A FRAMEWORK FOR THE INTEGRATION OF SIMULATION IN UNDERGRADUATE PHYSIOTHERAPY: CONTEXTUALISED FOR SOUTH AFRICA

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A FRAMEWORK FOR THE INTEGRATION OF SIMULATION IN UNDERGRADUATE PHYSIOTHERAPY: CONTEXTUALISED FOR SOUTH AFRICA

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DECLARATION

I, Anke van der Merwe, declare that the PhD research thesis that I herewith submit at the University of the Free State, is my independent work and that I have not previously submitted it for a qualification at another institution of higher education.

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22 April 2020

A. van der Merwe **Date**

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ABSTRACT

This thesis aims to describe the process of developing a framework for integrating simulation in the South African undergraduate physiotherapy programme. An exploratory multi-method research design comprising three study phases was utilised in the framework development. A systematic review, utilising deductive content analysis, identified the key elements making up the frameworks that were designed to facilitate the curricular integration of simulation. Following the review, a Delphi survey was compiled to develop a conceptual framework for integrating simulation in the South African undergraduate physiotherapy programme. Contextualisation and credibility were ensured by means of a validation meeting.

The systematic review included eight articles, which have an almost equal distribution of low and high finding reliability. In total 18 descriptive themes, grouped under four analytical themes, were identified. Analytical themes identified were planning, implementation, evaluation and revision. All articles noted thoughtful planning of simulation-based learning experiences (SBLEs), including stipulating learning outcomes, considering resources and debriefing. Only three articles included the execution of needs analyses and identified the need for simulation-based educator training prior to simulation integration.

Data obtained from the review was formulated into a Delphi survey and distributed to purposively selected international and national experts in healthcare education and/or simulation. Results from the Delphi survey confirm the importance of curriculum development, SBLE design, resource availability and development of learning outcomes. Panel members also highlighted educator competence as essential. Analysis of both institutional and student needs were deemed essential, with societal needs being regarded as merely useful. The majority of statements pertaining to student preparation, student assessment and mastery learning/deliberate practice only achieved stability during the Delphi survey. Following the Delphi survey, the conceptual framework was developed by the researcher, and it was refined further during a validation meeting.

Participants in the validation meeting suggested modifying the unidirectional framework illustration, which resulted in adjustment of the framework. Noteworthy was the importance of addressing all stakeholder needs, including societal needs. A collaborative approach to simulation integration was emphasised by participants especially in a resource-restricted South African setting. Participants refined terminology, so that it was more applicable to the South African education environment.

The framework was finalised by the researcher, who applied constructive and cognitive load education theories and the data of the current study. A framework depicting both the fluidity between framework elements and the need to adjust education approaches to optimise student training was designed/developed. The framework emphasises the preparation required by both educators and students. Curriculum and SBLE authenticity are essential framework components for optimising preparation of graduates for practice, which expects graduates to possess increased and complex skills early in their careers.

The final product is a credible and contextualised framework for the integration of simulation in the South African undergraduate physiotherapy programme. Though it is generic in nature, it may be applicable for use in any healthcare programme. It is recommended that a dedicated simulation expert, who is well versed in simulation-based education, is appointed to drive framework implementation; to ensure that all stakeholder needs are addressed, and to promote the sustainability of the integrated framework. Engagement with national regulating bodies regarding the inclusion of simulation as part of the mandatory undergraduate physiotherapy training requirements is recommended. Further research, exploring the practical use of SBLEs for mastery learning/deliberate practice and assessment purposes, is required. Investigation into a standardised approach to peer assessment in SBLEs is advised, to encourage student participation. In light of national resource restrictions, the researcher recommends research is undertaken in relation to the development and/or identification of validated outcome measures that calculate the return on investment of simulation integration at institutional level.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADDIE	Instructional design framework: Analysis, Design, Development, Implementation, and Evaluation
AIDS	Acquired immunodeficiency syndrome
ASSAf	Academy of Science of South Africa
ASPiH	Association for Simulated Practice in Healthcare
CHE	Council on Higher Education
DREEM	Dundee Ready Education Environment Measure
FOAM	Free Open Access Medical Education
5IR	Fifth industrial revolution
4IR	Fourth industrial revolution
HIV	Human immunodeficiency virus
HPCSA	Health Professions Council of South Africa
INACSL	International Nursing Association for Clinical Simulation and Learning
IoMT	Internet of Medical Things
IPE	Interprofessional education
ML/DP	Mastery learning/Deliberate practice
MOOC	Massive Open Online Courses
NLN	National League for Nursing
NPEF	National Physiotherapy Educator's Forum
NQF	National Qualifications Framework
ROI	Return on investment
SADoH	South African Department of Health
SANC	South African Nursing Council
SAQA	South African Qualifications Authority
SBE	Simulation-based education
SBLE	Simulation-based learning experience
SSSQ	Short Stress State Questionnaire

CONCEPT CLARIFICATION

Accommodating learner: Accommodating learners learn from experience and internalise the knowledge acquired through active experimentation (Waldner & Olson, 2007; Hauer *et al.*, 2005).

Adult learner: An adult learner is a student enrolled in a tertiary education system who is chronologically older than the majority of undergraduate students and whose undergraduate education was delayed for any reason (e.g., military service, single parenthood, full-time work) (Schreyer Institute for Teaching Excellence, 2007). Adult learners are claimed to display some key characteristics in their approach to their education, namely, being highly motivated, possessing broad life experiences, being independent and self-directed, and preferring practical, goal-directed learning (Taylor & Hamdy, 2013; Schreyer Institute for Teaching Excellence, 2007).

Assimilating learners: Assimilating learners, according to Kolb's learning style inventory, form abstract ideas and internalise the knowledge acquired via reflection (Waldner & Olson, 2007; Hauer *et al.*, 2005).

Assessment: Assessment refers to the processes of evaluating and measuring the achievement of outcomes or objectives by individual students or groups, with the aim of determining competency for progression to the next training level, or readiness for independent practice (Association for Simulated Practice in Healthcare [ASPiH] Standards Project Team, 2016).

Authenticity: Authenticity involves replicating the professional communities students serve during their clinical practice, and also relates to the subjective interpretation of the curriculum and/or simulation-based learning experience (SBLE) by the student, who perceive it as being real and of value (Bland *et al.*, 2014).

Communicable disease: Communicable diseases, also known as infectious diseases, are caused by microorganisms (bacteria, viruses, and fungi); communicable diseases include sexually transmitted diseases, which can spread from one person to another via either direct or indirect contact (World Health Organization [WHO], 2019).

Competence: Competence refers to stakeholders (students, educators, facilitators or simulated patients) being able to perform their roles or possessing a skill identified according to standardised criteria after undergoing training. Criteria for defining competence may be observable behaviours guiding the identification, development and evaluation of the stakeholder's ability to perform the identified role or skill (INACSL Standards Committee, 2016a).

Computer-based simulation: Using computer-based programmes that enable interaction between students and computers. It also involves the ability to provide instant, automated feedback (e.g., through virtual patients, virtual worlds, second life and avatars) (Milkins *et al.*, 2014; Østergaard & Dickman, 2013).

Conceptual fidelity: Conceptual fidelity refers to the authenticity and relatedness of all aspects of the case or scenario presented with the theory that is learned (INACSL Standards Committee, 2017b).

Converging learners: According to Kolb's learning style inventory, converging learners use abstract ideas and active experimentation with these ideas to learn (Waldner & Olson, 2007; Hauer *et al.*, 2005).

Curriculum: A curriculum is a complete learning programme, comprising all teaching and learning opportunities and detailing content, learning outcomes, educational activities and assessment and evaluation (South African Qualifications Authority [SAQA], 2018; PennState Health, 2016).

Debriefing: Debriefing is a collaborative, reflective facilitator-led process that follows a simulated event, and during which educators/facilitators and students discuss the experience with the purpose of adjusting demonstrated behaviours and skills to improve future performance and foster critical thinking skills (Lopreiato *et al.*, 2016).

Decentralised training: This term refers to training that has moved away from traditional, discipline-specific training occurring at tertiary institutions, to clinical training that takes place in a community. Decentralised training provides students with contextual experience and knowledge relating to the healthcare needs of both the community and country (Gray & Vawda, 2017).

Decolonisation: Decolonisation, particularly the decolonisation of a curriculum refers to adaptation of a curriculum to take into account that teaching and learning occurs in a way that considers and addresses unique African realities in terms of student needs, societal circumstances (Bitzer & Costandius, 2018; Fomunyam & Teferra, 2017, Letsekha, 2013) and through the use of adjusted pedagogical approaches, assessment methods, and curriculum content choices (Ruddock, 2018).

Deliberate practice: This type of practice refers to students purposefully and systematically practicing a required skill, in, for example, the simulated environment, in order to improve their performance in a specific domain (Lopreiato *et al.*, 2016).

Diverging learner: Diverging learners learn from experience and use reflection to internalise the gained knowledge (Hauer *et al.*, 2005).

Educator: An educator is defined by Oxford Learner's Dictionary (2020) as someone who teaches or educates people and has knowledge of education theories and methods. An educator involved in simulation-based education (SBE), also called a simulationist, is described as an expert in both the theory and implementation of SBE, and who is responsible for developing, managing and/or implementing SBLEs (PennState Health, 2016). In the South African SBE context, educators are required to fulfil all the roles listed above.

Evaluation: Evaluation is a broad concept that refers to the appraisal of data gathered by means of one or more measurements, resulting in the rendering of judgements related to participant/programme strengths and weaknesses against a predetermined performance standard (INACSL Standards Committee, 2017a).

Facilitator: As defined by the Healthcare Simulation Dictionary (Lopreiato *et al.*, 2016), a facilitator is an individual who is involved in simulation implementation and/or delivery, and may include educators and other institutional members.

Feedback: The constructive provision of information or dialog relating to a student's performance in the SBLE, which is intended to improve understanding of concepts or performance aspects in relation to the learning objectives (INACSL Standards Committee, 2016a; Lopreiato *et al.*, 2016). Feedback can be provided by a variety of sources, among which, the educator/facilitator, peers, simulated patients, or a machine (simulator or computer program) (Lopreiato *et al.*, 2016).

Fidelity: The degree of reality of a specific simulation activity. Simulation can involve a variety of fidelity dimensions, for example, physical factors, including the environment, equipment used, psychological factors (i.e., participant emotions and beliefs), social factors (i.e., motivation and goals), group culture and the degree of trust between participants (Lopreiato *et al.*, 2016; Chiniara *et al.*, 2013).

Formative assessment: Formative assessment is defined as assessment for learning with the aim of assessing achievement of the goals set for learners and educators (ASPiH Standards Project Team, 2016).

Framework: In this study, the operational definition for framework refers to the basic structure of the proposed research product – a set of elements used to guide choices regarding the content, methods of education and interpretation of outcomes and results (Bordage *et al.*, 2016; Thackray, 2013).

Haptic: In healthcare simulation, haptic devices provide specific, tactile feedback to students, for example, palpation of organs or body parts, feedback regarding pressure exerted or response of tissue to a cut or tear (Lopreiato *et al.*, 2016).

Health Professions Council of South Africa (HPCSA): The HPCSA is a professional body that governs South African health professional registration, education, professional conduct and ethical practice. The HPCSA, furthermore, ensures continuous professional development of health professionals, and fosters compliance with national healthcare standards (Health Professions Council of South Africa [HPCSA], 2020).

Human patient simulators: Making use of lifelike high-fidelity simulators/manikins to accurately recreate and mimic realistic clinical conditions, patient behaviours and characteristics (Milkins *et al.*, 2014; Chiniara *et al.*, 2013; Silberman *et al.*, 2013)**.**

Immersive simulation: A teaching and learning strategy that provides students with an experience of the task or setting that is similar to what they would encounter in the real world (Spies, 2016).

Internet of medical things (IoMT): The IoMT refers to the application of internet of things technologies, such as nanotechnology, personal digital devices and connected medical devices, in healthcare, and envisions a system of linked devices providing constant monitoring and tracking of a variety of parameters to measure biometric data and activity level (World Economic Forum, 2019; Vogenberg & Santilli, 2018).

Mastery learning/deliberate practice: The concepts of mastery learning and deliberate practice were grouped together for the purpose of this research study, as both concepts require repetition of SBLEs in order to demonstrate skill acquisition by the student (McGaghie *et al.*, 2010) and are intertwined within SBE.

Module: A module is a coherent and self-contained unit of learning, which is specifically designed so that students achieve a detailed set of learning outcomes (Health and Care Professions Council [HCPC], 2017).

Non-communicable disease: This term refers to a non-infectious medical condition or disease, usually of long duration and slow progression. Non-communicable diseases include cancers, cardiovascular diseases, diabetes, chronic lung diseases, injury and violence (WHO, 2019).

Non-technical skills: Non-technical skills refer to skills such as communication, leadership, professionalism, collaboration, health advocacy and scholarship. It can also include problem-solving and clinical reasoning skills (HPCSA, 2014).

Part-task trainer: This is a simulator that replicates specific components of a system or patient and is designed for practicing isolated procedures that promotes procedural skills training (Milkins *et al.*, 2014; Chiniara *et al.*, 2013; Kneebone *et al.*, 2006).

Physical fidelity: This term refers to how realistically an SBLE replicates the same situation in real life, and relates to the environment, equipment, simulated patients and embedded patients (INACSL Standards Committee, 2016a).

Physiotherapist: A physiotherapist is an individual who is qualified to assess, treat and manage a wide variety of conditions, including those relating to orthopaedics, paediatrics, neurology, respiratory and thoracic (including intensive care unit care), cardiology (including intensive care unit care), obstetrics and gynaecology, sports medicine and geriatrics, and general rehabilitation (University of Stellenbosch (US), 2019; World Confederation of Physical Therapy [WCPT], 2019).

Practical-skills-based SBLE: This is an SBLE that focusses on acquiring technical skills and/or procedures by means of specific simulation modalities (e.g., part-task trainer, manikin, simulated patients) (INACSL Standards Committee, 2016a). Practical skills may also refer to other practical skills, such as communication skills, which may be practiced during specifically designed SBLEs.

Programme: A programme refers to consecutive educational activities, related to curriculum implementation, that result in the achievement of a qualification (SAQA, 2018).

Psychological fidelity: Psychological fidelity relates to the integration of contextual elements found in the clinical environments, for example, a patient voice to enable conversation, relevant ambient noise and distractions (INACSL Standards Committee, 2016a).

Rehabilitation therapist and worker: According to the World Health Organization's *World Report on Disability*, the following professions are classified as rehabilitation therapists and rehabilitation workers: "occupational therapists, orthotists, physiotherapists, prosthetists, psychologists, rehabilitation and technical assistants, social workers, and speech and language therapists" (WHO, 2011:p100). Exercise and sports medicine professionals are now also recognised as part of the healthcare team by various countries, including South Africa (UFS, 2019; Zhou *et al.*, 2019).

Relevant healthcare simulation: The operational definition for relevant healthcare simulation, in this study, refers to using simulation modalities that are applicable to undergraduate physiotherapy training.

Reflection: In the context of this study, reflection refers to the abstract conceptualisation that takes place after an SBLE, of which the aim is applying the new knowledge acquired during similar future situations (INACSL Standards Committee, 2016d).

Simulation: An educational methodology that creates a situation or environment that allows learners to experience, replace or amplify real-life situations with facilitator guidance for the purposes of practice, learning, assessment, or gaining insight into the functioning of systems or human actions (Lopreiato *et al.*, 2016). Simulation, in the context of this study, refers to both practical, skills-based and immersive SBLEs.

Simulationist: A simulationist is defined by the Healthcare Simulation Dictionary as an individual involved in designing, implementing and/or delivering SBLEs (Lopreiato *et al.*, 2016).

Simulation expert: For the purpose of this study, a simulation expert is defined as an individual who is well established in the healthcare simulation and/or healthcare education community, and who has extensive knowledge regarding healthcare simulation and/or healthcare education, evidenced by research publications of studies in either of these areas (PennState Health, 2016). A simulation expert often fulfils the role of a consultant or mentor for other simulation-community members (PennState Health, 2016).

Simulation facilities: These are facilities where students can engage in various simulation-based activities. These facilities should be designed in such a way that they accommodate the needs of various healthcare disciplines (e.g., hospital ward setting, consultation room, skills training areas).

Simulated patient: A simulated patient is a carefully trained individual who portrays the role of a patient, or other relevant party, in a healthcare simulation, both realistically and accurately (Chiniara *et al.*, 2013).

Summative assessment: Summative assessment (similar to high-stakes assessment) is defined as the assessment of learning outcome achievement, which indicates the readiness of a student to progress to the next study level (pass/fail) (ASPiH Standards Project Team, 2016).

Suspension of disbelief: Suspension of disbelief refers to students accepting and believing otherwise unrealistic aspects related to the SBLE they are engaging with, in order to fully immerse themselves in the SBLE (Muckler, 2017; Spies, 2016)**.**

A FRAMEWORK FOR THE INTEGRATION OF SIMULATION IN UNDERGRADUATE PHYSIOTHERAPY: CONTEXTUALISED FOR SOUTH AFRICA

CHAPTER 1

INTRODUCTION AND STUDY ORIENTATION

This chapter will present the reader with an introduction to the study, and will postulate both the research and problem statement, and provide the research question and research objectives of the study. A brief discussion of the study methodology will also be presented. A thesis outline concludes this chapter.

1.1 INTRODUCTION

Training institutions continue to battle challenges related to shortages of healthcare educators, available clinical placements, apprehensions related to ethical patient care, a rapidly changing burden of disease and an increasingly diverse and larger student population (Academy of Science of South Africa [ASSAf], 2018; Chen, 2017; Ryall *et al.*, 2016; Labuschagne *et al.*, 2014; Kneebone *et al.*, 2006), which makes reflection about education essential. The crisis in healthcare education, both locally and abroad, has resulted in educators exploring alternative teaching methods (ASSAf, 2018; Østergaard & Dickman, 2013) to continue ensuring the throughput of skilled graduates, and undergraduate healthcare professionals who are better prepared for their current working environments.

In the past, it was sufficient to provide healthcare students with an array of clinical placements, so that they could demonstrate the practical application of theoretical knowledge (Thurling, 2017). However, a change in the burden of disease has altered the complexity of the current patient population (Labuschagne, 2012), and today medical innovation and therapies struggle to keep up with the shifting disease burden, which requires almost constant adaptation of health systems and policies (Jones *et al*., 2012). The alarmingly high rate of non-communicable disease (NCD) in South Africa, which accounts for approximately 28% of the total burden of disease (Lalkhen & Mash, 2015), the fact that 7.42 million people are living with Human Immunodeficiency Virus (HIV), high rates of Tuberculosis (TB) infection, increased mother and child mortality, and an increased life expectancy of the general population (Government Communication and Information System, 2020; WHO, 2017) has required the healthcare training platform to change dramatically. Consequently, individuals may present with earlier onset of NCDs, or complications related to their management, with a subsequent increase in premature deaths or disability. A change in patient case mix, the lack of clinical competency of students upon graduation (National Physiotherapy Educator's Forum [NPEF], 2019) and the under-preparedness of students entering the tertiary education system (Lange, 2017; Singh, 2015; Kent & De Villiers, 2007) have also been noted in South Africa, which raises questions about the applicability of traditional education strategies (Phillips *et al.*, 2017). Exploring different educational methodologies is, therefore, crucial (Thackray, 2013; Berragan, 2011; Cahalin *et al.*, 2011; Van der Merwe, 2011), to create a classroom environment that fosters active participation, critical thinking and higher-order cognitive skills. International simulation-based research advocates that simulation-based learning experiences (SBLEs) may overcome the healthcare and education challenges that have been identified (Wright *et al.*, 2018; Phillips *et al.*, 2017; NLN Board of Governors, 2015), with curricular integration of simulation being essential for optimising the education benefit (Motola *et al.*, 2013).

Simulation is defined by the Healthcare Simulation Dictionary as an educational methodology that involves designing a realistic situation for students, to enable learning and skills practice (Lopreiato *et al.*, 2016). A wide variety of simulation modalities and terminologies are used in healthcare literature. Simulation modalities include using part-task trainers, human patient simulators, simulated patients, role play, computer-based simulation and virtual reality (Melling *et al.*, 2018). In line with the definition provided, simulation, in the context of this study, refers to the integration of a variety of the above-mentioned modalities in both immersive and practical, skills-based SBLEs in a healthcare training programme.

