total of nine respondents agreed (37.5% agree and 18.8% strongly agree) that SBE offers similar advantages to that of PBL, with a total of 31.3% who were undecided, one (6.3%) who disagreed, and one who strongly disagreed.

When the same question was asked about PBL, the result was very different. A total of 12 respondents agreed (43.8% agreed and 31.3% strongly agreed) that PBL offers similar advantages to SBE. Only one respondent (6.3%) was undecided. Literature supports this claim that PBL and SBL offer similar advantages (cf. Section 2.3).



4.5.6 SBE may contribute to increased patient safety?

Figure 4.27: SBE may contribute to increased patient safety? (n=16)

Safety in patient care is always high on the agenda in health care. So it was not surprising that 12 of the respondents (43.8% agreed and 31.3% strongly agreed) thought that SBE offers a safety net in clinical education. One respondent (6.3%) was undecided, and one

disagreed, with another one respondent who strongly disagreed. This result also supports the literature that SBE has the ability to improve and boost medical professionals' performance by enhancing patient care and safety (cf. Section 2.3, 2.4).



4.5.7 This session was effective in helping me to integrate theory into practice?

Figure 4.28: This session was effective in helping me to integrate theory into practice? (n=16)

The majority of the students thought that SBE was effective when they put into practice what they had learnt into clinical practice, with 50% of respondents who agreed and 37.5% who strongly agreed to this statement. One respondent (6.3%) was undecided, and one strongly disagreed. The age of the participant that did not agree was 25 years old. One would have to look at andragogy of adult learning and assume that this is the reason for his/her answer. In other words, we know that Malcolm Knowles coined the term "andragogy "and defined it as "the art and science of helping adults learn". It is based on five assumptions:

- Adults are independent and self-directing;
- They have accumulated a great deal of experience, which is a rich resource for learning;
- They value learning that integrates with the demands of their everyday life;
- They are more interested in immediate, problem centred approaches than in subject centred ones; and
- They are more motivated to learn by internal drives than by external ones (Cantillon, Hutchinson & Wood 2003:1).

More research would be helpful that determine the age of paramedic students'. A recent study by Lambert (2011), entitled, "A framework for articulation between the emergency

care technician certificate and the emergency medical care professional degree". This study looked at how the emergency service can accommodate current employees that are in service to upskill them by articulation. Here one need to look at the age groups and adult learning principles of Malcolm Knowles.





Figure 4.29: Simulation training is a very stressful experience, but relevant for clinical practice? (n=16)

A total of 13 respondents (62.5% agreed and 18.8% strongly agreed) thought that SBE is stressful, as opposed to 12 respondents from the PBL questions section (cf. Section 4.4.8) who thought PBL is stressful. Very similar results were seen in these questions. But the respondents do think that both PBL and SBE are necessary for clinical practice. One respondent (6.3%) was undecided, one disagreed, and one respondent strongly disagreed.



4.5.9 Simulation could reflect real patient care?

Figure 4.30: Simulation could reflect real patient care? (n=16)

When comparing the same question on PBL (cf. Section 4.4.9) the results are very similar, with a total of 13 respondents (56.3% agreed, and 25% strongly agreed) indicating that

SBE could reflect real patient care. Two respondents (12%) disagree and one respondent (6.3%) strongly disagreed.



4.5.10 I have understood the technical material of the course better than if it had been presented in the form of PBL?

Figure 4.31: I have understood the technical material of the course better than if it had been presented in the form of PBL? (n=16)

This question gave surprising results. One would think that because SBE has been the main method of paramedic education in that students felt more comfortable with it as to PBL. But the results showed that the same question that relate to PBL (cf. Section 4.4.10) had different results. Students now think that PBL is a better approach to learning than SBE. Thirteen respondents (75% agreed and 6.3% strongly agreed) thought that PBL offers a better learning experience than SBE, with only one respondent (6.3%) was were undecided, one disagreed and one respondent strongly disagreed.



4.5.11 I think I have learned as much technical material as compared to PBL?

Figure 4.32: I think I have learned as much technical material as compared to PBL? (n=14)

The majority of the respondents (64.3% agree and 7.1%) thought that they had learned as much as to a PBL approach, with 14.3% respondents undecided, one (7.1%) respondent

who disagreed and another one who strongly disagreed. Only 14 students completed this question.

4.5.12 This session helped me to develop confidence to use what I have learned in class in the clinical setting?



Figure 4.33: This session helped me to develop confidence to use what I have learned in class in the clinical setting? (n=16)

A total of 15 respondents (93.8%) said that SBE could be used for the clinical setting with only one respondent (6.3%) that said 'no'.

An explanation was asked of the students for their answer. Table 4.11 provide their answers.

Table 4.11: This session helped me to develop confidence to use what I have learned i	n
class in the clinical setting? Please Explain (n=12)	

No2	I learn a lot about simulation for Asthma that lecturer gives us.
No4	We link the theory & practical together & then it won't be difficult for you to fail
No6	Because what I've learned in class is not well prepared that what I've learned in this session
No7	Learned more real patients are like, patient of fire, so own discretion should be used.
No8	Simulation usual give me confidence cause I'm always afraid
No9	Practice what you preach
No10	Have the right way to treat the patient even if you don't have any Of patient.
No11	Yes because when I do practical I already understand the theory.
No12	I've learn for Something let me solve
No13	I now have more confidence than before
No14	SBE doesn't give me a change to go and research on what I am to be assessed.
No15	In theory I can develop the confidence

4.5.13 SBE made me relate to feelings that are similar to what I have encountered in clinical practice?



Figure 4.34: SBE made me relate to feelings that are similar to what I have encountered in clinical practice? (n=16)

The researcher wanted to know if students could relate SBE to real patient care, and 75% of the respondents said 'yes', with only 25% of the respondents who answered 'no'.

An explanation was asked of the students; these are tabulated in Table 4.12 below. Only 10 respondents provided an explanation to this question.

Table 4.12: SBE made me relate to feelings that are similar to what I have encountered in clinical practice? Please Explain (n=10)

No2	I learn that one simulation have different Management when you manage the patient
No6	Because I based execution things are not the way I was expecting
No7	Working on high index suspicion in this regard means not all patients are relieved by drugs
No8	because when doing Sim you are always nervous
No9	It is true
No10	N/A
No11	Simulation are more skills than the PBL.
No13	As to deal with patient
No14	Patient present differently and therefore PBE allows you to have a broad picture of disease process.
No15	To be assessed on

4.5.14 SBE is relevant for practicing and teaching guidelines and algorithms for patient care



Figure 4.35: SBE is relevant for practicing and teaching guidelines and algorithms for patient care (n=16)

A total of 14 respondents (87.5%) said that SBE is relevant for algorithms with only two (12.5%) respondents who said 'no'. When the same question was asked in the PBL section (cf. Section 4.4.14), the entire group (100%) said that PBL could be used for an algorithm approach to patient care. This was also very surprising as PBL is new to the students.

Below (Table 4.13) is an explanation of the student's comments. Only 12 respondents completed this part.

•	
No2	Yes we learn more and get practice and training how to manage and how is the cause and what is the diagnosis
No4	They are relevant only on teaching but not on the simulation final
No6	Because to do things in practice you learn more than to see someone standing in front of you without understanding what he is saying
No7	You see everything pathophysiology & symptoms and treatment add them & giving treatment. Knowing what you want to give.
No8	Pt will be more than safe cause we gone be used on practising
No9	So as it won't be a problem who you need to treat the patient
No10	Treatment of anaphylaxis easy understandable
No11	This one I think is good because I can hear the sound in the patient chest.
No12	You gain exposure on it and improve you knowledge
No13	Asthma simulation
No14	It's more stressful than to work in teams
No15	But was not to be assessed , it's scaring

Table 4.13:	SBE is relevant for	r practicing	and teaching	guidelines and	l algorithms	for
patient care.	. Please Explain (n	=12)				



4.5.15 Did working in groups mean that you learned from one another?

Figure 4.36: Did working in groups mean that you learned from one another? (n=16)

All the respondents agreed that SBE foster a good working environment for team work. The same question (cf. Section 4.4.16) had the same results when asked about PBL and team work.

Table 4.14 below provides their explanations thereof. Only 12 respondents provided an answer for this section.

Table 4.14: Did working in groups mean that you learned from one another? Please Explain (n=12)

No2	It help us to work as a group because if you don't know we learn from the group
No4	Because every one of the group will come with different view & at the end of the session we will agree with one thing.
No6	Because we share what we think it's right and what we reach as a group
No7	Different approaches 0-2 groups about same topic at lots of info was gathered.
No8	When I'm working with groups I understand better
No9	To learn from one another
No10	It was very helpful and understand much better rather than doing alone.
No11	Working in a group we share our different mind and different opinion.
No12	The more we discuss the more you understand
No13	As everyone comes with different views we learn from one another.
No14	Different opinions give a broader picture
No15	I am one of the students learn from one another. Sometimes I thought I am

Table 4.15: How was the lecturer's role different from teaching PBL? (n=11) (Table continues on next page)

No2	The lecturer was very excellent because he represents, we do simulation and he
	represent by the group. It works for us very well
No6	was fine because it was more clear to everyone what he was teaching and even
	explaining to me
No7	Professional
No8	Nothing

No9	No difference
No10	Easy understandable and explanation was very easy.
No11	Are the lecture advise us of researching things to the letter.
No12	Because we perform and explain.
No13	He was so marvellous and sweet to approach
No14	Less interaction
No15	They differ to approach because they work differently and we get confused

With the question above, the researcher wanted to find out if there was a difference in the way the two educational methods were being conducted. The comments can be seen above in the Table 4.15.



4.5.16 Which method of Education do you prefer?

Figure 4.37: Which method of Education do you prefer? (n=16)

Finally the question was posed to the respondents on which method of education was preferred. It was clear that majority of the group felt that SBE was the preferred method of education in EMS, with a total of 11 respondents (68.8%) choosing SBE and only 5 (31.3%) respondents choosing PBL.

Their explanation is provided in Table 4.16 below. Only 14 respondents answered this section.

No2	Problem based Emergency Medical are training because of the facilitator we won't not
	facilitator.
No4	It will help use a lot because what we have gain now is a lot of experience on the field
	of EMS & it will help the older guys as well
No5	We learn by doing and it's not easy to forget it that way
No6	Because it's a practical one, and it's clear to me even to everyone

Table 4.16: Which method of Education do you prefer? Please Explain (n=14) (Table continues on next page)

No7	It was with more information there was no question left unattended.
No8	It gives you confidence when going over there you will not gone get confused of drugs
No9	This method enlighten me about the patient and it expose me to real environment
No10	Not easily forgettable if practicing.
No11	Cause I prefer doing practical to theory.
No12	When you perform things is the easy way to learn.
No13	Is a theory integrate into practice
No14	Its more comfortable for me
No15	Not to be assessed on
No16	Simulate you to learn and have/ get understanding more than SBE

4.5.17 The 95% Confidence Interval



Figure 4.38: The 95% Confidence Interval

4.6 DISCUSSION OF THE FINDINGS OF THE QUESTIONNAIRE SURVEY

In this chapter, the results of the questionnaire survey were presented, discussed, interpreted and analysed. The purpose of the questionnaire was to determine ECT student's experiences with SBE and PBL.

The questionnaire survey was handed out to all participants on the day of the study. The questionnaire took approximately 45 minutes to complete. A total of 16 students were involved in the study.

There were four sections to the questionnaire survey:

- Demographic information;
- Background information questions;
- Questions on simulation based education; and
- Questions on problem based learning.

In the demographic information section, information regarding the participants ages and gender were recorded. The respondents ranged from 25 to 41 years of age. The largest number of the respondents were in the age group 31 to 40 years of age, followed by the age group 20 to 30 years of age; there was only one participant that was 41 years of age. There was a total of nine males and seven females.

In the background information section, the researcher wanted to know if the respondents had previous experience of SBE and PBL. Only ten of the sixteen respondents had previous experience of PBL, while 12 of the respondents said they have had previous experience with SBE.

In the section on PBL, the students were asked multiple different questions. These questions attempted to elicit a response from the students about how PBL can be used in clinical practice. Information about team work, problem-solving skills, patient safety and how relevant PBL is in EMS was also gathered. The answers varied greatly, with some students saying that PBL has better outcomes when using an algorithm approach in EMS for patient care. Students also enjoyed the team work aspect of PBL and agreed that PBL is a valuable learning experience. Fifty percent of the students were happy that PBL contributed to increased patent safety. This is very important as health care is all about treating the patient is a safe manner. Where students had to choose 'yes' or 'no' answers, motivation or explanation was required.

In the section on SBE, students had the same questions as in the PBL section - only this time it was on SBE. This ensured that the questions were not biased to one particular method of education. As such, all questions in the PBL and SBE were asked twice to get different responses for PBL and SBE based on the same question. The answers here were mixed as well, with some students who preferred SBE and some who preferred PBL. What was clear, is that students do feel (objective b, cf. 1.4.3) that both educational methods are very stressful, but relevant for clinical practice. A total of 9 respondents agreed that SBE offers similar advantages to that of PBL. It was clear though that students preferred PBL over SBE when it comes to group work and discussions. Students enjoyed the interactions and felt that it helped them to understand the contexts better, which helps putting theory into practice.

The end results were clear (objective three), namely that the majority of the students (68.8%) do prefer SBE over PBL as the mode of education. The reasons vary here from students saying that they learn better by doing things practically, and that SBE exposes the students to a similar environment to clinical practice.

4.7 CONCLUSION

The main findings of the research indicated that SBE is preferred over PBL. More research is needed that could possibly look at trends and then assess if interaction with PBL does really mean students favour it more as claimed by research (cf. Section 2.1). Both PBL and SBE definitely offer advantages and disadvantages, but it is how the educator presents these educational methods that determine the outcomes of student learning. In answering objective two of the study, the themes that emerged from the results indicated that team work scored high for both PBL and SBE. Also, the students regarded patient safety as a main concern for both educational methodologies. Surprisingly, all participants agreed that PBL could be used for patient care using an algorithm approach, whereas only 14 participants agreed that SBE could use this approach - which is surprising as the participants never had a full PBL experience or session prior this research.