The benefits of integrating simulation in undergraduate healthcare programmes include the enhancement of clinical confidence, the acquisition of psychomotor skills, and the facilitation of effective communication and teamwork (McGaghie & Harris, 2018; Bednarek *et al.*, 2014; Ohtake *et al.*, 2013) – all in a non-threatening environment. Further benefits are found in the ability of simulation to produce challenging and high-risk learning opportunities for students when clinical practice settings are scarce (Thurling, 2017). Using SBLEs for summative assessment purposes is also described (INACSL Standards Committee, 2016c) and is increasingly being utilised in both nursing (Thurling, 2017) and medical education (West & Parchoma, 2017; Khamis *et al.*, 2016), as it provides for a controlled assessment environment. It is, therefore, not surprising that the volume of simulation-based research has increased exponentially over the past decade and the use of this educational modality has subsequently shifted to the centre stage of healthcare education (Melling *et al.*, 2018; Cantrell *et al.*, 2017; Berragan, 2011; Miller, 1990).

Simulation is widely accepted and utilised within healthcare settings (Ryall *et al.*, 2016; McGaghie *et al.*, 2010), and international nursing and medical councils and professional bodies (Bradley *et al.*, 2019; HCPC, 2017; Thurling, 2017) endorse the use of simulation as an education strategy. In the international physiotherapy programme, simulation has also been developing (Melling *et al.*, 2018; Bednarek *et al.*, 2014), albeit not at the same pace as in medical and nursing education. Recently, 16 Australian physiotherapy programmes funded by Health Workforce Australia explored the implementation of immersive, high-fidelity role-play simulation (Wright *et al.*, 2018). Currently, the supplementation of a number of the mandatory Australian physiotherapy clinical hours with simulation-based education (SBE) is in preliminary stages (Wright *et al.*, 2018). Limited evidence indicates that only some South African nursing education institutions have fully embraced simulation in their undergraduate training, mostly owing to limited access to facilities (Thurling, 2017). However, the majority of South African healthcare training institutions report access to simulation equipment and/or facilities (Swart *et al.*, 2019; Burch, 2014). Limited evidence about the use of these simulation equipment and/or facilities in South African healthcare education is currently available (Swart *et al.*, 2019; van Vuuren, 2016) and no published evidence detailing the use of simulation in South African undergraduate physiotherapy training was available at the time this study was executed.

Although simulation-based learning in various healthcare disciplines has been researched extensively, most notably in developed economies, there remains a scarcity of South African research regarding the implementation of this educational methodology. Anecdotal evidence indicates that SBLEs have not been fully embraced or implemented by South African undergraduate physiotherapy programmes beyond skills training by means of task trainers and basic peer role play.

1.2 PROBLEM STATEMENT

The benefits of integrating simulation in healthcare education is undeniable (McGaghie & Harris, 2018; Kneebone *et al.*, 2017). Healthcare curricula have incorporated aspects of simulation over the past 40 years, nevertheless, full curricular integration of this valuable educational methodology is still met with resistance (Thurling, 2017). Fear of utilising simulation might stem from organisational factors, such as lack of time available in healthcare programmes or curricula and limited support for integration, or personal factors relating to educators who lack confidence for working with the educational methodology, including the technology that could accompany it (Swart *et al.*, 2019; Thurling, 2017; Motola *et al.*, 2013; Jeffries, 2005). Published best-practice guidelines guide the design of SBLEs, and only briefly mentions the importance of curricular integration. As with any educational methodology, acceptance and full integration of the methodology is essential to ensure success and sustainability (Motola *et al.*, 2013), which highlights the need for a framework to guide the curricular integration of simulation.

In addition to the mentioned obstacles to simulation integration in healthcare education programmes (*cf.* 1.1), South African educators face additional challenges that relate to the current education climate, and which require reflection. These challenges include, but are not limited to, an underprepared student population, lack of adequate infrastructure and resources, severe financial constraints, a change in patient case mix, a decreasing training platform and an ethnically and culturally diverse student population (Singh, 2015; Labuschagne, 2012; Frantz, 2007). These challenges necessitate that traditional educational methodologies are revisited and that alternative methods, for example, simulation, are explored and integrated in the South African context.

A review of literature revealed few published frameworks for simulation integration with frameworks mostly published in developed countries. Compared to nursing and medical research, there is a dearth of literature describing the use of simulation in undergraduate physiotherapy programmes (Johnston *et al.*, 2018; Wright *et al.*, 2018; Phillips *et al.*, 2017; Pritchard *et al.*, 2016; Mori *et al.*, 2015; Coon *et al.*, 2014). None of the available physiotherapy-based research studies mentioned above present a framework for the integration of a variety of simulation modalities, instead, they focus on integrating selected simulation modalities, for example, simulated patients. Neither did the aforementioned physiotherapy research studies investigate achieving, by means of simulation, graduate attributes expected by undergraduate physiotherapy programmes. As mentioned in Section 1.1, healthcare simulation is currently being used in pockets at South African universities (Thurling, 2017), with no evidence of simulation being integrated in South African physiotherapy education (Swart *et al.*, 2019).

The changing context of higher education makes programme responsiveness essential (Bitzer & Costandius, 2018); Frantz (2007) emphasises that context-specific research is a vital component of education development, which highlights the need for the development of a framework for the South African context. The urgency of developing a contextualised framework for simulation integration was identified by the researcher. Such a framework will make it possible for South African undergraduate physiotherapy education to evolve and promote the use of this evidence-based educational methodology. By encouraging both educator and student participation in the education environment, simulation can aid meaningful learning. In this research study, an in-depth investigation was undertaken into the curricular integration of simulation.

1.3 RESEARCH AIM

The aim of this research study was to develop a framework for the integration of simulation in the South African undergraduate physiotherapy programme.

1.4 RESEARCH QUESTIONS

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

- What is the current position of simulation integration in healthcare education, specifically with regard to physiotherapy education?
- What elements, according to the available literature, should be included in a framework for the integration of simulation in a healthcare programme?
- What are the perspectives and recommendations of international and South African experts in the fields of healthcare simulation and healthcare education regarding the elements to be included in a conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme?
- What are the opinions of South African experts in the fields of healthcare simulation and/or physiotherapy education regarding the content of a framework for the integration of simulation in the South African undergraduate physiotherapy programme?
- What should the finalised framework for the integration of simulation in the South African undergraduate physiotherapy programme entail?

1.5 RESEARCH OBJECTIVES

The objectives of this study were,

i. To perform an extensive and in-depth literature review to conceptualise and contextualise the use of simulation in healthcare education, with a focus on physiotherapy education;
ii. To conduct a systematic review to critically and thematically review all relevant international and South African healthcare literature relating to the key elements forming part of simulation-based frameworks, with a focus on curricular integration of simulation, in the healthcare context;

iii. To identify the elements to be included in a conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme by means of a Delphi survey amongst international and South African experts in the fields of healthcare simulation and healthcare education;
iv. To discuss, critically review and validate the contents of a framework for the integration of simulation in the undergraduate South African physiotherapy programme by means of a validation meeting amongst South African experts in the fields of healthcare simulation and/or physiotherapy education; and
v. To finalise a framework for the integration of simulation in the South African undergraduate physiotherapy programme.

The above-mentioned objectives were achieved as follows during the four study phases:

- Phase 1a: Literature overview
- Phase 1b: Narrative systematic review
- Phase 2: Delphi survey
- Phase 3: Validation meeting
- Phase 4: Framework finalisation

Detail regarding the methodology of each study phase will be discussed in Section 1.6, and summarised in Table 1.1.

1.6 RESEARCH DESIGN

This study utilised a sequential exploratory multi-method research design within the pragmatic constructivist paradigm. Kivunja and Kuyini (2017) group the constructivist and interpretivist paradigms together, as both include the interpretation of participants' opinions and views (Thomas, 2010). The elements of the research paradigm, namely, the epistemology, ontology, methodology and axiology, specifically for study phases 2 to 4, will be described.

The study assumed a subjective epistemology, as the authoritative knowledge gathered from experts in the research fields that were identified was obtained by an interactive process between participants and researcher, and was subsequently interpreted through the researcher's engagement with and own understanding of the data (Kivunja & Kuyini, 2017). In assuming a relativist ontology, the researcher viewed the stipulated research objectives as having multiple realities, which were explored by means of a participant-based iteration process (study phase 2) and interviews (study phase 3) (Kivunja & Kuyini, 2017). The assumption of a naturalist methodology required the researcher to collect data via interaction with participants by means of a Delphi survey and validation meeting (Kivunja & Kuyini, 2017). Finally, the study assumed a balanced axiology, as the research outcome reflects the ethical values of the researcher, through a balanced report on the research findings (Kivunja & Kuyini, 2017).

The strengths of multi-method research are that all the methods are applied thoroughly and with rigour, and that robust research findings are obtained through the processes of cross-validation and triangulation (Tashakkori & Teddlie, 2003). By utilising both quantitative and qualitative methods, the researcher gained an in-depth understanding of both the research problem and question (Creswell, 2012) and ensured, by means of an constructivist approach, appreciation of participants' views regarding the research questions posed during study phases 2 and 3.

The majority of multi-method research designs use time orientation as their base – one phase follows the previous, with all phases being dependent on each other to some degree (de Vos *et al.*, 2011). The first phase of the study comprised identifying and elaborating on specific concepts, which took the form of a literature overview and systematic review. The literature overview aimed to conceptualise the current state of SBE in healthcare, whereas the systematic review identified elements that were included in current frameworks that had been designed to achieve curricular integration of simulation.

The second study phase included classifying the concepts that had been identified in the preceding phase (Okoli & Pawlowski, 2004), which was achieved by performing a Delphi survey amongst international and national experts in healthcare simulation and healthcare education fields. The Delphi survey was applied in order to develop a conceptual framework for simulation integration in the South African physiotherapy programme by means of expert consensus.

The questioning aspect of the study continued through to phase three, during which an expert review process, by means of a validation meeting, was executed to discuss and critically review a framework in the South African undergraduate physiotherapy context. By using the data obtained through the above-mentioned methods, a context-specific framework for the integration of simulation in the South African undergraduate physiotherapy programme was developed and, subsequently, finalised during Phase 4 of the study. Table 1.1 provides an overview of the research methodology.

Table 1.1: Overview of study research methodology

PHASE	OBJECTIVE	SOURCE/PARTICIPANTS	SAMPLE	METHODS	INSTRUMENT
Phase 1a: **Literature overview**	To perform an extensive and in-depth literature review to conceptualise and contextualise the use of simulation in healthcare education, with a focus on physiotherapy education	Literature published in English	1980 – 2019	National Research Foundation Nexus database, PubMed, EBSCO, CINHAL, Google Scholar, Medline, Health Source, ERIC, AfricaWide, Academic Search Complete and Academic Search Ultimate	N/A
Phase 1b: **Systematic review**	To conduct a systematic review to critically and thematically review all relevant international and South African healthcare literature relating to the key elements forming part of simulation-based frameworks, with a focus on curricular integration of simulation, in the healthcare context	All available, published articles pertaining to the use of simulation-based frameworks in the healthcare setting	1 January 2005 – 31 December 2017	Review of documents retrieved from • Above-mentioned databases; and • Literature reference lists Search terms: *conceptual framework, instruction design, framework, model, clinical simulation, simulation, healthcare, nursing, physiotherapy/physical therapy, occupational therapy, medical*	Self-compiled data extraction sheet

	OBJECTIVE	SOURCE/PARTICIPANTS	SAMPLE	METHODS	INSTRUMENT
Phase 2: **Delphi survey**	To identify the elements to be included in a conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme by means of a Delphi survey amongst experts in South Africa and abroad in the fields of healthcare simulation and healthcare education	Experts in South Africa and abroad in the fields of healthcare education and/or simulation	8 to12 expert participants in South Africa and abroad	Delphi survey (Arthur *et al.*, 2013; Savin-Baden & Major, 2013; Morgan *et al.*, 2007; Okoli & Pawlowski, 2004)	Structured closed-ended electronic questionnaire (Arthur *et al.*, 2013)
Phase 3: **Validation meeting**	To discuss, critically review and validate the content of a framework for the integration of simulation in the undergraduate South African physiotherapy programme by means of a validation meeting amongst South African experts in the fields of healthcare simulation and/or physiotherapy education	South African experts: physiotherapy education and/or healthcare simulation	4 to 7 South African experts	Validation meeting	Self-compiled meeting guide with open-ended questions (Botma *et al.*, 2015; Creswell, 2012)
Phase 4: **Framework finalisation**	To finalise a framework for the integration of simulation in the South African undergraduate physiotherapy programme	Researcher and experts participating in the validation meeting	N/A	Member checking (Saldaña, 2010)	Framework developed and data obtained during Phase 3

1.7 JUSTIFICATION

A noticeable gap was identified in the current body of literature in relation to a framework designed specifically for guiding the integration of simulation in South African undergraduate physiotherapy programmes. Even though the modules, assessments and educational methodologies used by physiotherapy training institutions differ, they all adhere to set minimum standards, as governed by the Health Professions Council of South Africa (HPCSA), and a generalised framework would, therefore, be applicable to all national physiotherapy programmes.

Focussed research is essential for pioneering the direction of not only undergraduate education, but also the development of the profession as a whole. Educators are essential in driving research into alternative educational methodologies, to address the needs of all stakeholders, especially the needs of the student population and the society they will serve once they qualify. Therefore, the researcher is of the opinion that investigating simulation integration is vital for transforming the physiotherapy profession, due to the need to respond to the fourth industrial revolution (4IR) and demands to decolonise the curriculum, due to the imminent implementation of national health insurance, and to accommodate a changed student population. If these needs are not addressed, graduates will not be able to keep up with the ever-changing society and the profession. To quote Albert Einstein,

> *"The world as we have created it is a process of our thinking. It cannot be changed without changing our thinking."*

This sentiment is, ultimately, what the researcher is hoping the research will create, that is, to open the door for future research and transforming the physiotherapy profession in a way that ensures a lasting and positive impact on future physiotherapists. The transformation of South African tertiary training institutions is essential for shaping civic values and adaptability in graduates, in the quest to develop responsible citizenship (Cloete, 2020). The framework could assist with creating teaching and learning experiences through which healthcare students develop responsible citizenship through an awareness of and learning from society, including their role related to social responsibility (Júnior, 2016).

In South Africa, where studies on the current use of simulation in physiotherapy education has not been published, the framework could increase diversity in undergraduate physiotherapy teaching and learning methods, by guiding educators to provide context-specific and constructively aligned SBLEs. The research could, therefore, contribute significantly to the effective integration of simulation in the South African undergraduate physiotherapy programme. Rigorously implemented simulation could affect the quality of graduates positively, as it would make it possible for student training to address the identified learning needs of the current student population better. It is the vision of the researcher that these integrated SBLEs, designed by educators equipped with the necessary knowledge and context-specific guidelines, will facilitate the development of clinical reasoning, confidence and expected graduate attributes in South African undergraduate physiotherapy students further.

The identification of the challenges faced by healthcare education, and the resulting utilisation of alternative educational methodologies to overcome these challenges will ensure that tertiary institutions continue to produce graduates of excellent quality. Training students in various tasks – which could possibly be absent from the clinical setting, due to changes in patient case mix and clinical availability – could equip and prepare physiotherapy graduates better for the ever-changing clinical environments they will encounter upon graduation, thereby ensuring a positive influence on the South African healthcare system. Healthcare professionals who have well developed abilities related to problem-solving, clinical reasoning and reflection could influence current healthcare services positively, resulting in the provision of optimal, person-centred care (Hillermann, 2015).

Furthermore, a collaborative approach to resource and knowledge sharing may foster national interinstitutional partnerships and ensure simulation development. As proposed by Hillermann (2015), collaboration between all stakeholders, on both interdepartmental and interinstitutional levels, should be fostered, to develop a shared simulation research agenda and assist with resource sharing. Higher education institutions can lobby government and the private sector to provide funding to expand available simulation facilities, to ensure that the needs of all healthcare professions are met. Other African higher education institutions could also utilise the simulation facilities available at South African healthcare faculties for training purposes, and collaborate inter-institutionally to address problems relating to resource constraints, to guarantee simulation sustainability. A platform for international collaboration and empowerment is also possible. Not only will students be empowered with confidence regarding their clinical skills, but physiotherapy educators will be knowledgeable and skilled in an educational methodology that has been proven to address the unique needs of the current student population (Johnston *et al.*, 2018; Bland *et al.*, 2014; Labuschagne, 2012).

Physiotherapy educationalists may use the findings of this research study as evidence to approach higher education institutions to assist with improving the integration of simulation in terms of providing standardised Train the Trainer training to all identified healthcare educators.

As mentioned, no South African literature and limited international literature could be found on the integration of simulation in the undergraduate physiotherapy programme. By disseminating the framework South African physiotherapy education will be able to contend and collaborate with other international higher education institutions.

1.8 RESEARCH SETTING

The study was performed in the South African tertiary healthcare education setting. South Africa is classified as an upper-middle-income country (WHO, 2017; Pillay-van Wyk *et al.*, 2016) with documented social disparities (Benatar, 2013). The tertiary and healthcare education environments face many challenges, owing to severe financial constraints and the diverse sociodemographic backgrounds of educators, students and patients.

1.9 LAYOUT OF THESIS

This thesis is divided into seven chapters. A study orientation and literature overview are to be found in Chapters 1 and 2 respectively. Chapters 3, 4 and 5 comprise detailed descriptions of the study methodology used during each individual study phase, as well as a presentation of the phase-specific results and subsequent discussion of these results. The developed framework is discussed in Chapter 6 with Chapter 7 presenting a conclusion of the current research study in totality, including recommendations, and other considerations regarding study strengths and limitations.

The layout of the thesis is detailed in Table 1.2.

Table 1.2: Layout of thesis

CHAPTER	DESCRIPTION
1	Introduction and study orientation
2	Literature overview
3	Systematic review of healthcare-based simulation frameworks
4	Delphi survey used to develop a conceptual framework by means of expert consensus
5	Critical review and finalisation of the framework in the undergraduate South African physiotherapy context by means of expert discussion
6	Description and discussion of the framework for integration of simulation in the South African undergraduate physiotherapy programme
7	Conclusion, recommendations, study strengths and limitations
	References
	Appendices

1.10 CONCLUSION

This chapter provided the reader with a condensed overview of the study. Chapter 2 will provide a comprehensive overview of healthcare education and simulation literature.

CHAPTER 2

LITERATURE OVERVIEW

In this chapter, relevant literature will be discussed to provide insight into the current international and national healthcare education climate. The present use of simulation in healthcare education will be explored, to motivate the use of SBLEs, and to expose the limitations of this educational method.

The chapter will start by contextualising the global and South African training platforms, will describe the student population and the learning, teaching and assessment climate. Simulation-based education will be explained, followed by a description of simulation design, focussing on curriculum design and the learning theories informing SBE. Lastly, the framework for simulation integration will be described.

Phase 1a of the research study comprised a literature overview with the following objective:

- *To perform an extensive and in-depth literature review to conceptualise and contextualise the use of simulation in healthcare education, with a focus on physiotherapy education.*

Figure 2.1 provides an illustration of the various pillars that influence the integration of simulation in the South African healthcare context and that will be discussed in this chapter.