In Chapter 4, the questionnaire survey that was used to collect the data was discussed. This chapter presented and discussed the questionnaire together with the associated results and findings that were used by the researcher to construct and summarised the findings of the results. The demographic information and the results of the questionnaire were presented in graph and tabled form and was analysed, interpreted, and discussed accordingly, followed by a summary of the results of the questionnaire.

The next chapter, Chapter 5, **Conclusions and recommendations**, will state the conclusions of the mini-dissertation and make recommendations for future study.

CHAPTER 5

CONCLUSIONS, LIMITATIONS AND RECOMMEDCATIONS OF THE STUDY

5.1 INTRODUCTION

In Chapter 4, the questionnaire survey that was used to collect the data was discussed. The demographic information and the results of the questionnaire were presented in graph and tables and analysed, interpreted, and discussed accordingly, followed by a summary of the results of the questionnaire.

In this chapter, the conclusions of the mini-dissertation, as well as recommendations and limitations off the study are presented. A brief overview of the study is provided, followed by a review of the research questions and conclusions drawn from the study. This will be followed by a brief discussion of the limitations of study, the contribution to knowledge and the significance of the study. Lastly, the recommendations for future study and concluding remarks are made.

5.2 OVERVIEW OF THE STUDY

The research was carried out and completed based on two research questions. The findings of the questionnaire survey was to attain the aim of the study which was to perform an evaluation of ECT students' experiences with SBE and PBL in paramedic education (cf. Chapter 4). In Chapter 1, an orientation to the study was given, and a brief background to the research problem and the research questions (cf. 1.3) was stated. The research questions guided the study and shaped the final outcome. The aims, objectives and methods employed to achieve them were also discussed briefly. The demarcation of the field and the scope of the study, its value and significance, and the implementation of the findings were also explained. In Chapter 2, the theoretical perspectives of the study were provided. Information from international EMC curricula were used as there was limited information on EMC curricula in South Africa on which methods of education is currently being used in EMC education. In Chapter 3, the description of the design of the study and the methods implemented to collect the data for the empirical part of the study were explained. In Chapter 4, the results of the questionnaire survey were presented and analysed and the interpretation of the findings were explained.

This Chapter concludes this mini-dissertation. In Chapter 1 (cf. 1.3) an outline of the various research questions was presented. The research questions guided and shaped the final outcome. In section 5.2.1, the research questions are reviewed together with the three objectives and the main findings of each research question.

5.2.1 Research questions and objectives

The research questions were - What are ECT paramedic students' experiences with PBL and SBE? and Which method of education (SBE or PBL) is preferred by ECT paramedic students?

The following three objectives were pursued to answer the research questions.

a. To determine the context and concepts related to the education of paramedics in as far as PBL and SBE are concerned. This objective was addressed by means of a literature study.

This objective was pursued and achieved by carrying out a literature study of the available articles on SBE and PBL locally and internationally. The current outcomes and essential content derived from the literature study were presented and discussed in Chapter 2.

While extensive research has explored clinical teaching and learning in disciplines such as medicine, nursing, physiotherapy and dentistry, very little literature exists on PBL and SBE within the context of paramedic education. The expansion of paramedic education from vocational to higher education methods in South Africa creates a basis for the study that seeks to understanding of how paramedics feel about the method of education in this important emerging area of health care education.

Universities and institutions offering paramedic programmes across South Africa have recognised the vital role the development of educational programmes plays in clinical placements at hospitals, which is an asset and forms an essential component of undergraduate programmes. These placements could provide opportunities that apply a number of competencies, such as communication skills, working in an interdisciplinary team environment, professional etiquette, and training of psychometric skills. But these clinical placements are not always guaranteed as medical students, nursing and allied health students also compete for the same spot. As such, the investment in developing a robust

SBE or a PBL curriculum that could support or provide and immersive clinical environment is of utmost importance.

There is a clear gap in EMC education with regards to curriculum guidelines and which method of education is being used (cf. Section 2.10.2) The literature also supported this as limited articles could be found on EMC curriculums in South Africa. However, in medical education locally and internationally, PBL is widely used as the mode of learning (cf. 2.8).

b. To determine how ECT student paramedics experience PBL and SBE.
This objective addresses research question 'i' (cf. 1.4.3). A questionnaire was used to address this objective.

This objective was achieved by means of a questionnaire (Appendix F) which was handed to all participants to complete.

All participants were given an explanation and experience a practical session of both SBE and PBL where after they were asked to complete the questionnaire. The questionnaire revealed that students prefer SBE over PBL (cf. Chapter 4, 4.5.16) as this is the method they are used to. The complete discussion and details of the results of the questionnaire were presented in Chapter 4.

The literature also supports that 'If a student's learning style is mismatched then it may negatively affect the student's performance' (cf. Section 2.1). As such, the teacher need to assess his/her teaching style and environment to adapt to that of the student. Research has also proven that that learners alter their learning styles soon after being exposed to PBL (cf. Section 2.1). This study did not prove this, but it would have been interesting to be able to monitor the students' progress over a two year period and see if this results supports the research findings in section 2.1 of the literature review. In this study at the start of the questionnaire survey, only six participants have had previous experience of PBL, but a total of 12 participants said that PBL hold similar advantages to that of SBE (cf. Section 4.4.5).

PBL students learn through the experience of solving problems, whereby they use both content and thinking strategies (cf. Section 2.7). Students work in groups and identify what they need to learn in order to solve a problem. They then apply their new knowledge to the problem and reflect on what they learned and the effectiveness of the strategies employed. SBE, on the other, hand allows the health professional to acquire knowledge

and skills in a safe environment where learning can take place without harm to the patient (cf. Section 2.6). Here the student learn about procedure-based skills, communication and working in a team and how to become and independent practitioner.

 c. To identify which method of education is preferred by ECT student paramedics. This objective addresses research question 'ii' (cf. 1.4.3). A questionnaire was used to address this objective.

From the onset of the study, it was clear there was a scarcity of literature that supports which method of education is best suited in EMC while there was ample evidence-based research on the education and training of other health professions such as medicine, physiotherapy, dentistry and nursing on curriculum development. This was also demonstrated in the 'SUPER' study whereby the authors explain the following concerns:

- A lack of evidence in SBE within EMC, given the fact that it's been used for clinical assessment;
- Because of this lack in literature, researchers make use of other health care fields to look for findings and relate this to EMC; and
- EMC has a unique set of challenges and more research is needed in this fields to develop a body of knowledge specific to EMC in SBE (McKenna *et al.* 2015:7).

It is essential to create a professional body of literature for the development of the profession's academics. As such, the need to create a paramedic pedagogy is vital to orientate teaching materials that could address differences in learning styles and learning difficulties in paramedic education.

This paucity comes at a time where EMC has seen a rapid change in the demand for highly skilled paramedics and training to provide care for complex community expectations, and social and economic pressures on health services in South Africa. In light of this, this research will shed some insight on how universities could possibly rethink the aims and expectations of paramedic education in light of the new models of care. Paramedic education needs to be relevant to clinical practice, and should focus on professional and academic development.