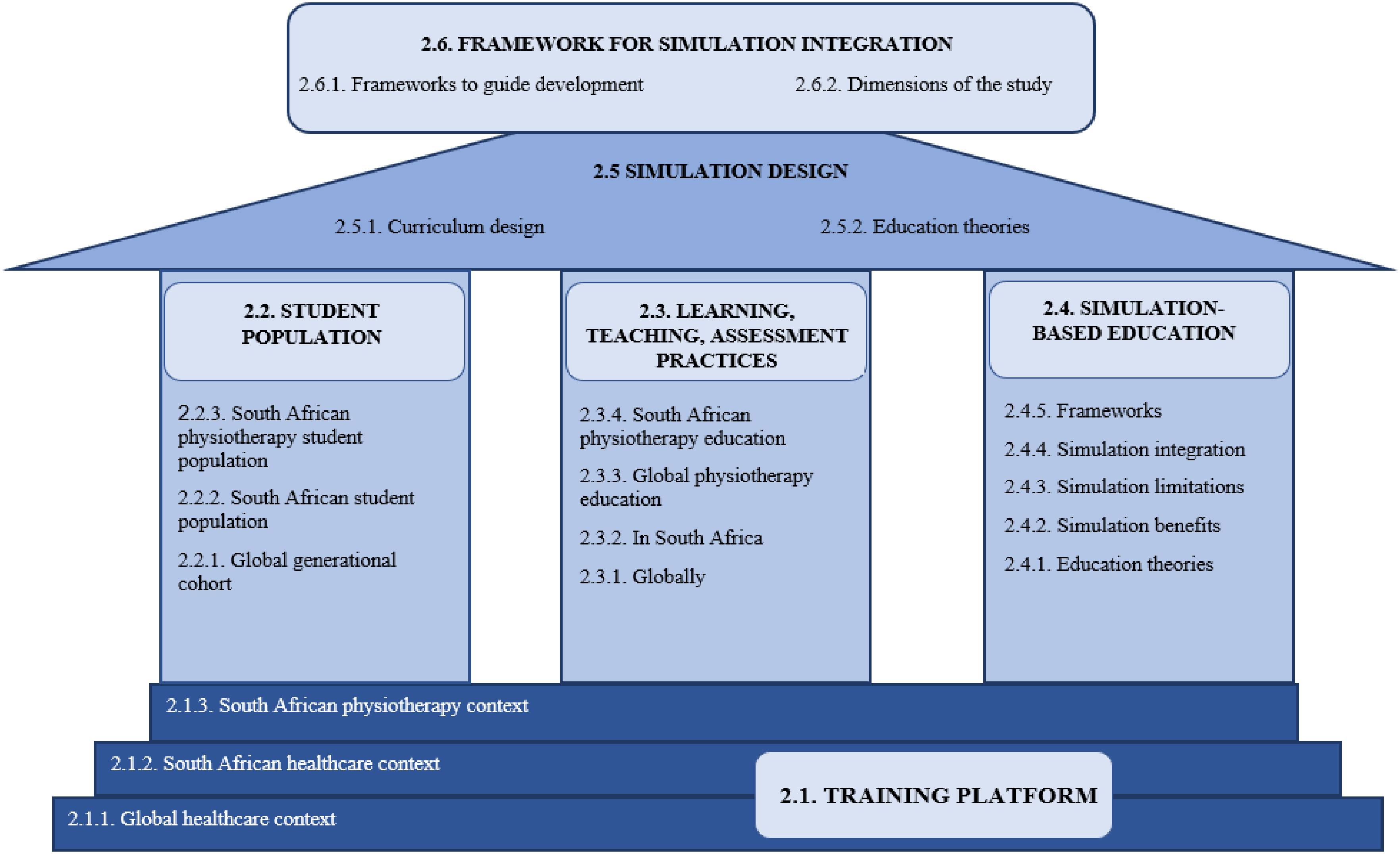

Figure 2.1: Illustrated layout of Chapter 2 (compiled by the researcher, Van der Merwe, 2020)

2.1 TRAINING PLATFORM

2.1.1 Global healthcare context

Global healthcare is facing challenges related to sustainability in the wake of the 4IR. With an estimated fifth of the global population being over 60 years old, and over two thirds of current newborns expected to live to 100 years by the year 2050, the financial burden on the healthcare sector is evident (World Economic Forum, 2019). In addition to the ageing population, approximately 75% of healthcare expenses are attributed to the NCD burden, with both these challenges expected to culminate, by 2030, in an estimated worldwide gross domestic product loss of $47 trillion (World Economic Forum, 2019). Furthermore, market evolution has resulted in healthcare patients with less access to healthcare plans, and healthcare providers receiving lower reimbursement for services delivered (Vogenberg & Santilli, 2018). High healthcare costs have both providers and patients looking for ways to cut expenses by introducing cost-sharing initiatives and using technology-based medicine in the form of telemedicine and wearables (Vogenberg & Santilli, 2018), even though these medical advances might still, today, be associated with high costs (World Economic Forum, 2019). Advances in medical technologies have also seen a drop in in-patient hospital procedures, as patients are preferably treated in outpatient settings to save costs on both the part of the patient and healthcare providers (Vogenberg & Santilli, 2018).

The World Economic Forum (2019) describes two fundamental shifts that reshape the healthcare industry. The first is that healthcare aims to be seamless and delivered away from a clinic-centred approach, with patients using telemedicine and other technologies to provide healthcare professionals with relevant information to enable remote diagnosis and real-time monitoring (World Economic Forum, 2019; Vogenberg & Santilli, 2018). The digitalisation of healthcare through social media, 3D printing, wearables, the internet of medical things (IoMT) and artificial intelligence are some of the advances that are increasing interconnectivity and transforming the healthcare system as we know it (Allen, 2020; World Economic Forum, 2019). In a proof of concept application, artificial intelligence has demonstrated superior skills in post-operative patient triage for intensive care admission, compared to surgical teams who, at present, rely on clinical judgment (MedicalBrief, 2019). Merging technology and healthcare has many benefits in terms of cost saving and ensuring patient safety (MedicalBrief, 2019), therefore, redefining professional roles. Including technology in healthcare is essential for professional survival and growth in all healthcare settings. In light of reduced government funding and resulting decreases in personnel numbers (Allen, 2020; Vogenberg & Santilli, 2018) an alternative approach to healthcare provision than what is currently provided is recommended by industry advisors.

The second shift is a healthcare delivery approach that is person-centred, with focus being placed on individuals within their own environments (Allen, 2020; World Economic Forum, 2019). The healthcare industry is changing rapidly and, in response to growing healthcare consumerism, the duty of healthcare professionals is to ensure that they are prepared to engage fully with available technology to support clinical decision-making and improve patient management (World Economic Forum, 2019). Not only is engagement with technology essential, but the doctor-patient relationship is to be safeguarded (World Economic Forum, 2019) by developing a person-centred approach that ensures patient satisfaction (Scheffler *et al.*, 2015). Considering the above-mentioned, it is clear that, for healthcare professionals to adjust their approach to healthcare provision, requires adjustment of the undergraduate training of healthcare professionals, to instil a person-centred and technology-oriented approach to healthcare in future professionals.

Globally, a shortage of appropriately skilled healthcare workers is cause for concern for the future of optimal healthcare (Allen, 2020; WHO, 2016), and has resulted in the development of the Global Strategy on Human Resources for Health: Workforce 2030 by the World Health Organization (WHO, 2016). This strategy aims to improve health, economic and social development through the optimisation of the performance, quality and impact of the health workforce (WHO, 2016). One of the main objectives of the strategy is to align investment in the health workforce with the future needs of both the population and health systems (WHO, 2016). The integration of regional, national and global strategies to achieve the set Global Strategy on Human Resources (WHO, 2016) has been encouraged by industry advisors to ensure healthcare workforce sustainability (Allen, 2020). Physiotherapists are a vital part of the healthcare team, and focus on preventing disability, maximising patient function and increasing quality of life (Afzal, 2017; O'Sullivan *et al.*, 2017). Even though the physiotherapy profession has been well established over the past few decades (Afzal, 2017), a dearth of physiotherapists is still reported in low-income developing economies (WCPT, 2019). Further impacting the low number of physiotherapists in these countries, is the emigration of skilled physiotherapists to more developed countries (Afzal, 2017) due to workplace dissatisfaction, familial safety concerns and the high level of inequality in South Africa (Labonté *et al.*, 2015). The most recent global physiotherapy statistics indicate that physiotherapists enjoy first-line practitioner status in 48 countries, with most developing countries, including but not limited to Chile, Argentina and Turkey, still requiring referral from other health practitioners (WCPT, 2019; Afzal, 2017). Professional dominance, due to other healthcare professionals opting to treat patients themselves, and not refer patients to physiotherapists when required, add to the challenges faced by the profession, especially in countries where physiotherapists rely on referrals (Afzal, 2017). A lack of interprofessional teamwork, partly due to lack of knowledge regarding the interprofessional team's scope of practice, might be to blame for this phenomenon (Thistlethwaite & Vlasses, 2017).

2.1.2 South African healthcare context

Even though South Africa is classified by the World Bank as an upper-middle-income economy, it is a country with one of the highest inequality rates in the world (World Bank, 2019), with an unemployment rate of 29% (Mbatha & Cohen, 2019). South Africa is more industrialised and has better infrastructure than many other African countries, however, it is still described as an emerging market, due to the majority of the population having a low household income, inadequate education, resulting in a lack of skilled manpower, a volatile currency and chronic electricity shortages (Mbatha & Cohen, 2019; World Bank, 2019).

The mandate for developing policies for South African healthcare professionals resides with the national Ministry of Health in conjunction with both the Department of Higher Education and Training and the Department of Public Service and Administration. Upon graduation, healthcare students are required to perform a certain duration of paid community service, which is a legal prerequisite for practice in South Africa, prior to their registration as private practitioners by the relevant professional boards, which are governed by the HPCSA (HPCSA, 2020; US, 2019). A concern raised by the South African Council of Medical Deans is the increasing number of healthcare graduates who are not placed in internships or community service posts due to government budget constraints, resulting in major human resource and financial challenges for the South African healthcare system (Msomi, 2019).

At the end of apartheid in South Africa in 1994, and as emphasised in the National Health Bill of 2002, primary healthcare became one of the main focus areas of the national healthcare system (Maillacheruvu & McDuff, 2014). This shift towards primary healthcare has resulted in resources being redistributed away from tertiary care institutions, which has limited patient numbers, and resulted in major personnel and budget cutbacks at tertiary academic hospitals (Labuschagne *et al.*, 2014; Kent & de Villiers, 2007).

Disparities in South African healthcare are resulting in a healthcare system that is failing the majority of its population (Benatar, 2013). Provincial health departments have been placed under administration, task teams have been appointed to oversee facility systems, industrial action prevents access to healthcare, there is a continuing crisis in the provision of oncology services and there is an increasing burden of disease – this all points to a struggling health system (Timeslive, 2018; Benatar, 2013). In 2018, the South African Council of Medical Deans called on the South

African government to prioritise the ongoing national health crisis, especially in light of the proposed implementation of national health insurance. Not only is the revival of dysfunctional and run-down public healthcare facilities necessary for ensuring the best possible outcome for the implementation of national health insurance, but a significant increase in the number of skilled healthcare professionals by means of adequate funding of health professional education and training is also essential (Timeslive, 2018). As stated by Benatar (2013), South Africa has the capacity to train skilled healthcare professionals, but doing so requires the prioritisation of academic platform improvement, thereby ensuring high-quality education and fair service conditions and instilling the values of person-centred care in healthcare professionals.

The Human Resources for Health strategy reports that South Africa has a considerable deficit of health professionals per population, in contrast to comparable countries such as Brazil, Chile and Argentina (South African Department of Health [SADoH], 2011). The identified shortage of South African healthcare professionals, coupled with the expanding burden and complexity of diseases and an increase in the workload of the public sector healthcare workforce, led to the Academy of Science in South Africa (ASSAf) demanding immediate attention to be given to the required transformation of national health professions education (ASSAf, 2018). An ever-increasing national population, which has resulted from medical advances leading to increasing the longevity of individuals, and, most notably, the provision of anti-retroviral treatment for an estimated 53% of people living with HIV and Acquired Immunodeficiency Syndrome (AIDS) (Gray & Vawda, 2018), places an additional burden on healthcare professionals, in particular. The progressive aging and resultant complexity of the HIV-infected population, who face a higher risk of disability, either resulting from the HIV infection itself or from treatment side-effects, is a reality (Basu, 2018; Gray & Vawda, 2018) and alters the patient case mix available for student training.

South Africa faces a unique quadruple burden of disease: the HIV/AIDS epidemic, a high rate of TB, high maternal and childhood mortality, high levels of injury and violence, as well as an increasing burden of NCDs (Basu, 2018; Pillay-van Wyk *et al.*, 2016). This quadruple burden of disease influences the variety and complexity of patient conditions healthcare students are required to assess and treat (Labuschagne *et al.*, 2014; Kent & de Villiers, 2007). With 43.4% of South African deaths yearly attributed to NCDs, 33.6% to HIV/AIDS and TB, and 9.6% to interpersonal violence and injuries, the extent of the burden of disease is apparent. Labuschagne *et al.* (2014) highlight the importance of widening the student training platform to ensure adequate exposure and training for healthcare students. An additional impact on the available institutional budgets and training opportunities for South African healthcare professionals, mostly medical students, is the yearly influx of an estimated 651 South African medical students who received their training in

Cuba. In accordance with the Nelson Mandela/Fidel Castro Medical Collaboration Programme (Medical Academic, 2019), these Cuba-trained medical students are required to complete their medical training in South Africa. Although the programme has been criticised for its high training costs, it continues to integrate hundreds of medical graduates, in addition to the 1 800 South African medical graduates annually, into the South African healthcare system. All South African medical schools are required to participate in integrating Cuba-trained students (Medical Academic, 2019), which leads to both healthcare platforms and tertiary education institutions experiencing immense pressure relating to funding and training opportunities.

A high annual attrition rate, of 25% of South African healthcare workers, is reported by the South African Department of Health (SADoH, 2011). Retention of healthcare professionals and skilled academics is jeopardised by financially attractive positions within the private sector, nationally and abroad, as well as poor working conditions in the public healthcare sector (Allen, 2020). Due to dwindling personnel numbers and an increasing and aging population, healthcare professionals are working longer hours (SADoH, 2011) and they encounter heart-breaking cases, death and low points of humanity on a daily basis (de Villiers, 2018). The severe lack of physical resources, and rising concerns for personnel safety on hospital premises (Maroela Editorial Staff, 2020; Mabuza, 2019; Chabalala, 2019) exacerbates further the challenging working conditions South African healthcare professionals face daily, resulting in low morale among healthcare workers (Allen, 2020; Scheffler *et al.*, 2015). Personnel safety does not only centre on physical safety, but also on safety from communicable diseases, most notably TB infection. Recent statistics indicate that, compared to the general population, South African healthcare workers are three times as likely to contract TB (O'Hara *et al.*, 2017) and six times as likely to contract drug-resistant TB (O'Donnell *et al.*, 2010). It is no surprise that healthcare professionals, locally and abroad, are increasingly experiencing serious symptoms of burnout (De Villiers, 2018; Dyrbye *et al.*, 2017), and subsequent mental health issues. Increased levels of burnout in healthcare professionals are associated with high personnel turnover rates, deteriorating teamwork and a decline in productivity (Dyrbye *et al.*, 2017) all of which place further strain on an already strained healthcare system.

The 43,6% of the South African population who live in rural areas are serviced by only 12% and 19% of all South African doctors and nurses respectively (Gray & Vawda, 2018) – this indicates that access to primary health care in rural areas needs improvement. A priority of South African healthcare education, in response to identified societal needs, is to train professionals who are prepared to serve in rural and often remote areas, which require a wide range of administrative, cultural, clinical and interprofessional collaborative practice skills (Singh, 2015; Kent & De

Villiers, 2007). In accordance with the levels of healthcare in South Africa (*cf.* Appendix A), the majority of patients are required to access their nearest primary healthcare providers, often travelling 3 km per foot to do so (Scheffler *et al.*, 2015). Patients are subjected to long waiting times, both at clinics and for referral to other healthcare services, resulting in an increased need for services to be provided at primary healthcare level (Scheffler *et al.*, 2015). Healthcare professionals are often required to work in townships, which are viewed as impoverished communities where residents live in shacks made of scrap metal and dirt floors, and they have no or limited access to running water and functional ablutions (Young, 2016), which relates to the context-specific training required if professionals are to continue delivering healthcare. These healthcare professionals are often required to adapt and solve problems according to the available infrastructure and resources, and are required to adjust to the needs of patients in order to deliver person-centred care (Scheffler *et al.*, 2015).

2.1.3 South African physiotherapy context

Developed countries, such as those in the Nordic regions, Australia and the United Kingdom, have a physiotherapist to patient ratio of >20:10 000, 10-15:10 000 and 5-10:10 000 respectively, compared to a sparse ratio of <1:10 000 in Africa (WCPT, 2019). Currently, 7937 physiotherapists are registered with the HPCSA in South Africa with an estimated ratio of 1-5 physiotherapists per 10 000 patients in the public and private sectors combined (WCPT, 2019). However, it is unknown how many of the country's registered physiotherapists are currently actively working in South Africa, as many practitioners retain their professional registration, even when they cease actively practicing, or emigrate.

In 2019, the total number of registered physiotherapy students was 2 172 (HPCSA, 2019) -- this number includes all students, not only possible final-year graduates. With only eight national physiotherapy training programmes in South Africa, compared to 74 and 41 training programmes available in the United Kingdom and Australia respectively (WCPT, 2019), the shortage of training institutions, combined with a shortage of highly qualified educators, is limiting the growth of the African physiotherapy profession (WCPT, 2019; Frantz, 2007).

The changing patient profile in South Africa, due in most part to the unique quadruple burden of disease and an increased life expectancy, results in more people at risk of disability, either directly or indirectly related to their main diagnosis or condition. However, such disabilities are rarely comprehensively managed, because the individuals affected lack access to care (Gray & Vawda, 2018). The limited care available and lack of access to rehabilitation, therefore, necessitates not only an increase in the physiotherapy workforce, but requires physiotherapists to adapt their clinical evaluation and management of these individuals (Basu, 2018).

2.2 STUDENT POPULATION

2.2.1 Global generational cohort

A mix of generations encountered in the current workplace results in a varied pool of life experiences, skills and technical abilities which are to be navigated by clear and constant communication (Vogenberg & Santilli, 2018). It is claimed that millennials influence the future of healthcare through the use of online resources and believe in lowering health costs (Vogenberg & Santilli, 2018), thus, consideration should be given to generational theory in the context of this research study.

Consideration of generational theory is also required when the intention is to educate a diverse undergraduate student population (Holyoke & Larson, 2009). As more learners are currently gaining access to tertiary education at various stages of their lives, the "adult audience" will definitely consist of a mix of generations, each with its own distinct characteristics (Holyoke & Larson, 2009). Table 2.1 provides a concise summary of the main definitions and characteristics of the generational cohorts of current undergraduate students. Generations omitted from the summary are the so-called Silent Generation (born 1921-1940) and Baby Boomers (born 1940-1960), as these generations are no longer prominent in undergraduate populations. Recent additions to the generational groups are Generation Z (Hussin, 2018; Keystone Academic Solutions, 2018) and Xennials (Wertz, 2018; Holyoke & Larson, 2009), the latter a micro-generation comprising a merger of Generation X and Generation Y. The present tertiary student is likely to belong to Generation Z, has been revolutionised by technology and displays different learning styles from their predecessors; these students are more hands-on and directly involved in the process of learning (Hussin, 2018).

To ensure the sustainable and valuable integration of educational methods, it is essential to consider the profiles of future tertiary students. Generation Alpha, the current pre-school and kindergarten population, born since 2010, are digital natives and are the most technologically literate generation to date (Nagy & Kölcsey, 2017). Information regarding the characteristics and learning styles of this generation is currently no more than forecasts, as this generation is, at most, only 10 years old. Generation Alpha will no doubt be exposed to increased screen time, due to technological advancements, and is, therefore, likely to be much more digitally literate (Nagy & Kölcsey, 2017). Shorter attention spans and increased access to information will also, as with

Generation Z, require adapted education strategies to satisfy their need for rapid progression and multitasking (Nagy & Kölcsey, 2017). The prediction that Generation Alpha will practice increased use of the internet, resulting in less social contact with their peers, will (Nagy & Kölcsey, 2017), according to the researcher, highlight the importance of nontechnical skills training to ensure person-centred care in healthcare settings. The researcher did not deem it applicable to add the sparse and purely speculative information regarding Generation Alpha to the descriptive table below. It should, however, be noted that Generation Alpha will probably follow in the education style footsteps of Generation Z, making the education strategies for Generation Z just as applicable to Generation Alpha.

Table 2.1: Description of relevant generational cohorts

ATTRIBUTES	GENERATION X	XENNIALS	GENERATION Y/MILLENNIALS	GENERATION Z
Birth years	1961-1980; 1960-1980 1964-1978	1977-1983	1981-2002; 1989-2000 1980-2004; born after 1982	1995-2009
Behaviours	Motivated by balance; self-reliant; ironic, cynical	Consider health and wellness and relaxation important; nostalgic; don't want to feel dependent on technology; analogue childhood with a digital adulthood; love-hate relationship with social media	Multitasking; ambitious, confident; high expectations of rapid progression; collaborative and supportive; consumerist, addicted to the media; team players who enjoy group activity	Desire responsibility; prefer face-to-face communication; social; mobile; digital; less carefree
Work style	Work to live; goal oriented; question authority	No definite data available	Work-life balance; fun-oriented; team oriented; mobile and change careers often; not loyal	Value social rewards and flexible schedules, want to do what is meaningful; speed more important than accuracy
Education style and need	Self-directed learning; clear and practical; do not require instant gratification; problem-solving; independent, outcome-oriented learners	No definite data available	Fast, random thought processes; pursue lifelong learning; active, independent learners who want an older mentor; expect technology in the classroom, enjoy real-world simulations and experiential learning; accustomed to digital devices; value "doing" rather than "knowing"; favour teamwork; struggle with critical thinking skills; desire frequent and immediate feedback	Group discussions and interactive environment preferred; need mentoring; learning has no boundaries; require constant feedback, structure, requires clear directions and transparency; visual, peer-focussed learners; expect technology and use of digital tools in the classroom

Sources: Hussin, 2018; Keystone Academic Solutions, 2018; Wertz, 2018; Van der Merwe, 2011; Holyoke & Larson, 2009.

Even though generational theory is often used as an excuse to justify behaviour, the influences of a rapidly changing society and advances in technology are undeniable. Both Generation Y and Z value teamwork and constant and immediate feedback, and have grown to expect the presence of technology to their classroom. Educators are required to work with the positive generational traits and transform the negatively viewed traits into socially acceptable behaviour in order to produce employable graduates. According to literature, the major educational styles and needs of Generation Y (Van der Merwe, 2011) and Generation Z (Keystone Academic Solutions, 2018) can be classified as experiential and engaging, and that they are learners who transform personal experiences into knowledge (Van der Merwe, 2011; Kolb *et al.*, 2000). Simulation is supported by the theory of experiential learning and by immersing students in a simulated environment; active participation, critical thinking and collaboration could be fostered in a contextualised environment (Thackray & Roberts, 2017; Arthur *et al.*, 2013). Active participation in learning allows students to learn collaboratively and demonstrate learnt skills, including communication skills and professional and ethical behaviour (Harder, 2018), in an environment closely resembling the clinical environment.

2.2.2 South African student population

The belief that an educated population will result in economic growth and success, including a strong civil society, has seen developed countries deliberately investing in the "massification" of higher education (Council on Higher Education [CHE], 2016). Government and institutional pressure is also felt within the healthcare education sector, on which there is mounting pressure to increase student numbers to address the healthcare skills shortages that have been identified (UFS, 2015; Labuschagne *et al.*, 2014; South Africa, 2014). In developed countries, increased accessibility of higher education to students from diverse backgrounds has seen tertiary student enrolment rates reaching between 70 and 80%, with Africa only averaging a meagre 6% (CHE, 2016). The need for South African universities to increase their student numbers in specifically identified health professions occupations, in line with the aim proposed by the Human Resources for Health South Africa (SADoH, 2011) and White Paper for Post-School Education and Training, is highlighted in the National Skills Development Plan (South Africa, 2017; South Africa, 2014). Although a major expansion in South African student enrolment has been observed since the first democratic election in the country in 1994, from 799 490 in 2008 to an estimated 1.1 million students in 2020/2021, South Africa is still lagging, considering the population size of other middle-income developing countries of comparable size (Jansen, 2018; Tjønneland, 2017). Student support has been identified by the national government as another essential element requiring attention from education institutions (South Africa, 2014). Merely improving student access does not appear to offer a solution to the need to increase the skilled workforce, as demonstrated by the fact that only approximately 15% of all South African students graduate (Lange, 2017; South Africa, 2012). The reason proposed for the low student throughput rate at tertiary institutions is that the current South African secondary education system is not preparing students adequately for tertiary education, resulting in students who struggle with basic language and comprehension skills when they commence their studies (Lange, 2017; Singh, 2015; South Africa, 2014; Kent & De Villiers, 2007).

Language skills have been identified as a key element in establishing a curriculum that seeks commonality with others (Singh, 2015). The 2016 Progress in International Reading Literacy Study reveals that nearly 8 out of 10 South African Grade 4 children are unable to read for understanding (Jansen, 2018), which highlights the shortcomings of the academic background of most South African university students (Jansen, 2018). In addition, South Africa has the unique situation of having 11 official languages (Alexander, 2018), with all South African universities currently only providing tuition in English, as primary language, thereby stacking the odds against student performance at tertiary institutions. Considering that isiZulu and isiXhosa are the two most commonly spoken national languages, and English is spoken by only one in 10 people at home (Alexander, 2018), tuition in English could negatively influence the students' learning experience and comprehension abilities. In higher education, literacy skills are essential for success and it has been established that there is a substantial difference between home-based literacy and school and academic literacy, which may result in poor school or academic achievement (Singh, 2015). Mathematical literacy is also deemed crucial for healthcare education, as this unique skill is essential for applying acquired knowledge and facilitating critical thinking (Kent & De Villiers, 2007).

As both international and national tertiary education institutions are now open to students from all sociodemographic backgrounds, a new set of challenges have emerged. Tertiary institutions now have student populations that are diverse in gender, race, caste, religion and geographical origins (ASSAf, 2018; Chen, 2017; Kapur, 2015). Extreme inequalities in relation to resource-poor secondary schools, an institutional culture favouring Black African student success rates, and poverty all influence the practice of tertiary education (Jansen, 2018; Schreiber & Yu, 2016). Because government subsidies are dependent on student enrolment and pass rates, many South African universities have lowered their admission criteria to provide more ill-prepared students access, for which they compensate with easy-to-mark assessments, and allowing up to three assessment opportunities to pass (Jansen, 2018). To address the problems that have been identified, South African tertiary curricula have subsequently been adapted to provide students access to extended curricula, in order for students to engage in intensive literacy and language development (US, 2019; Lange, 2017; Kent & De Villiers, 2007). The gap between literacy skills developed at school and those literacy skills demanded by higher education reveals the under preparedness of students entering the tertiary education setting (Prince & Firth, 2017). The blame for the unequal student experiences of, and outcomes in, the tertiary education setting has been placed on the vast differences in quality of secondary schooling (Prince & Firth, 2017). The National Benchmark Test (NBT) project was commissioned by Universities South Africa in 2005. All first-year university applicants are required to write the standardised NBTs, which assessed university readiness by evaluating competence in mathematical literacy, academic literacy and quantitative literacy, which made a universal evaluation of student competency possible (Addinall, 2019; Centre for Educational Testing for Access and Placement [CETAP], 2018). Results obtained from both the NBTs and the National Senior Certificate assist tertiary institutions to select and place students in appropriate programmes (US, 2019; CETAP, 2018). Curricular development at tertiary level is also influenced by students' underperformance in NBTs, and foundational, extended and augmented courses have been developed to assist students with the transition into the tertiary education environment (CETAP, 2018).

In addition to access to and availability of healthcare programmes is the need for resilience in current healthcare students to survive and thrive in the evolving and ever-changing work environment (Sanderson & Brewer, 2017). Healthcare students are expected to work in demanding conditions, which have been linked to burnout in medical students (IsHack *et al.,* 2009). The effects of burnout in healthcare professionals include poor health of the healthcare provider, loss of empathy, depersonalisation and a decreased sense of accomplishment (IsHack *et al*., 2009). Student wellness has, therefore, rightfully become a major focus area in tertiary education, especially due to the increased prevalence of psychopathology amongst students (Bantjes *et al.*, 2019). Healthcare students, specifically, have reported feeling increasingly stressed, anxious and under constant pressure (Koen *et al.,* 2018), which impacts their overall wellbeing and academic performance negatively. Students are not only at risk of mental illness, but physical wellbeing is jeopardised by poor nutritional intake and lack of exercise-related activities, with both being reported as well beneath the recommended norms in healthcare students at the Faculty of Medicine and Health Sciences, Stellenbosch University (Koen *et al.,* 2018). Regular participation in physical exercise and relaxation, resilience development and stress management training have been found to mitigate the risk of burnout (IsHak *et al.,* 2009). Various resilience-building methods are available and range from theory-based teaching, student wellness programmes and teaching students about coping strategies, such as mindfulness (Farquhar *et al.,* 2018). It should, however, be noted that developing resilience is mostly an internal process, which requires diverse approaches, as different student populations and countries have different learning approaches and, therefore, do not experience the same stressors (Farquhar *et al.,* 2018). The role of mentorship and collective resilience-building activities should be explored (Farquhar *et al.,* 2018), however, ultimately, the student population should feel comfortable with the resilience-building methods used by their institutions.

Further impacting on student wellbeing, especially in South Africa, is the well publicised death rate of the student population. In 2019, 24 student deaths were reported, with others presumably remaining unreported (Somdyla, 2019), which makes student safety a major stressor in the South African tertiary student population.

One of the hypotheses being put forward for students failing to address all aspects of their wellness (physical, mental and social), is financial insecurity (Bantjes *et al.,* 2019; Koen *et al.,* 2018), as the cost of enrolling for tertiary education in South Africa is well beyond the financial capabilities of the average South African household (Jansen, 2018). Funding sources for students, that is, study bursaries, are one way of reducing the financial impact of tertiary education on households; however, not all students are fortunate enough to secure bursaries to assist with the financial burden. This impact should be considered when selecting resilience development strategies, to allow for a diverse approach that addresses all identified student needs.

2.2.3 South African physiotherapy student population

The South African undergraduate physiotherapy degree (B.PhysT, B.Sc Physio or B.Physio) is a four-year degree consisting of practical training in all aspects of the physiotherapy scope of practice (Physiopedia, 2017). The degree is scaffolded in the sense that the first year commences with basic theoretical introductory work and students are gradually integrated into supervised practice, with the fourth and final years of study covering the majority of clinical training (Physiopedia, 2017; Unger & Hanekom, 2014). Students are also expected to complete a group-based physiotherapy research project in accordance with the National Qualifications Framework (NQF) requirements for Level 8 (SAQA, 2018). South African physiotherapy students are enrolled in the programme after a selection process, which is in force at all eight tertiary institutions recognised as physiotherapy training institutions (Physiopedia, 2017). An appointed selection committee reviews all student applications and selects candidates based on academic merit (US, 2019). In order to be considered for selection, a student is required to have achieved a minimum achievement level, as required by the physiotherapy training institutions, for identified mandatory subjects, including mathematics and life and physical sciences (US, 2019).

The student's NBT result is also taken into account during the selection process (US, 2019). In addition to the above-mentioned criteria, a quota system has also been instituted to select students based on their race and gender, in line with the enrolment targets set by the Department of Higher Education and Training (US, 2019).

The cost of studying physiotherapy in South Africa amounts to roughly R52 000 per year, which is significantly higher than the tuition fees of, for example, an undergraduate degree in liberal arts (R43 000 per year), but still less than studying medicine, which ranges from R68 000 to R84 000 per year across the six years of study (US, 2019). What should also be considered is additional costs for equipment, uniforms and professional body registration (US, 2019), which are not necessarily required by other degrees.

Adding to the financial and selection criteria challenges, physiotherapy undergraduate programmes are recognised as among the programmes with the most demanding course workloads, outranking medicine and dentistry (Russell, 2019). Balancing the approximately 16 hours per week mandatory clinical work, an estimated 17 hours per week lecture contact time and roughly 13 hours per week independent study (Russell, 2019) is challenging. Physiotherapy students are exposed to similar stressors, and face a risk of burnout (Section 2.2.2) similar to that of other healthcare professions students. Physiotherapy students are, furthermore, faced by challenges of early patient exposure in various clinical environments, sometimes as early as their first year of study (Unger & Hanekom, 2014; US, 2019), which adds to the emotional burden experienced by these students (De Villiers, 2018; Dyrbye *et al.*, 2017). The increased stress experienced by South African physiotherapy students, who report receiving minimal healthcare assistance (Janse van Vuuren *et al.*, 2018), adds to the physical and mental challenges encountered in a South African undergraduate physiotherapy degree.

The behavioural traits and learning needs of, and environment in which the international and national undergraduate student profile functions are essential for guiding healthcare educators in developing learning, teaching and assessment practices. The following section will detail the current learning, teaching and assessment practices of both international and national healthcare education, with a focus on physiotherapy education.

2.3 LEARNING, TEACHING, ASSESSMENT PRACTICES

2.3.1 Globally

Patients seek the best available care when they are unwell or confronted with an illness, with the current definition of best care not being limited to the provision of medical care only, but consideration of the patient as a whole for overall wellness (Choi *et al.*, 2017). It is imperative that educators adjust healthcare teaching strategies to ensure a person-centred approach to healthcare delivery (WHO, 2016). Policy makers and stakeholders in higher education are, thus, urged by education research, as well as the 4IR, to shift their focus away from the traditional lecture environment, towards a more student-centred, transparent learning approach, where students are able to apply knowledge (Picchi, 2015; Van der Merwe, 2011). The 4IR moves beyond the introduction of electronics and technology, towards the blurring of lines between the biological, physical and digital worlds, with the introduction of artificial intelligence, nanotechnology and IoMT (Butler-Adam, 2018; Hussin, 2018; Vogenberg & Santilli, 2018). Education 4.0 was created in response to the alignment of human attributes, skills and technology in the 4IR (Hussin, 2018). Education 4.0 expects students to not only acquire the required knowledge and skills, but also to engage with the educational environment in a variety of ways, which necessitates education reform (Hussin, 2018). Although informal conversations have taken place between leaders at the economic forefront regarding the imminent 5th industrial revolution (5IR) (Lauchlan, 2019), no research has been published regarding the 5IR, which limits discussion thereof in the current study. It is, however speculated that the 5IR, also considered as the trust revolution, will focus on the human factor, including values and ethics of both industry and individuals (Lauchlan, 2019). Although no research describes the unique attributes the 5IR will require from healthcare professionals, it is clear that its focus will probably be a person-centred and sustainable approach to healthcare provision and management.

Learning is not limited to the classroom, as is evident from educational strategies such as blended learning, which require educators to fulfil a facilitative role rather than that of instructor (Hussin, 2018). The shift away from traditional educational strategies is evident in a greater emphasis on deliberate practice and mastery learning activities, the inclusion of more project-based and hands-on learning, and the need to identify students' own learning techniques (Hussin, 2018). In healthcare education, a number of these aspects are already addressed, especially by the inclusion of simulation in many healthcare programmes. Data interpretation and inclusion of students in updating curricula are, however, newer concepts in Education 4.0 that still require attention.

To facilitate the acquisition of all required skills and graduate attributes, the global trend in healthcare education over the past decade has been towards what has been learnt by students, rather what is taught. This shift in education focus has resulted in the blending of a variety of new and old teaching strategies, to achieve the desired educational outcomes more effectively. Although students engage in research projects, the appraisal of information sources is paramount to healthcare students' scholarly role, fosters lifelong learning (HPCSA, 2014), and should be emphasised in programmes.

Further influencing teaching and learning is the growing number of adult learners (see concept clarification) enrolled at tertiary education institutions worldwide, who have necessitated the incorporation of adult learning principles by healthcare educators. Adult learners are reported to demonstrate specific learning traits, for example, they desire immediate and frequent feedback, demonstrate internal motivation for knowledge acquisition and require insight into the value of educational content prior to engaging in learning (Spies *et al.*, 2015). Adult learners are also predominantly problem-centred and value the immediate application of their gained knowledge (Spies *et al.*, 2015) to an experiential problem-solving situation (Taylor & Hamdy, 2013).

In addition to global teaching and learning adjustments, assessment practices in health professions education has aimed to adapt in accordance with changes in education directives. A programmatic approach to assessment has been suggested by authors (Van der Vleuten *et al.*, 2012) to optimise bias reduction in healthcare assessment. A programmatic assessment approach includes assessment methods and instruments that optimise learning and provide feedback, with high-stakes assessments being based upon a combination of multiple assessment sources in or across methods (Van der Vleuten *et al.*, 2012).

Five types of assessment are mainly utilised in healthcare education – these methods will only be mentioned broadly by the researcher. Most formal assessments comprise either constructed-response and/or selected-response written assessments (Yudkowsky *et al.*, 2020). Written assessments may be either paper-based or computer-based, with selected-response assessments having many practical advantages and showing to be valid (Yudkowsky *et al.*, 2020; UFS, 2020). Contrary to these are oral examinations which, although allowing for thinking and reasoning, introduce subjectivity due to its traditionally unstructured format, which may jeopardise assessment validity (Yudkowsky *et al.*, 2020). Performance assessments are widely used to assess measurable skills, most notably in the objective structured clinical examination format. Simulation-based performance assessments, which use standardised patients, have become an integral part of health professional assessments (Yudkowsky *et al.*, 2020; Swart *et al.*, 2019). Assessment and treatment of patients within the clinical environment are evaluated either at a specific point in time, or over extended periods of time, and is another unique form of assessment that carries a large weighting in healthcare programmes (UFS, 2020; Yudkowsky *et al.*, 2020). Narrative and portfolio assessments are also widely used in healthcare education, and could include qualitative descriptions of student encounters and reflective components in the form of narrative student reflections, which may be used for student assessment (Yudkowsky *et al.*, 2020).

Each assessment method has its own, unique advantages and disadvantages relating to what (behaviour, attitudes and skills) are measured and how they are being measured. Literature advises that a variety of methods should be used to assess learning over required roles and competencies (Yudkowsky *et al.*, 2020; Van der Vleuten *et al.*, 2012). Although it is speculated that the process of tertiary education assessment will change, and will become more practical (Hussin, 2018), this will not influence healthcare programmes, as global healthcare programmes already include clinical and practical-based assessments.

2.3.2 In South Africa

The South African education system still rests on the pillars of dominance, control and power, with a bias towards memorising skills and intelligence quotient (IQ) – resulting in those not in power being forced to perform tasks in line with the requirements of those in power (Falkenberg, 2017). This situation is, however, changing, as digital intelligence becomes freely accessible through continuous connectivity (World Economic Forum, 2019). In the wake of the 4IR, it stands to reason that the health professions education sector in South Africa requires adjustment to ensure the future employability of graduates. Programme renewal, which results in university curricula making relevant contributions to society, which is described as critical citizenship (Bitzer & Costandius, 2018), is essential to ensure institutional sustainability, optimal preparation of students for their professions and the desire and ability of students to make relevant societal contributions.

Change shapes the future of quality tertiary education, but change comes with numerous challenges, specifically for tertiary institutions in emerging economies like that of South Africa (Singh, 2015). The drive to increase student numbers, a lack of funding, an ever-changing student population, graduates who demonstrate a lack of skills, extreme inequalities and, currently unique to South Africa, a call to decolonise the curriculum, are all challenges faced by higher education (Mekoa, 2018; Bradlow, 2017; Tjønneland, 2017; CHE, 2016). Curriculum stasis is a universal problem, specifically in institutions facing more pressing matters, such as ensuring quality teaching and increasing graduate success rates (Jansen, 2017). Even though curriculum reform over the past decades were impressive in nature, the curriculum content, pedagogy and assessment procedures remained relatively unchanged (Jansen, 2017). During 2015-2016, South Africa experienced an unprecedented student protest movement, #FeesMustFall, which demanded free tertiary education and decolonisation of both traditionally white institutions and curricula (Jansen, 2017; Tjønneland, 2017).

Decolonisation, also referred to as Africanisation, is described as the adaptation of curricula to ensure that teaching and learning occurs in a way that considers and addresses unique African realities (Letsekha, 2013). Curricular inclusion of indigenous knowledge and practices has, until now, not been prevalent (Mekoa, 2018), even though being adopted as a government policy after the failure of tertiary education institutions to adapt in the more than 20 years marking the post-apartheid era. The fact that many academic programmes continue to be designed around irrelevant pedagogies, and containing obsolete knowledge forms, sparked the #RhodesMustFall campaign in 2015 (Bitzer & Costandius, 2018). Subsequent arguments have been made in favour of the equal treatment of all knowledge forms, which would enable a broadening of indigenous knowledge and practices and address vital absences from the curriculum (Jansen, 2017). Stakeholders are, however, cautioned that experts in the field should be actively engaged in the curriculum narrative, to provide every student with quality education that will enable their confident engagement in the worlds of science, knowledge and authority (Jansen, 2017).

The resultant shift, from generic education towards a more utilitarian purpose, with a focus on skills development, has seen an increased emphasis being placed on outcomes-based tertiary education (Lange, 2017; CHE, 2016; South Africa, 2014). Since 1990, South African higher education has undergone a multitude of curriculum reforms to phase out the curricular influence of apartheid and move towards a curriculum fostering a common identity (Lange, 2017). South African education authorities adopted an outcomes-based approach to teaching in 1997, with the NQF guiding curriculum change to ensure that demonstrable learning outcomes that are expected of students by both institutions and education regulatory bodies are embodied in curricula (SAQA: Strategic Support Unit, 2000). The implementation of the NQF resulted in learning outcomes being tailored to address the need for skilled graduates, and to ensure skills development for the majority of the South African population (Lange, 2017; Jansen, 2017). Lange (2017) refers to the 2013 Council on Higher Education (CHE) Task Team on the Flexible Curriculum, which proposed the adaptation and scaffolding of teaching and learning practices, to allow for student support and more meaningful learning experiences, taking into account how students make sense of information. In an attempt to bring about change in teaching and learning, institutional development with regard to transformative and adaptive educational strategies is essential (ASSAf, 2018). For educators to be able to facilitate learning experiences for the growing number of healthcare students, the ASSAf recommends expanding use of information and communication technologies (ASSAf, 2018). In times of crises where the reality of a decrease in lecture contact time exists, due to student protests or pandemics such as the COVID-19 pandemic, the use of information and communication technologies is essential.

Daggett (2017) highlights the critical skills expected of graduates if they are to be classified as appointable in working environments of the future. These critical skills include complex problem-solving skills, critical thinking, coordinating and negotiating with others as well as emotional intelligence, to name a few (Daggett, 2017). A matter of concern is that South African physiotherapy graduates are currently demonstrating a lack of the aforementioned skills (NPEF, 2019). A shift in instruction methods is, therefore, required, towards including increased use of relevant technology and activities focusing on development of students' reasoning and personal skills (Daggett, 2017).