Although it was clear that students prefer SBE over PBL, more evidence is needed to explore the use of SBE and PBL in emergency care training (cf. Section 4.5.16).

5.3 CONCLUSION

The study is based on the recognition and acknowledgement that a gap existed in the field of ECT education as pertaining to PBL and SBE (cf. Section 2.10.2). Although research in paramedic clinical practice is widely available in South Africa, it was lacking in paramedic education programmes and how paramedics learn. To bridge this gap in knowledge, the researcher set out to evaluate how ECT students experience SBE and PBL and which method of education they prefer.

The researcher used a literature study and a questionnaire survey to generate and analyse empirical data. The researcher has chosen this method as it is the most appropriate method to maximise the validity of the research findings (cf. Section 3.2.3). The results were interpreted and presented in Chapter 4.

Firstly, the researcher could not find any reference to paramedic curriculums in use in South Africa. A search internationally found that countries like Australia and the United States of America is exploring with PBL and CBL to improve paramedics' ability to recall and retain information. This type of evidence and research is lacking in the South African EMC. The literature study revealed that how students feel about an educational strategy is important when there is consideration about changing the educational mode of delivery (cf. Section 2.1). As such, careful planning and research has to be done to evaluate the outcomes of the programme to best suit the needs of the paramedic and how it could influence patient care. The evidence (cf. Section 2.10) gathered from the literature study was conflicting. Both methods of education have advantages and disadvantages. It was clear, however, that SBE has a much better advantage than PBL as SBE is mainly used as part of the paramedic curriculum to test competency (cf. Section 2.3), whereas PBL is not being used in paramedic education due to cost of such a curriculum, which also requires that the teacher should be familiar with the method of education.

For the second set of data collected and generated, a questionnaire survey was used. This was used to determine how students feel and explore their experience with SBE and PBL. Participants were asked the same questions regarding SBE and PBL so as to avoid any bias. Participants were requested to rate a particular mode of education and also requested to explain some of their answers so that the researcher could understand their reasoning behind choosing a particular mode of education. The results of the questionnaire revealed that 11 participants said that they prefer SBL over PBL (cf. Section 4.5.16), while only five
participants chose the PBL method. This raised the question that if the students never experienced PBL as part of the paramedic curriculum, would the results have been different if PBL were part of the curriculum to teach subjects like psychology, which does not have a practical component, thus needing more critical thinking and interactive role play to facilitate the learning process?

5.4 LIMITATIONS OF THE STUDY

The researcher identified the following limitations of the study:

- a. The researcher is currently working abroad outside the borders of South Africa, as such limited contact time was observed with the study leader in Bloemfontein. Contact sessions were limited to three session per year - which led to communication breakdowns. However, the researcher made constant contact with the study leader via telephone and frequent email correspondence to keep up to date with his research developments. Communication with the study leader was essential as he is involved in EMC developments and curriculum design with regards to adult education and training.
- b. Results and conclusions from the literature study was based on international studies and from education in medicine. No articles could be found that explore SBE and PBL in the South African EMC system. The content available was from the HPCSA, which refers to the regulation of paramedic education but make no reference as to which method of education is used in EMC. The researcher also looked at the Council for Higher Education (CHE) in South Africa to find information or guidelines as the mode of delivery in paramedic education. Again, the only information found here was that paramedic education has moved from vocational to higher education and training. This also formed the rationale for the study as there are limited articles in South Africa that explore paramedic education.
- c. Initially there was a sample size of 44 participants. These we all from the Free State College of Emergency Care, but due to the researchers travel arrangements and availability on the day of the research, only 16 participants took part in the study. The other factor that was beyond the control of the researcher was that some students had to observe practical sessions off campus at either a clinical or on road shifts. Since dealing with students that are actively studying proved to be a difficult task in getting all 44 participants in one place at one time to partake in the study.

could have been done in liaison with the principal of the college to get more students on the day of the research. However, the participants that took part in the study gave valuable information to a study that was not yet done ECT students' in South Africa. Thus, the small sample size prevented the research from making power calculations. The Central University of Technology could not be used at the time of the study as there was some issues of accreditation of the programme.

d. Because the researcher do not reside in Bloemfontein, he chose a population that would be convenient to save on time and money. A bigger sample size could have been possible if the students from the Central University Technology was also included in the study. But due to time constrains and budget, only the Free State College of Emergency Care was chosen as a sample. More data could have been collected if firstyear students and second-year students were included in the study. A correlation could have then been made between the two groups to see which method of education is preferred and at which level of academic year. Another approach would be to identify which age groups prefer SBL and which prefer PBL.

5.5 CONTRIBUTION TO KNOWLEGDE

The researcher is of the view that the study assisted albeit limited in clarifying which method of education is preferred by paramedic students while undergoing training. The study also identified that there is a lack of articles and information with regards to paramedic education and training in South Africa. This is to a certain extent acceptable as paramedics who hold a Bachelor's degree in EMC could only first register for a Master's programme in 2005, thus making the output of academic research in EMC very limited. Both SBE and PBL is widely used in medical and nursing education, but a lack of evidence on how these educational methodologies could be useful in paramedic education has not been fully explored in South Africa. This research has thus been successful in addressing the research questions of the study.

The research identified that although there is limitless articles available on paramedic prehospital clinical management of patient care, but lacking evidence in the basic science of methods of education in EMC. Pedagogy of paramedics and in health care should be at the fore front of patient care, if patient safety and health outcomes are what is expected from the health care provider. Research indicate a need to develop a body of knowledge specific to the use of SBE and PBL in EMC education. The research findings of this study will be reported to the HPCSA and the CHE to evaluate the modes of educational delivery at institutions offering paramedic education. The CHE as a quality assurance body could make recommendations for further studies in the field of EMC to assure the public that paramedics are receiving the proper training as needed to treat all emergencies competently.

The research findings and recommendations will also be submitted to appropriate South African journals and international academic journals, with a view to publication, since the information on SBE and PBL may be of value to other academic institutions. If possible, the research findings will also be presented at conferences.

This study may stimulate future interest in SBE and PBL at institutions in South Africa offering paramedic education and training.

5.6 RECOMMENDATIONS

Through this study, the need to evaluate SBE and PBL at learning institutions has been described. The research and literature study revealed that in medical education, not one method of education is needed, but maybe a combination thereof. It may be SBE and PBL or SBE and CBL. All of these educational methods could empower the student to retain knowledge to treat the patient safely. The ultimate goal of medical education is for the student to practice safely and competently as a self-reflective practitioner. Furthermore, the research indicated that there is no fixed curriculum model in place for EMC. Institutions make use of lecture-based sessions with a practical component to assess competency. These practical components are either in hospitals or via simulation experiences.

The way forward is to present the findings of this study and other international studies to universities that offer paramedic education. The focus will be new developments in EMC education and international trends in EMC education. Regulation bodies such as the CHE and the HPCSA need to be approached and due processes need to be followed to approve a more proactive approach in the development of paramedic education.

EMC training institutions should collaborate with medical training colleges and other health sector training colleges to align their outcomes to the needs of the community. EMC institutions should not work in isolation and should follow trends in medical education that

aim to deliver the Millennium Development Goals. By doing this, the CHE should see the need to bring about change in EMC education programmes.

This research was by no means a complete study of all the aspects of SBE and PBL. Training of competent emergency care practitioners is vital to treat a patient safely and with due regard to knowledge of the disease process. There is an urgent need to evaluate the different education institutions that offer paramedic education, to evaluate their methods of training and how they could best suit the needs of the student and the community. Only once this has been done could developments and standardisation of training programmes be carried out.

Further literature revealed that students in medical education adapted their learning style when they were orientated more to a PBL than SBE or CBL (cf. Section 4.4.3), (Williams 2009:434). This clearly shows the need for more research into PBL in paramedic education. It is the view of the researcher that the student's learning styles were not completely embraced by the short PBL and SBE introduction in this study.

The findings of this study cannot be taken to be a full representation of ECT teaching, rather they offer the experiences of the students who participated in the research. But it does provide new levels of understanding of paramedic education, which is important in this specific area of health education.

5.7 CONCLUDING REMARKS

This study set out to explore the experience of ECT student paramedics with regards to SBE and PBL. These were addressed by setting several main objectives to answer the research questions. The findings of this study also suggest that further research should be promoted in paramedic education, including similar studies with other universities and health care providers. Paramedic education programmes in South Africa remain diverse, which is in need of both teaching and professional perspectives to continually develop and improve how our students learn.

The lecturer needs to take into account the different learning styles of learners. Educators who utilize this model can become more efficient and effective lecturers by creating lessons and classroom activities which adapt to these different learning styles.

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APPENDIX A

Letter of request

(with information, consent form and list of questions) to potential participants to participate in the evaluation of Simulation Based Education and Problem Based Learning in Emergency Medical Care Letter of request (with information, consent form and list of questions) to potential participants to participate in the evaluation of Simulation Based Education and Problem Based Learning in Emergency Medical Care

Dear (Name of potential participant)

Letter of invitation with information (and consent form and list of questions as separate documents) to complete a questionnaire

I am extending a cordial invitation to you to participate in the evaluation of Simulation based education and problem based learning within the Emergency medical care, which forms part of research to be completed in partial fulfilment of a comprehensive minidissertation for the M.HPE degree (Magister in Health Professions Education)

The title of the research project is: "STUDENT'S EXPERIENCES OF SIMULATION BASED EDUCATION VS. PROBLEM BASED LEARNING IN EMERGENCY MEDICAL CARE TRAINING".

You have been identified, according to the criteria stipulated in the research protocol, to be a current student in the second year of training on the ECT programme who is in a position to provide valuable input in this regard.

The potential respondents include all second year students on the ECT programme. I would sincerely appreciate your assistance to participate in this regard.

No personal costs will be incurred by respondents. The participant reserves the right to withdraw from the study at any time during the study. Completion of the questionnaire will take approximately 45 minutes. The information collected will be treated with strict confidentiality and the necessary professional discretion, and there will be no references to participants' names when the research results are reported. The researcher will present each participant with the same set of questions.

I am very interested in how paramedics learn and which method of education is best suited in EMC. For this I need to evaluate which method of education is best suited in terms of paramedic education. A field of study that has not yet been undertaken in the South African Emergency care system. I will evaluate Simulation based education and Problem Based Learning approaches to EMC education.

This research will add value to the current EMC education curriculum in South Africa. Current research in EMC with regards to education is lacking. This is an international phenomenon where education and assessment of paramedic programs has not receive the attention it requires based on its vital component in public health. EMC practitioners transport millions of people each year, but lack valuable and robust research and evidence into education and training programs which explore students' experiences in PBL and SBE.

The overall goal of the study is to investigate and evaluate paramedic education and training and explore students' experiences with PBL and SBE. The study hopes to gain more insight into their training and to develop a validity tool for future studies.

The aim of the study is to evaluate students' experiences with PBL and SBE in EMC training

and education at the Free State College of Emergency care amongst second year ECT students.

The results of the study will be submitted for potential publication in national and international journals.

My study leader is:

Dr J Bezuidenhout (Division of Health Sciences Education Development, Faculty of Health Sciences, UFS)

The data collection process which includes the evaluation of Simulation based education, Problem based learning and the questionnaire are scheduled to take place during the period between March and April 2016.

My sincere thanks to you for taking the time to read this communication and for your anticipated participation.

You are welcome to contact me if you have any specific questions regarding the study.

Yours faithfully, Mugsien Rowland Magister student in Health Professions Education University of the Free State Student number: 2014155572

Cellular phone: +971 566896350 Email address: mugsienr@gmail.com

You may contact the Secretariat of the Ethics Committee of the Faculty of Health Sciences, UFS if you have any questions regarding your right as a research subject. The contact details of the chairperson of the ethics committee are:

Ms M. Marais Block D, Room 115 François Retief Building PO Box 339(G40) Faculty of Health Sciences University of the Free State Bloemfontein 9300 Tel: (051) 40521812 Fax: (051) 4444359 E-mail: MaraisMGE@ufs.ac.za

CONSENT FORM

<u>Project title:</u> "STUDENT'S EXPERIENCES OF SIMULATION BASED EDUCATION VS. PROBLEM BASED LEARNING IN EMERGENCY MEDICAL CARE TRAINING"

I have been informed about the study (in writing) by Mugsien Rowland

I understand the purpose of this research project and what my involvement in the study entails and that the information will be kept confidential in the documentation, audio-taping and reporting of the research findings.

I understand that participation in this interview is voluntary, and that I may withdraw from the study at any time.

I (the undersigned) hereby, consent to participate in the research process, as indicated above, which is scheduled to take place during the period from March – April 2016.

Title: _____

E-mail a	address:
----------	----------

Signature:

Date: _____

APPENDIX B

Letter for approval to the Principle of the School of Emergency Care, Free State College 15 June 2015

Mr. K Rowe-Rowe Principal School of Emergency Care Free State College

Re: Application for permission to perform a research project and collect data from second year ECT students performing Simulation Based Education and Problem Based Learning at the Free State College of Emergency Care.

Dear Mr. Rowe-Rowe,

I have registered for a structured master's degree in Health Professions Education, for which I must conduct a research study related to Health Professions Education. I am very interested in how paramedics learn and which method of education is best suited in EMC. For this I need to evaluate which method of education is best suited in terms of paramedic education. A field of study that has not yet been undertaken in the South African Emergency care system. I will evaluate Simulation based education and Problem Based Learning approaches to EMC education.

This research will add value to the current EMC education curriculum in South Africa. Current research in EMC with regards to education is lacking. This is an international phenomenon where education and assessment of paramedic programs has not receive the attention it requires based on its vital component in public health. EMC practitioners transport millions of people each year, but lack valuable and robust research and evidence into education and training programs which explore students' experiences in PBL and SBE. I write this letter to courteously ask for your permission to continue with this research project and to collect the data that are required for this study.