Fostering interprofessional education (IPE) and collaborative practice has also been identified as essential elements of providing effective healthcare (Li-Sauerwine & King, 2018), and should be implemented and expanded in the undergraduate healthcare curriculum (ASSAf, 2018). In light of the national burden of disease and the government's focus on primary healthcare (*cf.* Section 2.1.2), patients are increasingly managed in community settings by a diverse team of health professionals (Olson & Bialocerkowski, 2014), a situation that highlights the importance of good interprofessional communication and collaboration. To combat the reported loss of continuity in patient care, IPE has been integrated in healthcare programmes globally and nationally, in an attempt to improve interprofessional teamwork and communication (Olson & Bialocerkowski, 2014) and essentially person-centred care (WCPT, 2019; HPCSA, 2019; Macauley, 2018; Phillips *et al.*, 2017; Chartered Society of Physiotherapy [CSP], 2013).

Financial constraints also require consideration when the South African tertiary educational environment is analysed. Increasing numbers of students enrolled at South African universities are dependent on government funding for tuition fees, textbooks and accommodation, but they often lack basic living expenses, and even food (Jansen, 2018; South Africa, 2014). Financial constraints also impact the availability and accessibility of technology in the education environment. The lack of accessibility to and use of technology by students and educators in teaching and learning institutions are reported in the White Paper for Post-School Education and Training (South Africa, 2014). Other technological challenges include the ineffective use of the modest number of available technologies, limited accessibility of internet services to students, and a lack of funding for regular upgrades (Singh, 2015). However, despite limited financial resources, the majority of the world population have access to cell phones, which demonstrates the importance that teaching and learning "move with the times" and increasingly incorporate technology within the classroom, to ensure the success of students in a technological world (Daggett, 2017).

The assessment of healthcare students in South African healthcare education remains dominated by summative, written, paper-based, practical-based and workplace-based assessments (Beets, 2009). Although integrated assessments have been advocated, information regarding its implementation is lacking (Beets, 2009). Anecdotal evidence indicates the use of peers and portfolios for assessment purposes, but limited published research supporting this is currently available.

2.3.3 Global physiotherapy education

Physiotherapy education is regulated and guided by country-specific councils and associations that outline the attributes required for graduating physiotherapists (WCPT, 2019; HPCSA, 2019; Macauley, 2018; Phillips *et al.*, 2017; CSP, 2013). The global physiotherapy curriculum consists mainly of theoretical and practical components enacted in university and clinical settings respectively (Røe *et al.*, 2019; Johnston *et al.*, 2018).

A total of 1 000 mandatory clinical hours are required by physiotherapists all over the world in preparation for immediate practice upon graduation (Wright *et al.*, 2018; CSP, 2013).

The 2011 World Report on Disability encourages support from developed countries to build and strengthen both education and research capacity in universities situated in developing economies (WHO, 2011), as improving research capacity has the potential to produce contextualised research that could benefit the population (O'Sullivan *et al.*, 2017). In Africa, specifically, improving physiotherapy educationalists' tertiary education and increasing research capacity has been highlighted as a serious challenge facing the provision of undergraduate education (Jansen, 2018; Frantz, 2007). Quality education through global partnerships has the potential to translate into better rehabilitation services, resulting in improved patient outcomes and patient quality of life (O'Sullivan *et al.*, 2017).

The competency of entry-level physiotherapists has been identified as a concern, specifically in the areas of clinical reasoning, problem-solving and interprofessional teamwork (Afzal, 2017). With the clinical education setting becoming progressively challenging due to the increased medical complexity of patients, students are expected to work in higher-risk environments (Johnston *et al.*, 2018), which necessitate education focus on ways to develop reasoning processes in undergraduate students. However, due to the global aim to increase student numbers, and due to the limited capacity of healthcare services, fewer clinical education opportunities are available (Johnston *et al.*, 2018). Alternative educational methods, in the form of SBE, are being explored and implemented in countries such as the United Kingdom, the United States of America and Australia, to name a few, to assist physiotherapy students to acquire knowledge and practical and clinical skills (Johnston *et al.*, 2018; Wright *et al.*, 2018; Blackford *et al.*, 2015; Blackstock *et al.*, 2013).

2.3.4 South African physiotherapy education

The HPCSA, in accordance with the Health professions Act No. 56 of 1974, is responsible for accrediting the education, training and registration of all healthcare professionals registered under the Health Professions Act (HPCSA, 2019). The minimum standards expected by the HPCSA of a physiotherapy graduate (Appendix B) is frequently adjusted and benchmarked with international professional standards (HPCSA, 2019), however, the mode of educational delivery remains the prerogative of each institution.

The South African Qualifications Authority (SAQA) states the purpose of the undergraduate physiotherapy degree to be to provide the South African population with skilled, knowledgeable and independently functioning physiotherapists who are, amongst other skills, able to provide effective and efficient treatment services that are accessible to all and is based on research evidence. The manner in which the physiotherapy profession utilises research evidence in practice to manage patients has led to an interesting discourse. Veras *et al.* (2016) report a challenge facing the physiotherapy profession, namely, whether the profession is an evidence-based practice, that bases treatment on the best available evidence, integrated with professional practise, expertise and ethical principles, or whether physiotherapy practice is based on evidence that supports treatment choices. No consensus regarding the labelling of how evidence is utilised to support physiotherapy practice has been reached. However, the importance of physiotherapy students being responsible consumers of research evidence to support treatment and management choices, is undeniable, irrespective of the position of the profession regarding being evidence-based or using evidence to support treatment choices.

To achieve the output of skilled and knowledgeable physiotherapists, educators, when they design a curriculum or module, are guided by specific SAQA exit-level outcomes (Appendix C). Generic critical cross-field outcomes, which are relevant to all higher education teaching and learning, are developed by each physiotherapy department, according to the expected minimum requirements and graduate physiotherapy attributes prescribed by SAQA (*cf.* Appendix C) and the HPCSA *cf.*

(Appendices B & D) (SAQA, 2018).

Quality undergraduate training is dependent on adequate education resources (Frantz, 2007). African and, specifically, South African resources are not only limited in terms of human resources, but also by a lack of funds and equipment (Frantz, 2007). However, merely having education equipment does not constitute a good education system. Both students and educators should have access to quality, current literature to drive the quest for evidence-based teaching and learning (Frantz, 2007). In South Africa, the majority of physiotherapy practitioners lack postgraduate qualifications; approximately only 20.5% of practitioners hold Master's and/or Doctoral degrees (Cobbing *et al.,* 2017). In Canada, approximately 40.3% of practitioners hold postgraduate degrees (Mistry *et al.,* 2014). Comparatively, the postgraduate qualifications of African physiotherapists seem lacking. In addition to increasing much-needed institutional income generated by research, supporting South African physiotherapy-based research is crucial for improving the research capacity of physiotherapy educators, providing teaching and learning content and methods for students that are based on the best available evidence (Jansen, 2018). Even more important is support for health professions education (ASSAf, 2018), with supporting contextual research to empower healthcare educators with skills and knowledge to provide accurate and effective teaching and learning opportunities. The development of national physiotherapy research capacity has, according to the researcher, the ability to transform the profession and ensure students continue to participate in self- and professional reflection and lifelong learning.

Clinical reasoning and problem-solving are two essential competencies that graduates are required to develop through their participation in the physiotherapy programme, and which are also expected by both regulating authorities and employers. A qualitative study in the Netherlands found that physiotherapy students develop their clinical reasoning skills by means of comparison and reflection while observing professionals (Wijbenga *et al.*, 2018). Wijbenga *et al.* (2018) propose that, to foster the development of clinical reasoning abilities, programme developers aim to incorporate a variety of multidisciplinary settings and patient presentations in clinical placements. South African physiotherapy students are already exposed to a wide variety of complex patients in multiple environments, however, considering the challenges facing the national healthcare and education sectors, especially limited personnel numbers, learning through observation and reflection does not seem feasible at present. Furthermore, clinical educators and supervisors might, despite being content proficient, not be able to provide the constructive student-centred clinical education that is required, due to a lack of training in current teaching and learning methodology (Mungroo, 2019; Archer, 2011).

A study that investigated the learning styles of physiotherapy students at a South African physiotherapy training institution, found that students learned best during practical sessions, but still required visual and verbal cues (Hess & Frantz, 2014). The results, even though biased towards the female population and based on only one student cohort, demonstrate that real-life experiences and simulation would appeal to the majority of undergraduate physiotherapy students' learning styles (Hess & Frantz, 2014). The results of Hess and Frantz's (2014) study, therefore, promotes a hands-on practical approach to teaching and learning. Students engaged in teaching and clinical environments are more likely to feel more confident in their skills (Hess& Frantz, 2014). A national occupational-therapy-based study reports that graduates exhibited shortcomings in certain technical skills and confidence (Naidoo *et al.*, 2014), while, in comparison, physiotherapy students perceived themselves as relatively well prepared for the clinical environment (Talberg & Scott, 2014). The different reported feelings of competency of the two groups of students may be due to the physiotherapy training institution where the study was performed employing strategically placed clinical educators (Talberg & Scott, 2014), which may fulfil students' requirements of real-life experiences (Hess & Frantz, 2014), which they can observe (Wijbenga *et al.*, 2018) and take part in during learning.

Even though few South African undergraduate students are defined as fully adult learners (refer to the concept clarification), they demonstrate some key andragogical qualities, including the need for immediate feedback, active implementation of knowledge gained, and valuing teamwork (Spies *et al.*, 2015; Van der Merwe, 2011). It should be the educator's inherent aim to foster these andragogical qualities, to promote self-efficacy and internal motivation for lifelong learning (Spies *et al.*, 2015). Arnett (2000) in Buskirk-Cohen *et al.* (2016) coined the term "emerging adulthood" for people aged 18-25 years who are free of normative societal roles, have the potential to explore a variety of life and work goals and who reflect on the current political and economic climate. In this research study, the researcher held the view that, instead of grouping South African undergraduate healthcare students as either exclusively traditional learners or only non-traditional (adult) learners, they should rather be defined as *potentially emerging adult learners*. South African undergraduate healthcare students, irrespective of age, are still emerging and developing the skills and traits of adult learning. Although, according to Arnett's (2000) definition, the majority of South African undergraduate healthcare students can be categorised as emerging adults, it does not guarantee that they will mature into adult learners, as was demonstrated by Spies *et al.*'s (2015) study on postgraduate nursing students.

Taking into account the inadequacy of the current secondary schooling system, and its failure to produce independently thinking and reasoning school leavers (*cf.* Section 2.2.2), coupled with increased access to tertiary education (*cf.* Section 2.2.2), the reality is that not all undergraduate students will necessarily achieve adult learner status. However, when reflecting on the generational cohorts (*cf.* Table 2.1) within the tertiary education system, it is evident that, even though students are not exhibiting adult learning principles in its entirety, the current student population does exhibit some andragogical traits. Therefore, learning styles of both traditional and adult learners should be considered when integrating SBLEs, to ensure engagement of the student population and achieving the desired learning outcomes. From the above-mentioned, it is clear that active participation in SBLEs, with subsequent reflection and feedback, should satisfy both traditional and adult learners.

Regarding the South African undergraduate physiotherapy programme, the majority of universities offering the physiotherapy programme have adopted a combination of summative and high-stakes assessment in their assessment policies, none of which incorporates simulation. During the academic year, students are exposed to practical and clinical assessments in a formative fashion. At identified points in time during the academic year, students' practical and clinical skills are assessed in a summative manner, and they receive feedback after the assessment. During this assessment cycle, progress to the next level of study is not indicated. At the end of the academic year, student progression to the next level of the programme is determined by means of high-stakes assessment. Two evaluators are present during the high-stakes assessment and no feedback is provided upon assessment completion, except to indicate if the student was successful in progressing to the next programme level. Individual physiotherapy departments differ regarding the weighting of the assessment marks, but all utilise a combination of formative, summative and high-stakes assessment.

As is evident from the discussion in this section, the need to adapt teaching and learning practices is clear. The reported lack of physiotherapy graduate skills (NPEF, 2019) and students' desire for active participation in learning (Wijbenga *et al.*, 2018; Hess & Frantz, 2014) motivates the exploration and integration of simulation in the teaching and learning environment.

2.4 SIMULATION-BASED EDUCATION

2.4.1 Education theories

Knowledge of relevant education theories are essential for informing teaching practices, by providing support for the selection of instructional strategies, and to align evaluation strategies with the learning objectives and overall programme goals (Torre *et al.*, 2006). Education paradigms, also described as worldviews, refer to the most commonly accepted theories and beliefs, which are intertwined to inform teaching and learning (Bearman *et al.*, 2018). The researcher holds a pragmatic constructivist worldview, which influenced the methodological aspects of the research directly, namely, constructing a framework for simulation integration by means of collected quantitative and qualitative data. The pragmatic research paradigm also dictated how data was analysed and interpreted (Kivunja & Kuyini, 2017) by applying content analysis and quantitative analysis. The researcher aimed to explore the authoritative knowledge gained from expert opinions to collect and contextualise (interpret) the research data (Kivunja & Kuyini, 2017).

The building blocks of education paradigms are the learning theories that inform educators how students learn, and this information is essential to identify the way teaching is enacted (Nestel & Bearman, 2015). During the initial design phase, learning theories play an important role in identifying, shaping and substantiating programme and curriculum design, instruction, assessment and department development (Bearman *et al.*, 2018; McGaghie & Harris, 2018). Consideration of learning theories during the programme design phase will ensure that the overarching programme outcomes are achieved, in line with the way students are reported to learn.

As with any education tool, it is essential to know how the instructional approach is grounded in education theory and its applicability to the student population. SBE is rich in diversity and spans the use of basic skill trainers (part-task trainers and anatomical models), computer-based programs, virtual reality, case studies, medium- and high-fidelity simulations (simulated patients, role play, high-fidelity manikins). Due to the variety of simulation modalities, educators draw on a variety of learning theories and education principles to inform instruction by means of SBE, thereby demonstrating the value of this learning method (*cf.* Table 2.2) (McGaghie & Harris, 2018; Torre *et al.*, 2006). Table 2.2 summarises the most notable learning theories and education principles that are applicable to SBE, including how these theories and principles are applied to SBE.

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Table 2.1: Learning theories informing simulation-based learning

LEARNING THEORY	EDUCATION PRINCIPLES	CITATION	SUMMARY	IMPLICATION FOR SBLES
Behaviourism	Deliberate practice Mastery learning	Bearman *et al.*, 2018; McGaghie & Harris, 2018	Focussed on demonstrated behaviour and modifying behaviour as evidence of learning, knowledge acquisition and competence.	Defined learning objectives, precise measurement of behaviours and provision of actionable feedback result in cognitive enrichment and memory formation.
Cognitivism	Cognitive load theory Scaffolding Social cognitive theory	Bearman *et al.*, 2018; McGaghie & Harris, 2018; Reedy, 2015	Learning viewed as a systematic cognitive process, forming new understandings by organising known information with newly obtained information. Considers the context, volume, complexity and design of a learning experience.	Engagement in the simulated environment in order to instil and maintain self-efficacy in a contextual setting.
Constructivism	Experiential learning Gibbs' reflective cycle Transformative learning Threshold concepts Complexity theory Flipped classroom model Blended learning	Røe *et al.*, 2019; McGaghie & Harris, 2018; Dalton *et al.*, 2015; Fenwick & Dahlgren, 2015	Considers that the basic knowledge and individual learner perceptions, experiences and ideas are used to construct both new knowledge and meaning. Also examines the non-linear interaction of living phenomena (e.g., learning) with social and material things, enabling a co-participative learning process.	Executing the intended task, with inclusion of feedback and engagement in reflective practice to facilitate learning.
Social learning theory	Situated learning Cultural-historical activity theory	Eppich & Cheng, 2015a; Braungart *et al.*, 2008	Learning is a social process that considers the learner's personal characteristics, patterns of behaviour and the impact social factors and context have on this process. Considers both contextual and historical societal viewpoints.	Allowing observation opportunities prior to executing the intended task, allowing for internal self-regulation and control processes.
Humanism	Self-directed learning	Torre *et al.*, 2006	Learning is described as a personal act, where the learner is internally motivated to activate and sustain new understanding, affects and performances, to reach their optimal capabilities and essentially become autonomous.	Computer-assisted simulations, as well as problem-based scenarios, can encourage self-directed learning.

Simulation-based learning in healthcare is primarily grounded, albeit not exclusively, in behaviourism, constructivism and cognitive theory (McGaghie & Harris, 2018; Torre *et al.*, 2006). Behaviourist education theory refers to the acquisition of a skill, with no independent activities of the mind involved, which can be achieved by means of simulation using skills- and part-task trainers (Arthur *et al.*, 2013). Students are expected to deliberately practise a specific skill in order to demonstrate mastery of the skill. However, mastery in healthcare practice does not solely rely on learned motor behaviour, but requires demonstration and integration of various cognitive, psychomotor, social, professional and affective responses (McGaghie & Harris, 2018).

The constructivist and cognitive learning theories share many similarities, and differ in some ways. Cognitive learning theory emphasises cognition over effect – knowledge is passively transferred to the student and is related to previously gained knowledge or similar situations (Ertmer & Newby, 2013). Constructivism, albeit similar to the cognitive learning theory, emphasises the students' creation of meaning from previous experiences and reflection, rather than the creation of meaning through information being provided (Ertmer & Newby, 2013). With constructivism, the emphasis is on content knowledge being embedded in the situation, to encourage active application of ideas from multiple perspectives, while a cognitive approach appreciates the knowledge provider's perspective, which is then applied to situations requiring reasoning and problem-solving (Ertmer & Newby, 2013). Both constructivist and cognitive learning theories are rooted in students playing an active part in the learning process, in addition to environmental engagement, with emphasis on the importance of reflection (Ertmer & Newby, 2013).

Educators aim to train healthcare professionals who are able to reason critically and solve problems, and to consider both contextual and social factors when navigating the ever-changing clinical environment. Dramatic changes in the prefrontal cortex, the area in the brain responsible for problem-solving, planning and decision-making, have been reported to occur in adults between the ages of 18 and 25 years, and these changes should therefore guide the educational strategies incorporated in tertiary education (Buskirk-Cohen *et al.*, 2016). It is imperative that more than one learning theory is used, by means of carefully considered instructional design, so that students benefit optimally from the various SBLEs, with the specific aim of assisting them to develop their reasoning abilities.

2.4.2 Simulation benefits

With fewer clinical opportunities available to students due to the decrease in the training platform and increase in student numbers, the training of healthcare professionals requires adjustments, to ensure the continued throughput of skilled graduates (Johnston *et al.*, 2018; Wright *et al.*, 2018;

Østergaard & Dickman, 2013; Bandali *et al.*, 2008). The global increase in the burden of disease is placing additional strain on already strained healthcare budgets, which are a result of a decrease in government funding, more patients accessing healthcare due to increased life expectancy, and fewer patients having comprehensive access to healthcare plans (Vogenberg & Santilli, 2018). These organisational and economic challenges in healthcare settings are forcing educators to explore alternative teaching strategies (Johnston *et al.*, 2018; Macauley, 2018; Østergaard & Dickman, 2013; Kneebone *et al.*, 2006) to maintain the desired goal of relevant and effective health professions education.

As safe clinical practice is viewed by healthcare regulating bodies as an essential professional competency, the identified lack of knowledge transfer to healthcare students' clinical practice required for safe patient management, is reason for concern (Phillips *et al.*, 2017). Simulation, particularly the use of simulated patients, has been proposed by researchers as an educational method that can scaffold the development of skills related to ensuring patient safety (Phillips *et al.*, 2017). Simulation-based learning experiences are considered to be an effective education strategy for introducing safe patient management as part of early-year clinical preparation of undergraduate medical and physiotherapy students (Johnston *et al.*, 2018; Choi *et al.*, 2017). Other ethical considerations pertaining involving patients for training purposes are, specifically, obtaining informed consent, and ensuring that students' learning needs remain subordinate to patients' clinical needs, may be addressed by using simulation as an additional educational methodology, thereby decreasing patient and student risk (Bradley, 2006; Kneebone *et al.*, 2006).

The current student population tends to be problem-centred (*cf.* Section 2.2.1-2.2.3), implying that learning that involves actual problem-solving, as with case study discussions or a SBLE, is viewed by researchers and students as valuable learning (Macauley, 2018; Østergaard & Dickman, 2013). Aligning with the experiential and constructivist learning theories, Kneebone *et al.* (2006) argue that a highly contextualised learning environment might be effective in promoting learning that could assist in transferring skills to clinical practice (Bradley, 2006). By constructing an authentic setting that replicates a hospital ward, consultation room or a patient's home, student learning is promoted (Spies, 2016; Østergaard & Dickman, 2013). Simulation addresses the various learning needs of the current student population, making learning an interactive and realistic process that provides "hands-on", student-centred education in a more realistic environment (Johnston *et al.*, 2018; Bland *et al.*, 2014; Labuschagne, 2012). Providing a technologically advanced population with a variety of education-enhancing technologies, and a more contextualised approach to teaching, could stimulate interest and a willingness to learn. However, Gaba's well-known definition of simulation still resonates today: simulation is not about the technology used, but about the way learning is encouraged and facilitated, and technology should be integrated as such (Gaba, 2004).

The current challenges facing healthcare education are evident (Section 1.2). By utilising simulation effectively, learners can be exposed to a variety of clinical cases that are not necessarily encountered in clinical settings in a standardised manner (Johnston *et al.*, 2018). Exposure to various clinical scenarios will ensure that graduates are able to deliver the required services to the communities they serve, and present evidence that simulation might be effective in facilitating the transfer of knowledge to the clinical setting (Wright *et al.*, 2018; Imms *et al.*, 2017; Blackstock *et al.*, 2013; Motola *et al.*, 2013; Griswold *et al.*, 2012). A systematic review by Blackmore *et al.* (2018) concludes that communication improvements gained through teaching in the simulated environment may be translated into measurable benefits in clinical practice. Similarly, a research study by Griswold *et al.* (2012) in the paediatric medicine field, discusses the results of 13 practical-skills-based studies, which demonstrate that simulation-based training does translate into improved patient outcomes and safety in clinical practice.

As the majority of simulation-based research studies focussed on self-reported improvements in clinical competence (Wright *et al.*, 2018; Pritchard *et al.*, 2016), quantitative evidence demonstrating the transfer of knowledge and skills, from the simulated to the clinical environment, remains limited (Kiernan, 2018; Bandali *et al.*, 2008). Jones and Sheppard (2011) report that two four-hour practical-based simulation sessions led to no significant improvement in physiotherapists' clinical ability. However, as deliberate practice is described by the father of the concept, Anders Ericsson, as at least one, or more, hours per day of focussed practice (Cobb, 2018), the results described by Jones and Sheppard (2011) could be questioned, due to the limited practice time allowed. Despite evidence that questions whether simulation use result in skill transfer, the United States of America requires all medical graduates, including practicing anaesthesiologists, to participate in SBLEs as part of their final licensing and continuing certification (Agency for Healthcare Research and Quality, 2019). Australia has also approved the replacement of a percentage of their mandatory physiotherapy and occupational therapy undergraduate clinical hours (Wright *et al.*, 2018; Imms *et al.*, 2017), to address education issues relating to the shrinking training platform. Other developed countries and/or healthcare professions have not followed suit up to date, and reference to encouraging and supporting the use of simulation in undergraduate healthcare training is made only by accrediting bodies in the United Kingdom (nursing, physiotherapy), United States of America (nursing) and Nordic countries (all healthcare professionals) (Kiernan, 2018; NLN Board of Governors, 2015; CSP, 2013). In South Africa, only the South African Nursing Council (SANC) specifically mentions the use of simulation in undergraduate nursing training, including clinical training, and assessment (Crafford *et al.*, 2019; SANC, 2019), with no reference to SBE in the accreditation documents supplied by the HPCSA for other registered healthcare professionals.

Another advantage of SBE is that simulation provides a standardised, reproducible and objective setting for both formative (debriefing, feedback and repetitive opportunities) and summative (via testing) assessments. Using SBLEs for formative assessment by means of debriefing is an essential component of SBE, through the identification of learning outcome achievement; it allows for provision of constructive feedback and facilitates reflection on the part of the students regarding their learning and experience during the SBLE (West & Parchoma, 2017). Using SBLEs, specifically for undergraduate summative assessment purposes, is still under investigation (ASPiH Standards Project Team, 2016).

Although simulation has many benefits, several limitations also need to be considered when integrating simulation into healthcare programmes.

2.4.3 Simulation limitations

The extensive financial investment required to integrate simulation in a programme is one of the main limitations of SBE (Qayumi *et al.*, 2014; Bandali *et al.*, 2008), especially when using high-technology simulation. In an environment characterised by shrinking financial aid, integrating simulation requires motivation and thorough research, to demonstrate the value and financial viability of this educational method. No studies to date have investigated the true cost of simulation in a physiotherapy context (Coon *et al.*, 2014). Not only equipment adds to the price tag of simulation integration, but so does the remuneration of simulated patients, the costs involved in competency training of facilitators and educators involved in simulation integration, setting up facilities equipped to host this unique learning experience, and the nature of the SBLEs, namely, immersive simulation or technical skills training only (Swart *et al.*, 2019; Gaba, 2004). Although a decrease in medical costs has been reported following healthcare professionals' engagement in simulated practical-skills-based learning (Schwab *et al.*, 2018; Barsuk *et al.*, 2014; Gerolemou *et al.*, 2014; Cohen *et al.*, 2010), a detailed cost-benefit analysis should be conducted before committing to the integration of simulation in a programme. The integration of simulation-based learning should, however, not be equated with expensive technologies (West & Parchoma, 2017), but rather well designed and educationally aligned learning experiences; it can be an applicable educational method for even low-resource environments (Swart *et al.*, 2019).

Challenges related to the design and implementation of a programme that integrates simulation are resources required, including education and technical personnel, protected time for programme design, and set-up and execution of SBLEs (Motola *et al.*, 2013; Good, 2003). A notable shortage of South African healthcare educators (ASSAf, 2018) limits educator availability to engage with planning, designing and executing SBLEs. Providing protected programme design time might not be achievable, and may create additional work for an already overburdened educator workforce. Furthermore, achieving educational outcome is dependent on educators and facilitators being involved in all phases of simulation planning and implementation, and being competent to deliver the strategy (Khamis *et al.*, 2016; Jeffries *et al.*, 2015; NLN Board of Governors, 2015; Motola *et al.*, 2013; Binstadt *et al.*, 2007). The design phase requires educators who are knowledgeable about programme/curricular design and education theories that underpin simulation and best practice when designing SBLEs (ASPiH Standards Project Team, 2016; NLN Board of Governors, 2015). In accordance with best practice, constructive feedback and debriefing following SBLE engagement requires a trained facilitator, who can ensure optimal implementation of the educational method and, most importantly, the facilitation of learning (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016d; INACSL Standards Committee, 2016e). In the South African healthcare education setting, where the use of simulation is still in its infancy, ensuring educator and facilitator competency with regard to the implementation of simulation would require substantial financial investment to make training available to all relevant educators and facilitators. In a resource-restricted country, such as South Africa, strategic planning is essential when aiming to integrate simulation into an undergraduate programme, to ensure programme sustainability.

2.4.4 Simulation integration

The following section will offer a synopsis of the contextual background of simulation in healthcare education at present, and is not aimed at providing an exhaustive review of healthcare-oriented research into simulation.

Simulation features strongly in international under- and postgraduate medical, nursing and, to a lesser extent, physiotherapy curricula (Husebø *et al.*, 2018; Shepherd, 2017; Thackray & Roberts, 2017; Miles, 2016; Jones & Sheppard, 2011; Founds *et al.*, 2011). Simulated experiences described in healthcare research comprises numerous simulation modalities, with medical education focusing more on skills training (McGaghie & Harris, 2018; Khamis *et al.*, 2016; Zevin *et al.*, 2012; Paskins & Peile, 2010; Good, 2003) and nursing education on the use of human patient simulators and simulated patients in immersive environments (De Oliveira *et al.*, 2015; Berragan, 2011; Founds *et al.*, 2011; Beattie *et al.*, 2010; Wilford & Doyle, 2006). Not only are SBLEs consistently used for practical skill training (West & Parchoma, 2017), but studies have also demonstrated the value of SBLEs in IPE (Shepherd, 2017; Gordon *et al.*, 2015; Pullen *et al.*, 2012).

2.4.4.1 *Nursing*

It is evident from international literature that nursing education is one of the frontrunners when it comes to the integration of simulation. The stated vision of the National League for Nursing in the United States of America is to build a strong nursing workforce through the promotion of simulation as an educational methodology (NLN Board of Governors, 2015), by means of research support and educator training initiatives. This support has translated into a vast number of studies being published on the use of various simulation modalities in the nursing curriculum. Studies based in nursing education that investigated the effect of high-fidelity simulation found that simulation is a useful training tool and can increase student confidence (Miles, 2016; Cockerham, 2015; Decker *et al.*, 2013; Founds *et al.*, 2011; Waxman, 2010; Nagle *et al.*, 2009; Alinier *et al.*, 2006). International nursing research relating to the implementation, integration and development of simulation-based scenarios have also highlighted the frequent use of simulation in the nursing curricula abroad (Arthur *et al.*, 2013; Park *et al.*, 2013; Berragan, 2011; Wilford & Doyle, 2006). On a national level, the use of SBLEs for teaching, learning and assessment purposes has been endorsed by SANC (SANC, 2019), although, to date, it has not been fully integrated into all nursing programmes (Thurling, 2017). National simulation-based research has confirmed the usefulness of this educational method for the South African context, and has demonstrated acceptance of and satisfaction with SBE by nursing students (Amod & Brysiewicz, 2017; Thurling, 2017; Spies, 2016; Welman & Spies, 2016).

2.4.4.2 *Medicine*

International medical research reviewing the use of simulation in medical education describes a focus area of mostly practical-skills-based training (Husebø *et al.*, 2018; Khamis *et al.*, 2016; Dudas *et al.*, 2014; Zevin *et al.*, 2012; McGaghie *et al.*, 2011). Kneebone *et al.* (2006), however, advocate for the combined use of standardised patients and part-task trainers, to ensure a more realistic and contextualised learning approach. Currently, limited published information is available describing the use of SBE in South Africa, except for reports of an increase in the use of simulation in postgraduate anaesthesiology training (Swart *et al.*, 2019). Swart *et al.* (2019) report anecdotal evidence from their mainly medicine-based research participants regarding involvement in a wide range of simulation-based research, but the reported involvement in simulation-based research has not translated into contextualised SBE publications.

2.4.4.3 *Physiotherapy*

International healthcare research indicates the value of simulation integration, however, research regarding its use in physiotherapy education remains sparse and mostly situated in one or two specific clinical areas (Johnston *et al.*, 2018), which limits information related to the use of all simulation modalities for physiotherapy education. Australian physiotherapy-based simulation studies provide evidence that simulation including standardised patients may replace a percentage of mandatory clinical hours (Blackstock *et al.*, 2013; Watson *et al.*, 2012). Although reports of simulation in Australian physiotherapy programmes have been published (Jones *et al.*, 2017; Physiotherapy Project Consortium, 2017), a 2011 review reveals few reported implementations of simulation in physiotherapy education in the United Kingdom (Inventures, 2011). A systematic review by Mori *et al.* (2015) and a narrative literature review by Gough (2016) that investigated using simulation reveals limited results for physiotherapy, compared to nursing and medical literature. It should, however, be mentioned that all studies included in the studies by Mori *et al.* (2015) and Gough (2016) were published in developed countries, such as Australia and the United States of America. Considering Mori *et al.*'s (2015) systematic review, a total of eight studies focussed on skill training within the fields of manual therapy, electrotherapy and cardiopulmonary therapy. A further three studies assessed the use of computer-based learning activities with a computer interface (Mori *et al.*, 2015). All five studies assessing case management simulation were in the cardiopulmonary therapy field, with four of these using human patient simulators and the remaining one using role play in an intensive-care setting (Mori *et al.*, 2015). Seven studies focussed on clinical education, four of these investigating clinical performance and clinical time replacement in a cardiopulmonary therapy environment, and the remaining three investigated clinical learning in a simulated outpatient unit (Mori *et al.*, 2015). Gough (2016), in turn, describes the use of simulated patients, peer learning, virtual reality and haptic simulators, part-task trainers and human patient simulators. The studies included in Gough's (2016) literature review of specifically simulation-based research conducted in physiotherapy, correlates with Mori *et al.*'s (2015) systematic review, although Gough (2016) includes discussions on the use of simulation in physiotherapy. The use of simulated patients is more frequently reported in physiotherapy-related simulation (Johnston *et al.*, 2018; Phillips *et al.*, 2017; Pritchard *et al.*, 2016; Watson *et al.*, 2012; Shoemaker *et al.*, 2009; Ladyshewsky *et al.*, 2000), with results indicating student satisfaction and self-reported increase in clinical abilities. A further two published studies are on the use of simulated patients for physiotherapy education, however, these studies were published in 1978 and 1985, and are not deemed relevant, considering recent advances in simulation theory, technology and research (Coon *et al.*, 2014). Part-task trainers have shown statistically significant results, which suggest better clinical-related outcomes (Macauley, 2018; Hassam & Williams, 2003), immediate improvement of manual skills (Snodgrass *et al.*, 2010) and some, yet to be established, applications in physiotherapy (Tuttle & Jacuinde, 2011). Using human patient simulators (Blackstock *et al.*, 2013; Watson *et al.*, 2012; Jones & Sheppard, 2011; Blackstock & Jull, 2007) has not been proven to significantly improve physiotherapy students' clinical abilities, however, other influential factors hindering or assisting the development of clinical abilities remain unexplored in physiotherapy (Gough, 2016). Very little research has been published on the use of virtual reality and haptic simulators in physiotherapy, and this shortcoming prevents conclusions regarding the effect these simulation modalities might have, though results seem promising (Kelly *et al.*, 2018; Seefeldt *et al.*, 2012).

A systematic review by Olson and Bialocerkowski (2014) investigated the use of simulation within IPE in healthcare by reviewing 17 articles, of which 16 included physiotherapy students as participants; 15 of these made use of simulation as educational method. Compared to the 10 articles included in a similar systematic review describing simulation use in, specifically, the physiotherapy and occupational therapy interprofessional environment (Coon *et al.*, 2014), both research studies (Coon *et al.,* 2014; Olson & Bialocerkowski, 2014) reports on the value of simulation when aiming to develop collaborative practice.

To date, no South African research has been published detailing the use of simulation in physiotherapy education (Swart *et al.*, 2019).

2.4.5 Simulation frameworks

Various frameworks and guidelines for the design of SBLEs are available in published literature and provide approaches to designing these learning experiences (Nestel & Gough, 2018; Thackray & Roberts, 2017; Gough, 2016; INACSL Standards Committee, 2016b; Jeffries *et al.*, 2015; Groom *et al.*, 2014). In the most recent published simulation guidelines, six basic elements of simulation-based scenario design are proposed by Nestel and Gough (2018); 11 elements are described by the International Nursing Association for Clinical Simulation and Learning (INACSL). The latter elements contain similar content, but are summarised more concisely in the work of Nestel and Gough (Nestel & Gough, 2018; INACSL Standards Committee, 2016b) (*cf.* Table 2.3).

Table 2.2: Simulation design best practice comparison

NESTEL & GOUGH (2018)	INACSL STANDARDS COMMITTEE (2016B)
Preparation: learning objectives, scaffolding, SBLE design, SBLE context	Needs assessment
Briefing: personnel, simulated patients, students	Measurable objectives
Simulation activity	Design: modality, format, theory
Debriefing and feedback	Design: context for SBLE
Reflecting phase	Facilitative approach throughout
Evaluating	Student preparation: theory, resources
	Student preparation: briefing
	Conclude SBLE with debriefing
	Evaluation (participants, facilitator, SBLE, facility and support team)
	Pilot test SBLEs prior to implementation

No difference was noted in the 11 elements identified as essential for SBLE design in the 2015 and 2017 INACSL Standards for best practice guidelines (INACSL Standards Committee, 2016b; Lioce *et al.*, 2015), which indicates support for the elements initially proposed.

In literature, reference is made to frameworks and related discussions that describe the use of simulation in healthcare education, with various applications and objectives. Presented frameworks focus on utilising SBLEs for training only specific individual roles and competencies (Thackray, 2013; Treadwell & Havenga, 2013; Pullen *et al.*, 2012; Beattie *et al.*, 2010; Aggarwal *et al.*, 2007), and not addressing all expected graduate attributes throughout the curriculum. Some frameworks are designed specifically for the integration of one form of simulation modality (Eagleson *et al.*, 2011; Rogers, 2011; Parker & Myrick, 2009) and do not include consideration of and planning required for curricular integration of all simulation modalities needed for achieving the majority of learning outcomes. Individual SBLEs and isolated use of simulation modalities are not necessarily inclusive of all curricular aspects needing attention, and educators are required to consider all expected graduate attributes and learning outcomes, and identify where and which simulation modalities work best to achieve graduate attributes. All frameworks describing the development of individual scenarios are based in the nursing profession (Sabus & Macauley, 2016; Spies, 2016; Groom *et al.*, 2014; Founds *et al.*, 2011; Waxman, 2010; Munusamy, 2007) and, although valuable in the design of SBLEs, these frameworks do not consider all the necessary curricular design aspects. Although some frameworks are presented for curricular integration of simulation, these curricula, based in the nursing (Dalton *et al.*, 2015; Ackermann *et al.*, 2007) and medical professions (Dudas *et al.*, 2014; Adler *et al.*, 2009), are not comparable to that of an undergraduate degree of three to four years. As these curricula range from SBLEs presented over the course of a few days to one week and 18 months, considerations regarding scaffolding, the incorporation of various simulation modalities and the attainment of all required attributes are questioned. Frameworks are also available for simulation-based training programmes (Thurling, 2017; Chung *et al.*, 2012), to assist to ensure educator competency in the delivery and design of SBLEs. A novel framework was presented in the Doctoral thesis of Shepherd (2017) in relation to considerations when making use of simulation in healthcare education. Much of the framework content related to simulation best practice, and does not address the curricular integration of simulation in its entirety.

The majority of these frameworks was designed and published in developed countries, with only a small number being published in developing countries such as South Africa (Amod & Brysiewicz, 2017; Spies, 2016; Munusamy, 2007); it might be challenging for developing countries to adopt strategies designed for a developed economy. Challenges regarding lack of funding and resources, inadequate educator training in the integration of simulation, and a richly diverse and underprepared student profile sets South African healthcare education apart from that of many other countries (Singh, 2015; Frantz, 2007; Kent & De Villiers, 2007).

The planned simulation has to engage with all curricular content, and must consider all available resources and educator competency; thereafter further simulation integration may commence. The frameworks highlighted above only satisfy certain criteria required for curriculum design and, therefore, the development of a framework for curricular integration for simulation, specifically within the South African undergraduate physiotherapy programme, is required.

2.5 SIMULATION DESIGN

2.5.1 Curriculum design

Although the current research study did not aim to develop a new curriculum that integrates simulation, knowledge regarding the curriculum design process was required to design a framework for the integration of simulation. A curriculum serves as the purposeful and deliberate organisation of instruction and assessment in a programme, with the goal of improving student learning (Li-Sauerwine & King, 2018). The design of a curriculum follows a framework or model, which is similar to the structure utilised for the integration of, for example, an educational methodology, in order to satisfy needs that have been identified. An essential component of curriculum design is the acknowledgement of prior and future learning, to ensure alignment of the learning objectives and outcomes (Unger & Hanekom, 2014). Taking into consideration that both cognitive load and Benner's so-called novice to expert theories are frequently used in SBE, the importance of scaffolding SBLEs and, by implication, the curriculum, according to student abilities, is evident.

Kern's framework for curriculum development (Li-Sauerwine & King, 2018; Khamis *et al.*, 2016) remains foundational in healthcare education, and many subsequent curricular approaches are based on this framework (Li-Sauerwine & King, 2018). Kern guides the educator in the curriculum design process through six general steps. The first is problem and needs identification. Identifying why the curriculum requires changes (e.g., new knowledge or changed accreditation requirements) and the resources required for the design process, should be weighed against the projected improved outcomes of the new curriculum, namely, better patient outcomes (Li-Sauerwine & King, 2018). Following this, a targeted needs analysis is required to apply identified general needs to the environment where the curriculum will be enacted, taking into account the educational environment and students involved (Khamis *et al.*, 2016). Curriculum goals are subsequently set, and specific and measurable objectives developed. It is proposed that objectives are developed according to the specific, measurable, achievable, realistic and time-based (SMART) framework, with Bloom's taxonomy guiding the formulation of objectives (Li-Sauerwine & King, 2018). Once the objectives have been established, education strategies are identified, preferably in the form of multiple educational methods, to encourage concept reinforcement and to foster student engagement (Li-Sauerwine & King, 2018). Following these initial four steps, the curriculum is ready to be implemented, and should include subsequent, well-defined evaluation and feedback by means of appropriate methods (Li-Sauerwine & King, 2018; Khamis *et al.*, 2016). Even though it is alluded to in Kern's sixth step, a separate, seventh step relating to the dissemination of the developed educational material and outcomes is described by authors Li-Sauerwine and King (2018). Dissemination of material and findings is essential for increasing collaboration and optimising education efficiency, as external feedback from peers who are delivering similar content will streamline the curriculum evaluation process (Li-Sauerwine & King, 2018).