The title of my research project is:

"STUDENT'S EXPERIENCES OF SIMULATION BASED EDUCATION VS. PROBLEM BASED LEARNING IN EMERGENCY MEDICAL CARE TRAINING"

My supervisor is:

Dr J Bezuidenhout (Division of Health Sciences Education, Faculty of Health Sciences, UFS)

The overall goal of the study is to investigate and evaluate paramedic education and training and explore student's experiences with PBL and SBE. The study hopes to gain more insight into their training and to develop a validity tool for future studies.

The aim of the study is to evaluate student's experiences with PBL and SBE in EMC training and education at the Free State College of Emergency care amongst second year ECT students.

The objectives of the study (with the research methods that will be used to achieve these objectives) are as follows:

1) To determine the context and concepts related to the training of paramedics in as far as PBL and SBE are concerned. This will be done by means of a training exercise whereby paramedic students' can explore both PBL and SBE. They would then have to complete a questionnaire at the end of the session to express their experiences with both methods of education. A comprehensive literature review will also be done that evaluate literature in the EMC field.

2) To determine how student paramedics experience PBL and SBE. This will be achieved by the completion of a questionnaire by the students'.

3) To identify which method of education is best suited for EMC training. This would also be achieved by means of a questionnaire.

The researcher will collect the questionnaires from the Free State College of Emergency Care which contain closed and open ended questions from the participants enrolled in the second year of the ECT programme. This data will be correlated and integrated in order to inform further research in this regard and will be analysed by the Department of ICT services at UFS.

I therefore kindly request your consent to perform the evaluation of Simulation Based Education and Problem Based Learning and to distribute the questionnaire to selected second year students on the ECT programme under the auspices of your institution.

Alternatively, should you have any questions regarding the ethical aspects of the study, you can also contact the chairperson of the UFS Research Ethics Committee, Ms H Strauss, Block D, Room 115, François Retief Building PO Box 339 (G40) Faculty of Health Sciences University of the Free State Bloemfontein 9300 Tel: (051) 40521812.

I attach a copy of the protocol and the questionnaire that will be used.

I would like to sincerely thank you (in advance) for your attention and consideration of this request.

Yours faithfully,

Mugsien Rowland Magister student in Health Professions Education University of the Free State Student number: 2014155572

<u>Telephone number</u>: Cell number: +971 566896350 <u>E-mail address</u>: mugsienr@gmail.com **APPENDIX C**

Letter for approval to the Free State Head of Department of Health

15 June 2015

Dr Motau Free State Department of Health

Re: Application for permission to perform a research project and collect data from second year ECT students performing Simulation Based Education and Problem Based Learning at the Free State College of Emergency Care

Dear Dr Motau,

I have registered for a structured master's degree in Health Professions Education, for which I must conduct a research study related to Health Professions Education. I am very interested in how paramedics learn and which method of education is best suited in EMC. For this I need to evaluate which method of education is best suited in terms of paramedic education. A field of study that has not yet been undertaken in the South African Emergency care system. I will evaluate Simulation based education and Problem Based Learning approaches to EMC education.

This research will add value to the current EMC education curriculum in South Africa. Current research in EMC with regards to education is lacking. This is an international phenomenon where education and assessment of paramedic programs has not receive the attention it requires based on its vital component in public health. EMC practitioners transport millions of people each year, but lack valuable and robust research and evidence into education and training programs which explore students' experiences in PBL and SBE. I write this letter to courteously ask for your permission to continue with this research project and to collect the data that are required for this study.

The title of my research project is:

"STUDENT'S EXPERIENCES OF SIMULATION BASED EDUCATION VS. PROBLEM BASED LEARNING IN EMERGENCY MEDICAL CARE TRAINING"

My supervisor is:

Dr J Bezuidenhout (Division of Health Sciences Education, Faculty of Health Sciences, UFS)

The overall goal of the study is to investigate and evaluate paramedic education and training and explore student's experiences with PBL and SBE. The study hopes to gain more insight into their training and to develop a validity tool for future studies.

The aim of the study is to evaluate student's experiences with PBL and SBE in EMC training and education at the Free State College of Emergency care amongst second year ECT students.

The objectives of the study (with the research methods that will be used to achieve these objectives) are as follows:

1) To determine the context and concepts related to the training of paramedics in as far as PBL and SBE are concerned. This will be done by means of a training exercise whereby paramedic students' can explore both PBL and SBE. They would then have

to complete a questionnaire at the end of the session to express their experiences with both methods of education. A comprehensive literature review will also be done that evaluate literature in the EMC field.

- 2) To determine how student paramedics experience PBL and SBE. This will be achieved by the completion of a questionnaire by the students'.
- 3) To identify which method of education is best suited for EMC training. This would also be achieved by means of a questionnaire.

The researcher will collect the questionnaires from the Free State College of Emergency Care which contain closed and open ended questions from the participants enrolled in the second year of the ECT programme. This data will be correlated and integrated in order to inform further research in this regard and will be analysed by the Department of ICT services at UFS.

I therefore kindly request your consent to perform the evaluation of Simulation Based Education and Problem Based Learning and to distribute the questionnaire to selected second year students on the ECT programme at the Free State College of Emergency Care.

Alternatively, should you have any questions regarding the ethical aspects of the study, you can also contact the chairperson of the UFS Research Ethics Committee, Ms H Strauss, Block D, Room 115, François Retief Building PO Box 339 (G40) Faculty of Health Sciences University of the Free State Bloemfontein 9300 Tel: (051) 40521812.

I attach a copy of the protocol and the questionnaire that will be used.

I would like to sincerely thank you (in advance) for your attention and consideration of this request.

Yours faithfully,

Mugsien Rowland Magister student in Health Professions Education University of the Free State Student number: 2014155572

<u>Telephone number</u>: Cell number: +971 566896350 <u>E-mail address</u>: mugsienr@gmail.com

APPENDIX D

Letter for approval from the ethics committee, School of Medicine, Faculty of Health Sciences, UFS June 2015

Mrs. M. Marais The Chairperson: Ethics Committee Block D, Room 115 François Retief Building School of Medicine Faculty of Health Sciences University of the Free State

Re: Application for ethical approval to conduct research

Dear Mrs. M. Marais

I have registered for a structured master's degree in Health Professions Education, for which I must conduct a research study related to Health Professions Education. I am very interested in how paramedics learn and which method of education is best suited in EMC. For this I need to evaluate which method of education is best suited in terms of paramedic education. A field of study that has not yet been undertaken in the South African Emergency care system. I will evaluate Simulation based education and Problem Based Learning approaches to EMC education.

This research will add value to the current EMC education curriculum in South Africa. Current research in EMC with regards to education is lacking. This is an international phenomenon where education and assessment of paramedic programs has not receive the attention it requires based on its vital component in public health. EMC practitioners transport millions of people each year, but lack valuable and robust research and evidence into education and training programs which explore students' experiences in PBL and SBE. I write this letter to courteously ask for your permission to continue with this research project and to collect the data that are required for this study.

The title of my research project is:

"STUDENT'S EXPERIENCES OF SIMULATION BASED EDUCATION VS. PROBLEM BASED LEARNING IN EMERGENCY MEDICAL CARE TRAINING"

My supervisor is: Dr J Bezuidenhout (Division of Health Sciences Education, Faculty of Health Sciences, UFS)

I hereby apply for ethical evaluation and approval of my research protocol. The statistical analysis will be performed by the ICT Department of the University of the Free State.

The following documents accompany my letter:

Application form for ethical approval to conduct research Protocol summary Curriculum vitae Research protocol (which includes proposed study budget) Data information sheet for potential participants Informed consent form for participants of the study The questionnaire Letter of approval from the Department of Biostatistics, UFS

My sincere thanks for your attention and consideration of this request.

Yours faithfully,

Mugsien Rowland Magister student in Health Professions Education University of the Free State Student number: 2014155572

<u>Telephone number</u>: Cell number: +971 566896350 <u>E-mail address</u>: mugsienr@gmail.com

APPENDIX E

Questionnaire for data collection

Questionnaire for data collection

- Instructions to participants
- Please respond to each question
- Please answer the questions as candidly and comprehensive as possible

I am extending a cordial invitation to you to participate in the evaluation of Simulation based education and problem based learning within the Emergency medical care, which forms part of research to be completed in partial fulfilment of a comprehensive minidissertation for the M.HPE degree (Magister in Health Professions Education)

The title of the research project is:

"STUDENT'S EXPERIENCES OF SIMULATION BASED EDUCATION VS. PROBLEM BASED LEARNING IN EMERGENCY MEDICAL CARE TRAINING"

You have been identified, according to the criteria stipulated in the research protocol, to be a current student in the second year of training on the ECT programme who is in a position to provide valuable input in this regard.

Before signing consent to participate in this questionnaire survey, read the accompanying information letter carefully. Also take cognisance of the following:

No personal costs will be incurred by respondents. The participant reserves the right to withdraw from the study at any time during the study. Completion of the questionnaire will take approximately 30 minutes. The information collected will be treated with strict confidentiality and the necessary professional discretion, and there will be no references to participants' names when the research results are reported. The researcher will present each participant with the same set of questions.

The results of the study will be submitted for potential publication in national and international journals.

My sincere thanks to you for taking the time to read this communication and for your anticipated participation.

Mr M. Rowland

APPENDIX F

THE QUESTIONNAIRE

Appendix F The Questionnaire

The title of the research project is: "Student's experiences of Simulation based Education vs Problem Based Learning in Emergency Medical Care Training"

Please read the information document attached to this questionnaire explaining to you the research study before answering the questionnaire.

You have been asked to participate in a research study. Please note that by completing this questionnaire you are voluntarily agreeing to participate in this research study. Your data will be treated confidentially at all times. You may withdraw from this study at any given time during the completion of the questionnaire. The results of the study may be published.

A. Biographical information

- 1. Age
- 2. Gender



B. Background information questions

1. Are you currently a student studying towards becoming a paramedic?

Yes	No
-----	----

2. Have you encountered Problem based learning prior to this session?



For office use only			
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 6	





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	16-17 18-19 20-21



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30-31
32-33

C. Questions regarding Problem based learning

Please rate how strongly you agree or disagree with each of the following statements by placing a check mark in the appropriate box.

1.1This course has helped me to develop my problem-solving skills?

1.2 This course has helped develop my ability to work as a team member?

1.3 Problem based learning is a valuable learning experience?

1.4 Problem based learning is a relevant educational strategy for my current training/profession?

1.5 Problem based learning offers similar advantages to Simulation based education?

1.6 Problem based learning may contribute to increased patient safety?

1.7 This session was effective in helping me to integrate theory into practice?

1.8 PBL training is a very stressful experience, but relevant for clinical practice? 1.9 PBL could reflect real patient care?

1.10 I have understood the technical material of the course better than if it had been presented in the form of simulation based education?

 $1.11 \ I$ think I have learned as much technical material as compared to simulation based education?

1.12 This session helped you develop confidence to use what you have learned in class in the clinical setting?

	Yes <u>No</u>		
1.13 Please explain			
1.14 PBL made me relate to feelings that encountered in clinical practice?	are similar to what I have		
1.15 Please explain			
1.16 PBL is relevant for practicing and teaching guidelines and algorithms for patient care? (Asthma, Anaphylaxis, MI, etc.)			
	Yes <u>No</u>		
1.17 Please explain			
1.18 Was this session effective in helping you to integrate theory into practice?			
	Yes <u>No</u>		
1.19 Please explain			

.....











67-68
69-70
71-72

1.20 Did working in groups mean that you learned from one another?

Yes No
1.21 Please explain
1.22 How was the lecturer's role different from teaching Simulation based education? Please explain

D. Questions regarding Simulation based education

Please rate how strongly you agree or disagree with each of the following statements

2.1This course has helped me to develop my problem-solving skills?

2.2 This course has helped develop my ability to work as a team member?2.3 Simulation based education is a valuable learning experience?

2.4 Simulation based education is a relevant educational strategy for my current training/profession?

2.5 Simulation based education offers similar advantages to Problem based learning?

2.6 Simulation based education may contribute to increased patient safety?

2.7 This session was effective in helping me to integrate theory into practice? 2.8 Simulation training is a very stressful experience, but relevant for clinical practice?

2.9 Simulation could reflect real patient care?

2.10 I have understood the technical material of the course better than if it had been presented in the form of problem based learning?

2.11 I think I have learned as much technical material as compared to problem based learning?

2.12 This session helped me to develop confidence to use what I have learned in class in the clinical setting?



2.14 Simulation based education made me relate to feelings that are are similar to what I have encountered in clinical practice?

	<u>Yes</u>	<u>No</u>	
2.15 Please explain.	 		
	 		· · · · · · · · · · · · · · · · · · ·









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2.16 Simulation based education is relevant for practicing and teaching guidelines and algorithms for patient care? (Asthma, Anaphylaxis, MI, etc.)

Yes <u>No</u>
2.17 Please explain
2.18 Did working in groups mean that you learned from one another?
Yes <u>No</u>
2.19 Please explain
2.20 How was the lecturer's role different from teaching problem based learning? Please explain
2.21 Which method of education do you prefer?
<u>SBE</u> <u>PBL</u>
2.22 Please explain

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APPROVAL: FRE STATE DEPARTMENT OF HEALTH