Other healthcare-related curriculum development approaches that are based on Kern's framework are Massive Open Online Courses (MOOC) and the Free Open Access Medical Education (FOAM), which have been integrated into existing medical curricula during the past few years (Li-Sauerwine & King, 2018). MOOCs refer to programmes that enrol a large number of students, who share information in online education environments. FOAM's goal is to create an online medical community that shares medical education resources online, to inform clinical practice (Li-

Sauerwine & King, 2018). Neither of these approaches are able to fully supplement a traditional curriculum, but may complement existing instructional design (Li-Sauerwine & King, 2018).

The Analysis, Design, Development, Implementation, and Evaluation (ADDIE) instructional design framework is centred on designing the way instruction is to take place in modules, courses or smaller content units, rather than necessarily taking into account the full curriculum (Almomen *et al.*, 2016). Although the framework does not constitute a unique curriculum design process, it is similar to Kern's six steps, and is increasingly being utilised as a model for healthcare programme design, because it promotes behavioural change and improving performance of the programme participants (Patel *et al.*, 2018; Almomen *et al.*, 2016; Unger & Hanekom, 2014).

As the researcher of this study aimed to develop a framework designed around experiential learning, with the aim of changing students' behaviours and achieving better educational outcomes, the exploration of the ADDIE framework is warranted. The framework starts off with an analysis of the general needs of all involved stakeholders, and identifying the optimal educational methods for providing the content that has been identified (Patel *et al.*, 2018; Almomen *et al.*, 2016; Khalil & Elkhider, 2016). The needs that were identified guide the design of the programme and the development of the required content (Patel *et al.*, 2018). Following programme implementation, summative evaluation of the programme products is required, mostly guided by Kirkpatrick's model for training evaluation, with formative evaluation embedded throughout the implementation of the ADDIE framework (Patel *et al.*, 2018).

In South Africa, as in the rest of the world, healthcare educators are guided by a core curriculum that is designed in a subject-centred manner, and which details minimum requirements that are to be taught to students (Appendix B) (HPCSA, 2019; SAQA, 2018). Healthcare educators are required to enact their individual curricula in such a way as to motivate and engage students (Spies, 2016; Hess & Frantz, 2014; Unger & Hanekom, 2014). One South African physiotherapy department renewed their programme curriculum according to the ADDIE framework, moving it from a subject-centred to a more problem-centred approach (Unger & Hanekom, 2014) to prepare their students better for clinical practice upon graduation. As students exhibit a variety of learning qualities, preferences and styles (Spies *et al.*, 2015; Hess & Frantz, 2014), a multimodal approach to teaching and learning is essential and should be investigated by all healthcare educators.

2.5.2 Education theories

For the purpose of this study, the researcher supports the thinking that cognitive load theory could guide what is taught, and also the timeline for teaching in the programme, with Kolb's experiential learning theory informing how the SBLEs will inform the teaching. It should, however, be noted that learning theories are to be utilised in accordance with the desired learning objectives of each SBLE, and paying attention to the specific social context is essential if truly integrative learning is to be ensured.

The theory of how students learn should also be taken into account. As experiential learning, which is grounded in constructivism, is the most commonly used framework for simulation-based learning and forms the paradigmatic view of this research study, it stands to reason that it is applicable to reflect on Kolb's learning style inventory (Waldner & Olson, 2007; Hauer *et al.*, 2005). Considering the four learning styles proposed by David Kolb (see concept clarification) in relation to SBE was essential to guide this research. *Diverging learners* are accommodated within the simulated environment by allowing for groupwork, personal feedback and idea generation – as is done in the debrief (McLeod, 2017). *Converging learners* adapt to the simulated environment by means of problem-solving and participation in technical tasks and practical application of their gained knowledge (McLeod, 2017). Much the same as converging learners, *accommodating learners* value a hands-on learning approach, although they are reliant on others (educators) for information, and value new challenges and experiences such as those created within SBLEs (McLeod, 2017). Students classified as *assimilating learners* will probably not be entirely satisfied by the simulated learning environment, as these students prefer formal learning environments and learn mostly by watching and thinking about what transpired during the educational session (McLeod, 2017). However, post-simulation debriefing and subsequent reflection and goal-setting could satisfy assimilating learners' needs. It is, however, important to consider that not all students are attracted to all learning styles and educational methods, especially self-directed learning (Li-Sauerwine & King, 2018). It is, thus, the prerogative of educators to strategically develop these required skills throughout the curriculum.

Cognitive load theory, which is based on cognitive learning theory, also guides simulation integration, by aiming to structure the volume, complexity and design of an SBLE according to student experience level, thereby preventing cognitive overload, which is not conducive to learning (Motola *et al.*, 2013). Similar, in principle, to cognitive load theory and often applied to healthcare simulations (Shepherd, 2017; Thurling, 2017; Dennis *et al.*, 2016; Humphreys, 2013; Miller, 1990), is Benner's novice to expert theory, which describes the stages students move through to become experts who are less reliant on external assistance, and who solve problems independently (Benner, 1982). This research study did not aim to develop specific expertise and proficiency in physiotherapy students, instead, it aimed to couple the integration of simulation with a scaffolded approach, which is addressed better by cognitive load theory.

2.6 FRAMEWORK FOR SIMULATION INTEGRATION

2.6.1 Frameworks to guide development

As simulation is increasingly being utilised in healthcare training (McGaghie & Harris, 2018; Gough, 2016), simulation frameworks have been developed to guide the process. The motivation to use frameworks for healthcare simulation relates to optimising healthcare delivery by including simulation in undergraduate healthcare training (Gough, 2016).

Although no physiotherapy-based framework to facilitate the design and implementation of simulation has been published, the frameworks described in Section 2.4.4 do share common traits, which are indicative of effective educational design, for example, planning, debriefing, reflection and evaluation.

In developing a framework for simulation integration, incorporating available best practice in existing curriculum design frameworks is advised to ensure optimal integration of and engagement with the current curriculum (Li-Sauerwine & King, 2018). The researcher utilised both Kern's framework for curriculum design and the ADDIE instructional design framework, as well as published best practice guidelines, to develop the framework to integrate simulation in the South African undergraduate physiotherapy programme.

2.6.2 Dimensions of the study

Frameworks are used to guide educators regarding choice of content and selection of educational methods, and to assist with the interpretation of the outcomes after framework implementation (Bordage *et al.*, 2016). The dimensions of the study, therefore, include content, methods and interpretation. The basic elements of a well-designed framework, which are similar to the elements considered during curriculum design, will be discussed briefly to provide context for the inception of the study to develop the framework, in response to this study's research question.

The dimension of content will be discussed under two sub-categories: basic elements and variables (Bordage *et al.*, 2016). The basic elements of the framework relate to what is known and what should be explored regarding the use and integration of simulation in healthcare education; this was addressed during Phase 1 of the study. Variables related to the framework would include the student population, educators, the training platform, resources and the teaching and learning to be employed, and how these variables are related and influence the framework design. During critical review of the framework in Phase 3 of the study, the researcher aimed to ensure framework credibility, and that all variables were addressed in the context of South African physiotherapy education.

The dimension related to methods of the framework includes education and investigative methods (Bordage *et al.*, 2016). Educational methods refer to educational design, assessment and instruction, and using education theories is paramount during this process. For the purpose of this study, the researcher used both constructivist and cognitive load theories, and applied them to healthcare simulation. Investigation required evaluation of the framework and the resultant product to determine success. Evaluation should be embedded within the framework, as part of the circular framework implementation-revision-adjustment-reimplementation process. In addition, for this study, the researcher ensured evaluation of the framework itself by involving experts in a validation meeting (Phase 3).

2.7 CONCLUSION

Healthcare education is constantly confronted by change and the necessity to adapt to the evolving global village and changing needs of student populations. Tertiary education institutions are frequently faced by a variety of challenges, including budgetary restrictions and an increasing demand for diverse educational strategies for changing student populations. According to literature, the current student population demonstrates a lack of technical, reasoning, problem-solving and interprofessional teamwork skills, despite being technologically advanced. International and national governing bodies are also expecting the number of students to be trained by tertiary institutions annually to increase, to address skill shortages that have been identified in the public health sector.

Inevitably, physiotherapy education has, and still is, undergoing a relatively similar evolution as other healthcare professions, albeit at a slower pace. The main aim of physiotherapy education correlates with that of other healthcare professions in relation to aligning itself with national strategies to meet the demands of rapidly changing societal needs and healthcare services. However, against the unique challenges described in this chapter, that confront not only South African healthcare providers, but also healthcare educators, adjustments to education are proving to be problematic. It would be unjust to ignore the strides that African physiotherapy education has made, however, compared to developed countries, there is still a long road ahead, and investment in contextual healthcare education research is essential to maintain the throughput of skilled healthcare graduates. When aiming to integrate a teaching strategy into a curriculum or module, care should be taken to assess if the strategy would, in fact, benefit students and help them achieve the profession-specific exit-level outcomes. It is recommended by literature that the curricular integration of simulation should be done after careful planning and consideration (INACSL Standards Committee, 2016b; Motola *et al.*, 2013), and planners should also consider how the SBLE will bridge the theory-practice gap. Clinical simulation should be viewed as an enabler of integrating theory with clinical practice and it should be structured within a curriculum to ensure transfer of knowledge and skills to the workplace. It is not deemed sufficient to simply add simulation to the curriculum, as more simulation sessions do not necessarily equate to better learning.

No South African research pertaining to any type of simulation integration within physiotherapy education could be found by an extensive literature review. As emphasised throughout this chapter, contextual research could add value to the optimal integration of simulation in the South African undergraduate physiotherapy programme. This benefit highlights the need to develop a framework for simulation integration in the South African undergraduate physiotherapy programme.

In conclusion, simulation, as with all educational methods, has its benefits and disadvantages. Simulation offers a safe, non-threatening environment in which learners can actively engage in realistic problem-solving activities. Despite possible obstacles, simulation has been shown to significantly improve healthcare education outcomes, as learners can be trained to manage various clinical situations by means of active participation in a realistic and safe learning environment. By repeating simulated scenarios with increasing complexity, and introducing guided reflection, the specified level of competence could be achieved.

In the following chapter, the execution of the narrative systematic review will be described in terms of aims, objectives and detailed methodology. The results will also be presented and the chapter will culminate in a discussion and the conclusion of the study phase, and implications for the following phase.

CHAPTER 3

NARRATIVE SYSTEMATIC REVIEW

As was demonstrated in the previous chapter, the value of using simulation in healthcare education is evident, and simulation aims to address a variety of identified challenges and needs. This chapter will present the research methodology, results and a discussion of the systematic review, which formed part of the first study phase. The systematic review identified the key elements included in simulation-based healthcare frameworks describing the curricular integration of simulation.

3.1 INTRODUCTION

Current societal, education and healthcare challenges are described well by the literature (*cf.* Chapter 2) and influence the training of undergraduate health care students directly. Curriculum transformation as a result of societal changes is, therefore, vital to ensure graduates are able to demonstrate the critical skills required (Daggett, 2017) when they engage with peers, other healthcare professions and society. Innovative education strategies, for example, the integration of simulation, embedded within an authentic curriculum (Dent *et al.*, 2017) are advocated to foster skills development and the application of acquired knowledge (Hussin, 2018; Picchi, 2015; Van der Merwe, 2011).

Published healthcare education simulation frameworks vary in content and context (*cf.* Section 2.4.4). Available healthcare-based frameworks also differ regarding the simulation modalities utilised and elements identified for inclusion, with some only focussing on the training of individual roles and competencies (Thackray, 2013; Treadwell & Havenga, 2013; Pullen *et al.*, 2012; Beattie *et al.*, 2010; Aggarwal *et al.*, 2007). The researcher views healthcare simulation as an educational method that can develop all the expected graduate attributes (*cf.* Appendix D) by utilising a variety of simulation modalities, in both immersive and practical-skills-based settings. A framework for full curricular simulation integration is deemed essential by the researcher to ensure optimal use of this educational method in the undergraduate study years. In addition, only a few frameworks or recommendations have been published for, specifically, developing countries (Amod & Brysiewicz, 2017; Spies, 2016; Munusamy, 2007), which raises concerns pertaining to the feasibility of implementing frameworks published in developed economies, in a developing country.

It is necessary to identify the elements included in published frameworks for simulation integration, to evaluate and synthesise the currently available research and unequivocally guide curricular integration of SBLEs to enhance undergraduate physiotherapy education in South Africa. Limited international research, and the absence of South African publications related to the integration of simulation in physiotherapy necessitated the consideration of research studies from similar healthcare professions. As many of the healthcare professions share clinical skill commonalities (Thurling, 2017), including the development of critical thinking and problem-solving skills, most healthcare-based frameworks could easily be utilised within physiotherapy education. Therefore, including medical, nursing and rehabilitation therapy research studies was deemed appropriate by the researcher. A transparent systematic review methodology (Munn *et al.*, 2018) was deemed most appropriate to appraise and synthesise expert opinions, texts and policy informing the integration of simulation in a healthcare curriculum to enhance a healthcare programme (*see* concept clarification).

Systematic reviews are regarded as the gold standard in research, and involves rigorously gathering, scrutinising and providing valid evidence for the development of guidelines or decision-making processes pertaining to the stated research question (Munn *et al.*, 2018). Even though systematic reviews traditionally assess healthcare intervention effectiveness, a variety of review methods, which adhere to the principles of systematic reviews, have emerged for most questions arising in healthcare literature (Munn *et al.*, 2018; Peters *et al.*, 2015). In the absence of research studies on the integration of simulation in an undergraduate physiotherapy programme, a transparent systematic review enabled the researcher to identify the best available evidence in published articles (McArthur *et al.*, 2017).

The evidence-based identification of elements deemed essential for curricular integration of healthcare simulation could be viewed as the first step in the development of a framework guiding simulation integration in the undergraduate physiotherapy programme. As contextual research is essential (Chung *et al.*, 2012; Frantz, 2007) to ensure the success of new education strategies, the results of study Phase 1 will generate statements for the Delphi survey (study Phase 2), to develop and contextualise the framework.

Deductive content analysis (Elo & Kyngäs, 2008) was utilised to explore and describe the elements that form part of published simulation-based frameworks in healthcare education.

3.2 REVIEW QUESTION

As recommended for performing a systematic review that examines expert opinion and text (Munn *et al.*, 2018), the review question was formulated by making use of the advised PICo mnemonic, which refers to the Population, Intervention and Context of the situation under investigation. For this study, the population comprised healthcare students, the intervention investigated was that of simulation integration, within the context of healthcare curricula.
The review question was as follows:

- What elements are identified, and should be included, in simulation-based frameworks within the healthcare setting for curricular integration of simulation?

3.3 OBJECTIVES OF PHASE 1

During Phase 1b of the study, the following objective was set to answer the research question posed in Section 3.2.

- To conduct a systematic review to critically and thematically review all relevant international and South African healthcare literature relating to the key elements forming part of simulation-based frameworks, with a focus on curricular integration of simulation, in the healthcare context.

3.4 RESEARCH METHODOLOGY

3.4.1 Study design

The study design was a narrative systematic review.

3.4.2 Study methodology

The universally accepted systematic review framework, published by the Johanna Briggs Institute (Aromataris & Munn, 2017), guided the research process.

3.4.2.1 *Documents reviewed*

All published documents describing frameworks for the integration of simulation in healthcare curricula were included in the review. Diverse research methodologies were included in the document search.

Criteria were identified to guide the selection of documents for the purpose of the systematic review. The inclusion criteria were the following:

- Published in English;
- Published in a peer-reviewed journal or located in tertiary institution research archives;
- Propose a framework for the integration of simulation in a healthcare curriculum;
- Published between January 2005 and December 2017; and
- Full text documents.

The exclusion criterion was the following:

- Frameworks published for emergency medical care. Emergency medical care training was excluded because the training for this field is unique, with training options including university degrees, national certificates, diplomas and various short courses (HPCSA, 2018).

3.4.2.2 *Unit of analysis*

All retrieved documents meeting the inclusion criteria were included in the systematic review.

3.4.2.3 *Data gathering*

Ethics approval was obtained from the Health Sciences Research Ethics Committee at the University of the Free State (UFS) for all study phases, prior to study commencement (HSREC 108/2017) (*cf.* Appendix E).

The researcher, with the assistance of an experienced information scientist (Peters *et al.*, 2017) (*cf.* Appendix F), searched all available databases available on the EBSCOhost interface for documents that satisfied the inclusion criteria mentioned in Section 3.4.2.1. Combinations of search terms, Boolean phrases, and synonyms were used to obtain as much relevant data as possible. The exact search strategy and initial results are available in Appendix G. The researcher undertook a hand search of sources cited and referenced in the documents obtained that met the inclusion criteria, to ensure all possible frameworks were included for review. This process continued until data saturation was achieved, which was indicated by no relevant new documents or references being identified.

The databases searched included databases on the EBSCOHost interface, namely, Academic Search, Africa-Wide, CINAHL with Full Text, Cochrane Library, Medline, ProQuest Dissertations and Theses, Scopus (Elsevier) and SportDiscus.

Search strings included combinations of the following words and synonyms:

> *"conceptual framework", "instruction design", "framework", "model", "clinical simulation", "simulation".*

Within the title, any one of or combination of the following words were required:

> *"Clinical simulation", "conceptual framework", "model", "instruction design", "simulation".*

Areas of research included in the title were the following:

> *"Healthcare", "nursing", "physiotherapy", "physical therapy", "occupational therapy", "medical".*

A total of 947 documents were retrieved. After duplicates had been removed automatically, 447 documents remained. The researcher used the library search function of the UFS, via the EBSCOHost interface, and all documents were arranged according to date of publication, and non-English (12) documents were clearly indicated (*cf.* Figure 3.1).

Despite a rigorous search strategy, 216 documents retrieved were not related to healthcare simulation and were excluded. Seven conference proceedings without supporting full texts were omitted from review, and 129 documents were excluded because they only report on simulation effectiveness, participant/educator perceptions, satisfaction ratings and general discussions regarding the use of simulation (*cf.* Figure 3.1). The majority of documents (69) were excluded because the studies only include a single simulation modality, or aimed to develop only one competency by means of simulation. Only 14 articles remained for review. A further 28 articles were obtained by means of a hand search of the acquired literature.

A review of the 42 articles that were identified resulted in the exclusion of 34 articles due to various reasons stated in Table 3.1. The main reasons for exclusion were that they fail to present new frameworks for the full curricular integration of simulation, or only previously published simulation frameworks were reviewed or implemented.