APPROVAL: FRE STATE DEPARTMENT OF HEALTH

Mr. M Rowland et or J Bezuldenthout Emergency Medical Care Pergy of Health Science Dear Mr M Rowland Subject: Students Experience of simulation based education vs. problem based learning in emergency medici- training. Permission is hereby granted for the above – mentioned research on the following conditions: Participation in the study must be voluntary. A written consent by each participants must be obtained Serious adverse events to be reported and/or termination of the study. A seria that your data collection exercise neither interferes with the day to day running of the National Hospital nor the performance of duties by the respondents or health care workers. Confidentiality of information will be ensured and no names will be used. Research results and a complete report should be made available to the Free State Department of Health on completion o study (a hard copy plus a soft copy). Progress report must be presented not later than one year after approval of the project to the Ethics Committee of the Uni of Free State and to Free State Department of Health. Any amendments, extension or other modifications to the protocol or investigators must be submitted to the Ethics Committee of the Uni of Free State and to Free State Department of Health. Conditions study in your Ethical Approval letter should be adhered to and a final copy of the Ethics Clearance Certificat be submitted to khusemiziZishealth.gov.za or scheelatsiZishealth.gov.za before you commence with the study No financial liability will be placed on the Free State Department of Health. Please discuss your study with the institution managers/CEOs on commencement for logistical arrangements Department of Health to be fully indemnified from any harm that participants and staff experiences in the study Researchers will be required to erreer to a formal agreement with the Free State department of health research day Future research		
Dear Mr M Rowland Subject: Students Experience of simulation based education vs. problem based learning in emergency media training. Permission is hereby granted for the above – mentioned research on the following conditions: Participation in the study must be voluntary. A written consent by each participants must be obtained Serious adverse events to be reported and/or termination of the study. Ascertain that your data collection exercise neither interferes with the day to day running of the National Hospital nor the performance of duties by the respondents or health care workers. Confidentiality of information will be ensured and no names will be used. Research results and a complete report should be made available to the Free State Department of Health on completion o study (a hard copy plus a soft copy). Progress report must be presented not later than one year after approval of the project to the Ethics Committee of the Uni of Free State and to Free State Department of Health. Conditions stated in your Ethical Approval letter should be adhered to and a final copy of the Ethics Clearance Certificat be submitted to khasemj@lkbealth.gov.za or scheedats@lkbealth.gov.za before you commence with the study No financial liability will be placed on the Free State Department of Health. Please discuss your study with the institution managers/CEOs on commencement for logistical arrangements Department of Health to be fully indemnified from any harm that participants and staff experiences in the study Researchers will be	Mr. M l c/o Dr J Emerge Faculty UFS	Rowland Bezuidenthouut ney Medical Care of Health Science
Subject: Students Experience of simulation based education vs. problem based learning in emergency media training. Pernission is hereby granted for the above – mentioned research on the following conditions: Participation in the study must be voluntary. A written consent by each participants must be obtained Serious adverse events to be reported and/or termination of the study. Ascertain that your data collection exercise neither interferes with the day to day running of the National Hospital nor the performance of duties by the respondents or health care workers. Confidentiality of information will be ensured and no names will be used. Research results and a complete report should be made available to the Free State Department of Health on completion o study (a hard copy plus a soft copy). Progress report must be presented not later than one year after approval of the project to the Ethics Committee of the Uni of Free State and to Free State Department of Health. Any amendments, extension or other modifications to the protocol or investigators must be submitted to the Ethics Committee University of Free State and to Free State Department of Health. Conditions stated in your Ethical Approval letter should be adhered to and a final copy of the Ethics Clearance Certificate be submitted to khasemi@likbealth.gov.za or sebeclats@likbealth.gov.za before you commence with the study No financial liability will be placed on the Free State Department of Health. Please discuss your study with the institution managers/CEOs on commencement for logistical arrangements Department of Health to be fully indemnified from any harm that participants and staff experiences in the study Researchers will be requi	Dear	Mr M Rowland
 Permission is hereby granted for the above – mentioned research on the following conditions: Participation in the study must be voluntary. A written consent by each participants must be obtained Serious adverse events to be reported and/or termination of the study. Ascertain that your data collection exercise neither interferes with the day to day running of the National Hospital nor the performance of duites by the respondents or health care workers. Confidentiality of information will be ensured and no names will be used. Research results and a complete report should be made available to the Free State Department of Health on completion o study (a hard copy) lus a soft copy). Progress report must be presented not later than one year after approval of the project to the Ethics Committee of the Uni of Free State and to Free State Department of Health. Any amendments, extension or other modifications to the protocol or investigators must be submitted to the Ethics Clearance Certificat be submitted to khusemj@ishealth.gov.za or sebeclata?@ishealth.gov.za before you commence with the study No financial liability will be placed on the Free State Department of Health Please discuss your study with the institution managers/CEOs on commencement for logistical arrangements Department of Health to be fully indemnified from any harm that participants and staff experiences in the study You are encouraged to present your study findings/results at the Free State Provincial health research day Future research will only be granted permission if correct procedures are followed see <u>http://nhrd.hst.org.za</u> Trustou find the above inorder. Kind Resert. 	Subjec	t: Students Experience of simulation based education vs. problem based learning in emergency medica
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APPROVAL: FREE STATE DEPARTMENT OF HEALTH

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	Department of Health FREE STATE PROVIN
Mr. M R c/o Dr J Emerger Faculty o UFS	owland Bezuidenthouut cy Medical Care of Health Science
Dear M Subjec	Ar M Rowland :: Students Experience of simulation based education vs. problem based learning in emergency medical
trainin	g- Permission is hereby granted for the above – mentioned research on the following conditions:
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	A written consent by each participants must be obtained
	Controls advance events to be an entrol and/or termination of the stude
•	serious adverse events to be reported and/or termination of the study.
•	Ascertain that your data collection exercise neither interferes with the day to day running of the National Hospital nor the performance of duties by the respondents or health care workers.
•	Confidentiality of information will be ensured and no names will be used.
•	Research results and a complete report should be made available to the Free State Department of Health on completion of the study (a hard copy plus a soft copy).
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APPENDIX I

APPROVAL: FREE STATE COLLEGE OF EMERGENCY CARE
APPROVAL: FREE STATE COLLEGE OF EMERGENCY CARE



To: Mr. M. Rowland C/O Dr. J. Bezuidenhout Emergency Medical Care Faculty of Health Sciences UFS

07 December 2015

www.fs.gov.za

RE: REQUEST TO CONDUCT RESEARCH AT THE FREE STATE COLLEGE OF EMERGENCY CARE

PROJECT TITLE: STUDENT EXPERIENCES OF SIMULATION BASED EDUCATION VS PROBLEM BASED LEARNING IN EMERGENCY MEDICAL CARE TRAINING

Permission is hereby granted to conduct the research at the Free State College of Emergency Care as per the approval and conditions stipulated in the letter dated 25/11/2015 from the Head of the Free State Department of Health.

The Coordinator of the ECT student groups and the Deputy Principal have been informed of the research to be conducted and arrangements have been made.

Trust you find the above in order,

Mr. K.D. Rowe-Rowe Principal: Free State College of Emergency Care.

Mr K.D.Rowe-Rowe, Principal: Free State College of Emergency Care. P.O. Box 35548 Faunasig Bloemfontein 9325. Tel.no. 051-405 2773 or 083 417 3289 e-mail - rowerowekd@fshealth.gov.za• Free State College of Emergency Care, No 7 Roth Avenue, National Hospital, Bloemfontein 9301 APPENDIX J

LETTER FROM LANGUAGE EDITOR

26 July 2016

Luna Bergh

To whom it may concern

This is to certify that I language-edited Mugsien Rowland's mini-dissertation electronically via track changes, excluding references and front matter. Mugsien effected the changes and suggestions. In this way, both linguistic excellence and the candidate's ownership of the text were ensured.

Sincerely

Bergh-Luna Bergh

D Litt et Phil

Language and writing specialist