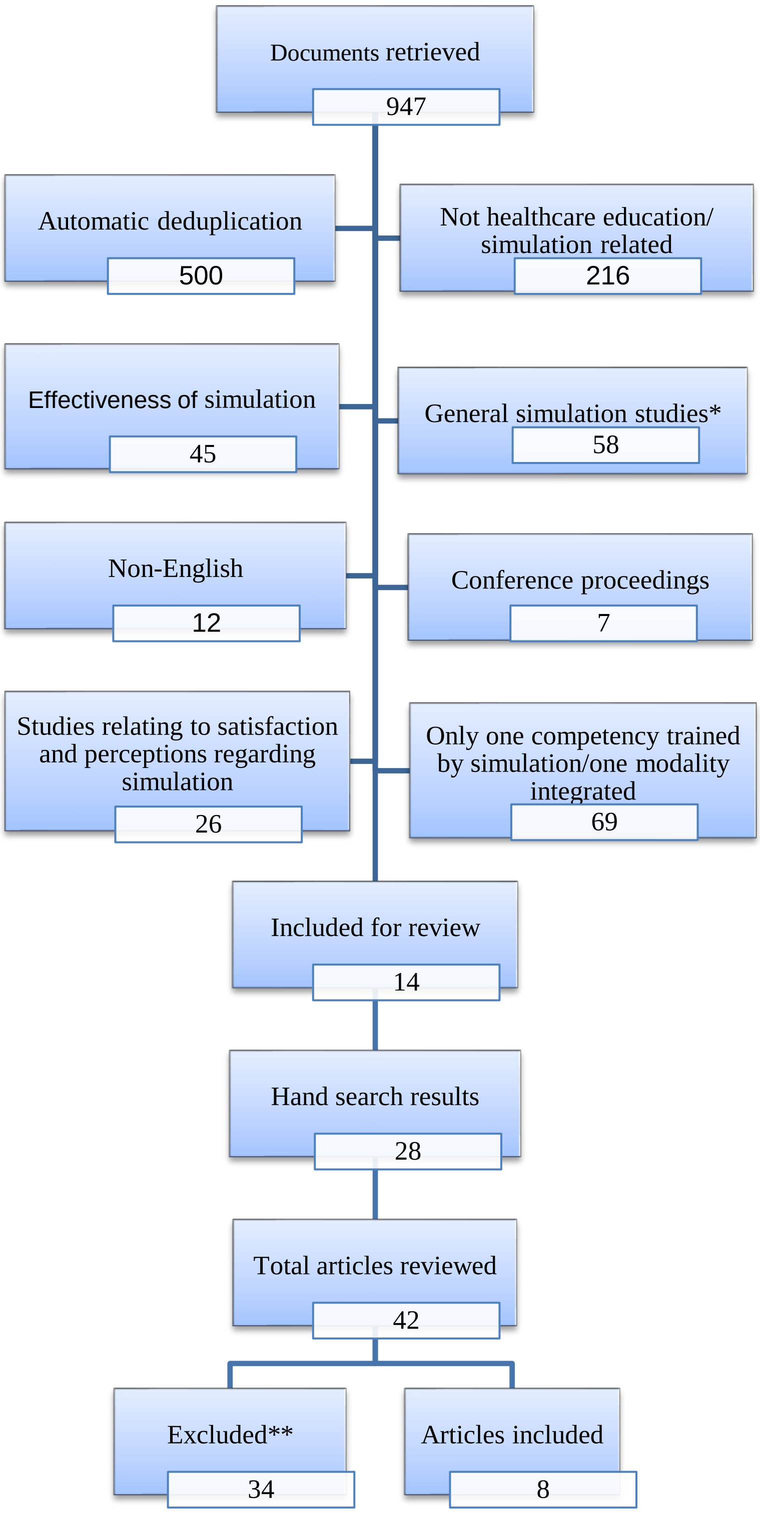

Figure 3.1: Search results (compiled by the researcher, van der Merwe, 2020)

** Articles excluded because they review the use of simulation in healthcare, discuss only aspects/education theory used in simulation, or research not applicable to undergraduate degree structures.*

*** Articles that, after closer inspection, did not meet the inclusion criteria.*

Table 3.1: Reasons for document exclusion

AUTHORS	REASON FOR EXCLUSION	N
Spies (2016) Treadwell and Havenga (2013) Labuschagne (2012) McGaghie *et al.* (2011) Nagle *et al.* (2009) Jones and Sheppard (2008) Ackermann *et al.* (2007) Brady *et al.* (2006)	Do not provide a framework for the integration of simulation within an entire healthcare curriculum	n=8
Groom *et al.* (2014)* Howard *et al.* (2011)* Burke (2010)* Kardong-Edgren *et al.* (2008)* Jeffries and Rizzolo (2006)*	Review/implement previously published simulation frameworks, do not provide a revised framework for simulation integration	n=5
Shepherd (2017) Cook *et al.* (2013) McGaghie *et al.* (2010) Bambini *et al.* (2009) Issenberg *et al.* (2005)	Best-practice guidelines for simulation use, quality indicators for simulation design and implementation, educational strategies supporting simulation and advances in simulation	n=5
Sabus and Macauley (2016) Stocker *et al.* (2014) Munusamy (2007)	Provide a framework for the development and execution of a single simulation session	n=3
Chee (2014) de Oliveira *et al.* (2015) Ellaway *et al.* (2009)	Investigated only isolated aspects of simulation use	n=3
Hallmark *et al.* (2014)* Jones *et al.* (2014)* O'Donnell *et al.* (2014)*	Forms part of the NLN state of the science project, each review individual domains of the NLN/Jeffries Simulation Framework	n=3

AUTHORS	REASON FOR EXCLUSION	N
Thackray (2013) Aggarwal *et al.* (2007)	Propose a framework for the integration of simulation with the aim of enhancing a single aspect of healthcare education (clinical reasoning, delivery of bad news, technical skills training)	n=2
Paskins and Peile (2010)	Obtained student perspectives on what should be included in a simulation programme	n=1
Eagleson *et al.* (2011)	Focusses on the use of only one simulation modality	n=1
Adler *et al.* (2009)	The curricula described were five day and one day curricula respectively and is not comparable to a four-year undergraduate degree.	n=1
Humphreys (2013)	Guide on how to teach with simulation, but the study did not focus specifically on the curricular integration of simulation.	n=1
Chung *et al.* (2012)	Developed a framework for a simulation instructor programme.	n=1

** The systematic review performed by Adamson (2015) aimed to review and provide support for simulation best practices with reference to the use of the NLN/Jeffries Simulation Framework. Although the systematic review does not provide a revised framework for curricular integration, the researcher reviewed all original sources included in the systematic review to consider possible inclusion in this study.*

A thematic synthesis, as described by Thomas and Harden (2008), was deemed the most appropriate method to extract and synthesise the data, in contrast to a traditional approach. The reason for this being that the data collected were descriptively reported in text which required the researcher to familiarise herself with the text and code the data. Terminology also differed between the included frameworks which required a thematic approach in order to identify similar codes and themes. The thematic synthesis process is similar to the process of structural coding (Saldaña, 2010), supplemented by generation of analytical themes, which is frequently used in healthcare professions research. This process enables the subjective interpretation of the collected data, through data coding, with subsequent theme/pattern identification (Hsieh & Shannon, 2005).

Critical appraisal proved challenging, as no standardised appraisal tools for systematic reviews involving various study methodologies were available. Thomas and Harden (2008) developed and utilised an appraisal tool specifically for evaluating the quality of both quantitative and qualitative studies included in a systematic review, which was adjusted, with permission from the authors, so that it was suitable for this research study (*cf.* Appendix H). Domains that were evaluated relate to the quality of reporting, sufficient number of methods used to ensure reliability and validity, as well as the appropriateness of the study method utilised (*cf.* Appendix I). Reliability in this context refers to the extent to which study bias and result errors were minimised by means of rigorous study methods (Rees *et al.*, 2009). For this research study, reviewers assessed the richness of descriptions (Rees *et al.*, 2009) of individual components deemed essential for curricular healthcare simulation integration, to determine the usefulness of the results reported. Critical appraisal was performed independently by the researcher and an independent reviewer. The second reviewer, a qualified physiotherapist with a MSc physiotherapy degree, who had been trained by the researcher in the appraisal and thematic analysis processes, reviewed and evaluated the included studies independently to ensure data accuracy (Miles *et al.*, 2014; Saldaña, 2010). Data was recorded in a data extraction sheet compiled by the researcher prior to commencement of the review (*cf.* Appendix J). The overall weighting of evidence assigned to the included studies was equally distributed between high and low reliability of findings. The included articles were almost equally weighted between the categories low, medium and high for usefulness of findings for this research study (*cf.* Table 3.2). The quality of studies that met each critical appraisal tool criterion is reported in Appendix K.

Table 3.2: Weighting of evidence judgements according to critical appraisal tool utilised

NO.	AUTHORS	WEIGHT OF EVIDENCE					
		Reliability of findings			Usefulness of findings		
		Low	Medium	High	Low	Medium	High
1	Guinez-Molinos *et al.* (2017)	✓				✓	
2	Khamis *et al.* (2016)			✓			✓
3	Jeffries *et al.* (2015)			✓			✓
4	Chiniara *et al.* (2013)	✓			✓		
5	Motola *et al.* (2013)			✓			✓
6	Zevin *et al.* (2012)			✓		✓	
7	McClusky and Smith (2008)	✓			✓		
8	Binstadt *et al.* (2007)	✓			✓		

For the thematic synthesis, both reviewers scrutinised the included articles and assigned codes to the key elements, and grouped similar codes in appropriate emerging themes. Coding and theme identification continued until all identified codes could be explained by the emerging themes (Thomas *et al.*, 2003). Following content analysis and appraisal, the researcher and the second reviewer entered into a consensus discussion of discrepancies in both coding and appraisal; they identified, debated and sought 100% agreement (Saldaña, 2010) (*cf.* Appendix L). No mediation was required, as the minor coding differences that were identified were resolved during the consensus meeting by referring to the study's concept clarifications and text re-examination. No appraisal discrepancies were noted.

3.5 DATA ANALYSIS AND DISCUSSION

The researcher and second reviewer independently identified four analytical themes, namely, planning, implementation, evaluation and revision (*cf.* Table 3.3). The four emerging analytical themes were, except for the absence of a dedicated assessment phase, identical to the phases proposed by Motola *et al.* (2013) in their framework for the curricular integration of simulation, and correlated with previously published curriculum design processes (Quirk & Harden, 2017). Following the consensus discussion, during which minor coding discrepancies were resolved (*cf.* Appendix L), 40 codes were identified, which were grouped in 18 descriptive themes and categorised further into four analytical themes. For ease of reporting, the descriptive themes of assessment and student preparation are shown in their individual components in Table 3.3. The descriptive theme assessment consisted of individual, self and peer assessment, and student preparation consisted of orientation, theory preparation and pre-test of knowledge.

The results of the systematic review are depicted in Table 3.3, which gives a clear indication of which articles yielded the respective descriptive themes. The results of each analytical theme is provided as a short summary and is followed by a discussion of each analytical theme's underlying descriptive themes. In the discussion that follows, descriptive themes are presented in bold text.

Table 3.3: Systematic review results

ANALYTICAL THEME	DESCRIPTIVE THEME	GUINEZ-MOLINOS *et al.*, 2017#	KHAMIS *et al.*, 2016	JEFFRIES *et al.*, 2015##	CHINIARA *et al.*, 2013	MOTOLA *et al.*, 2013	ZEVIN *et al.*, 2012	MCCLUSKY & SMITH 2008	BINSTADT *et al.*, 2007	% AGREEMENT
Planning	Design*	✓	✓	✓	✓	✓	✓	✓	✓	100%
	Outcomes**	✓	✓	✓	✓	✓	✓	✓	✓	100%
	Resources***	✓	✓	✓	✓	✓	✓	✓	✓	100%
	Educator role	✓		✓	✓		✓	✓	✓	75%
	Feedback			✓	✓	✓	✓	✓		63%
	Instructional method		✓		✓	✓		✓	✓	63%
	Scaffolding		✓	✓			✓	✓	✓	63%
	Assessment: Individual	✓	✓			✓	✓	✓		63%
	Curriculum development					✓	✓		✓	38%
	Mastery learning/Deliberate practice (ML/DP)		✓				✓	✓		38%
	Needs analysis****	✓	✓					✓		38%
	Assessment: Tool	✓					✓	✓		38%
	Training		✓	✓		✓				38%
	Assessment: Self				✓	✓				25%
	Assessment: Peer	✓								13%

ANALYTICAL THEME	DESCRIPTIVE THEME	GUINEZ-MOLINOS *et al.*, 2017[#]	KHAMIS *et al.*, 2016	JEFFRIES *et al.*, 2015[##]	CHINIARA *et al.*, 2013	MOTOLA *et al.*, 2013	ZEVIN *et al.*, 2012	MCCLUSKY & SMITH 2008	BINSTADT *et al.*, 2007	% AGREEMENT
Implementation	Debriefing	✓	✓	✓	✓	✓	✓	✓	✓	100%
	Student preparation: Orientation	✓		✓					✓	38%
	Student preparation: Pre-test knowledge		✓				✓			38%
	Student preparation: Theory						✓	✓	✓	38%
	Student goal setting			✓						13%
Evaluation	Programme evaluation		✓	✓		✓	✓		✓	63%
	Validation		✓				✓			25%
Revision	Adjustments					✓	✓			25%

** Design includes all relevant aspects to be considered when designing individual SBLEs (SBLE fidelity, authenticity, timeframe, content and other logistical considerations). Guinez-Molinos et al. (2017) advocate for students designing the simulation session content, with educator facilitation.*

*** Non-technical training was grouped with the code, outcomes, as all specific skills to be trained need to be addressed during the formulation of the learning outcomes.*
**** Resources refers to the available simulation modalities, financial resources, personnel and facilities, as well as educator time for planning and implementing the SBLEs.*
***** The needs assessments refer to addressing the needs of society; students and the institution when integrating simulation into a programme/curriculum.*

[#] Although the study by Guinez-Molinos et al. (2017) focussed on SBLEs, including a form of technology use, it was still deemed appropriate for inclusion in the review, as the framework presented is generic and applicable to other healthcare simulation modalities as well.

[##] Even though the framework presented by Jeffries et al. (2015) is not based on new research, but encompasses the refinement of a previously developed framework (Jeffries, 2005), the researcher opted to include the 2015 framework version, to ensure the inclusion of the most recent healthcare simulation practice and terminology.

3.5.1 Data analysis: Planning

SBLE design, with consideration of available institutional and departmental resources, as well as the development of both curricular and individual SBLE learning outcomes, were included in all (n=8) articles. The majority of articles (n=6) specifically defined the educator's role as that of facilitator during simulation sessions.

Scaffolding of SBLE complexity throughout the curriculum and the identification of both feedback method and timing were cited in five articles. In line with the conceptual definition presented in this study (concept clarification), debriefing was grouped under the analytical theme of implementation, and will be discussed accordingly. Identifying the instructional methods (e.g., self-directed, problem-based or instructor-led educational methods) which will be used prior to and during the SBLEs, were indicated as being of importance in five of the included articles.

Six articles included a form of student assessment when integrating simulation into a programme. This was sub-categorised as individual student assessment by a facilitator (n=5), student self-assessment (n=2) or peer assessment (n=1). The design of a procedure-specific assessment tool for each SBLE was, however, only specifically stated in three of the included articles.

Three frameworks mentioned the inclusion of curriculum development and educator training as prerequisites for simulation integration, with ML/DP and performance of needs analyses also only identified for consideration by three articles.

3.5.2 Discussion: Planning

When analysing the emerging analytical themes, it was evident that the **PLANNING** phase is the most substantial phase, as it consisted of 12 descriptive themes relating to integrating simulation into a programme.

SBLE **design** constitutes all characteristics that describe how the SBLE is planned and executed (Chiniara *et al.*, 2013). The design of SBLEs is multifaceted and of the utmost importance, with thought given to the timeframe (Guinez-Molinos *et al.*, 2017; Jeffries *et al.*, 2015; Chiniara *et al.*, 2013; Binstadt *et al.*, 2007), structure, content (Guinez-Molinos *et al.*, 2017; Khamis *et al.*, 2016; Chiniara *et al.*, 2013; Motola *et al.*, 2013; Zevin *et al.*, 2012; McClusky & Smith, 2008) and fidelity (Jeffries *et al.*, 2015; Chiniara *et al.*, 2013) of the SBLE.

To ensure optimal student participation and meaningful learning (Sabus & Macauley, 2016), an important consideration in the SBLE design process is the fidelity of the scenario. This includes the physical dimension, how closely the simulated patient/manikin features and environment match reality, and the psychological dimension, which describes how authentic the student experiences the scenario. The third dimension is the conceptual dimension, which refers to the link between theoretical knowledge and events transpiring during the SBLE (INACSL Standards Committee, 2016a; Paige & Morin in Spies, 2016). Attention should be paid to all three dimensions of fidelity when designing a SBLE, to ensure a believable scenario. Analysis of the desired learning outcomes is vital, to determine the real-world features (physical dimension) required in a simulated activity (Chiniara *et al.*, 2013). Alignment of these outcomes with the SBLE design is crucial, to ensure that students encounter an authentic environment in which they are able to engage fully and interact with the scenario, and can practise and develop their skills and reasoning processes under circumstances that are similar to those they will encounter in the clinical environment (psychological and conceptual dimensions).

Another feature of psychological fidelity is the accurate representation of roles and team dynamics within the simulated clinical environment (Sabus & Macauley, 2016). As simulation is an interactive, shared and social learning experience (Jeffries *et al.*, 2015; Chiniara *et al.*, 2013), it is essential to consider and include the appropriate team members in SBLEs, according to the stipulated learning outcomes. Teams could include a single discipline, interprofessional team members and/or simulated patients who form part of the SBLE (Chiniara *et al.*, 2013). Single-discipline teams have the advantage of providing team members with insight into their professional roles, and can enable collaborative learning (Guinez-Molinos *et al.*, 2017; Chiniara *et al.*, 2013). On the other hand, interprofessional team composition is favoured when the focus is on patient safety, team communication and clarifying professional roles (Chiniara *et al.*, 2013; McGaghie *et al.*, 2010). Considering the emphasis on IPE in healthcare (ASSAf, 2018; Thistlethwaite & Vlasses, 2017; Pritchard *et al.*, 2016; Humphreys, 2013), identification of the preferred team composition for SBLEs is vital during the planning phase, to ensure achievement of stipulated learning outcomes. By engaging in authentic learning, interprofessional relationships will be fostered, thereby contributing to optimum healthcare provision and person-centred care (Allen, 2020; World Economic Forum, 2019; Scheffler *et al.*, 2015).

Due to the diverse nature of the articles that were included in the review, the types of SBLE designs varied. Articles with a focus on practical-skill proficiency (Khamis *et al.*, 2016; Zevin *et al.*, 2012; McClusky & Smith, 2008) described the need for task deconstruction during the design phase, while more generalisable articles (Jeffries *et al.*, 2015; Motola *et al.*, 2013) allowed for flexibility during the SBLE design, even advocating for students (Guinez-Molinos *et al.*, 2017) contributing to scenario design according to the provided outcomes. The researcher is of the opinion that it is essential to view the programme in its entirety, to identify which outcomes will be achieved best by means of simulation and, subsequently, to identify the SBLE designs that will be suitable for achieving the identified outcomes.

Detailed learning **outcomes** are essential for guiding the SBLE, facilitating meaningful learning (Jeffries *et al.*, 2015) and enhancing both student confidence and satisfaction (Adamson, 2015). Therefore, in agreement with simulation best-practice guidelines (INACSL Standards Committee, 2016f; ASPiH Standards Project Team, 2016), all included articles highlighted the importance of specifying the outcomes that will be addressed by the SBLEs. In 1995, following the promulgation of SAQA Act No. 58, South African higher education institutions implemented outcomes-based education. Outcomes-based education is a student-centred approach to education, so students were encouraged and facilitated to take on more responsibility for their learning. The focus has shifted to how students think, rather than what they think, making simulation an ideal educational method to develop the expected graduate attributes (*cf.* Appendix D). However, for an outcomes-based education approach to be of value, constructive alignment between curricular and SBLE outcomes is vital (ASPiH Standards Project Team, 2016), to ensure appropriately designed SBLEs with clear educator expectations. An additional factor to consider is educator competency in instructional design, as knowledge for identifying challenging but achievable learning outcomes, as well as an understanding of the educational theory underpinning SBE (ASPiH Standards Project Team, 2016), will guide the development of aligned outcomes. As the expected graduate attributes (*cf.* Appendix D) require the inclusion of all skill components, and the segregation of skills is no longer accepted (Kneebone *et al.*, 2017), in this study, outcomes relating to technical and non-technical skills were collapsed in the descriptive theme outcomes. The term non-technical skills refer to behavioural and teamwork skills (Lopreiato *et al.*, 2016), of which training is easily achievable through SBLEs (Guinez-Molinos *et al.*, 2017; Spies, 2016; Chiniara *et al.*, 2013; McGaghie *et al.*, 2010; Jeffries *et al.*, 2005).

As mentioned in the literature (Phillips *et al.*, 2017; Chiniara *et al.*, 2013; Motola *et al.*, 2013; Gaba, 2004), initial costs and constant technological improvements place a financial burden on institutions who wish to implement simulation, and necessitate careful resource consideration prior to integrating simulation. In order to minimise the costs involved in SBLEs, collaborative initiatives (Guinez-Molinos *et al.*, 2017) could be a strategy to establish and sustain SBLEs in a programme. To support the integration of simulation in the undergraduate physiotherapy programme, the researcher recommends utilising interdepartmental and interinstitutional partnerships. **Resources** include not only physical resources, such as equipment and financial resources available, but also human resources, which refer to personnel and allocated time available to plan and implement SBLEs (Johnston, 2009). The researcher collapsed these related aspects under the descriptive theme of resources, as they all have a direct impact on the feasibility and sustainability of SBLE integration. Designing both the curriculum and individual SBLEs, planning and setting up SBLEs, training simulated patients, educator training, and the time required for SBLE execution and debriefing are all important aspects that were mentioned by all articles (Guinez-Molinos *et al.*, 2017; Khamis *et al.*, 2016; Jeffries *et al.*, 2015; Chiniara *et al.*; 2013; Motola *et al.*, 2013; Zevin *et al.*, 2012; McClusky & Smith, 2008; Binstadt *et al.*, 2007). As the integration of simulation is a time-consuming process and educators experience pressure to train skilled graduates, deliver research outputs and still provide quality theoretical and clinical education, institutional and departmental support is essential for assisting educators to ensure optimal integration of this educational method. Focussed time within the programme reflects what is viewed as important by the department and it is, therefore, the role of heads of departments to ensure that time is allocated and managed for both educators and students (Johnston, 2009), thereby allowing for SBLE engagement. The researcher advocates for time being thoughtfully allocated and managed, allowing for both focussed SBLE design, and effective SBLEs.

Simulation requires active student participation (Spies, 2016), and effective student-centred education is dependent on student and educator role clarification (Jeffries *et al.*, 2015). The **educator role** during simulation can vary considerably (Jeffries *et al.*, 2015), depending on the intended SBLE outcomes, that could include, student learning by means of formative or summative assessment, practical skill practice or the institutional context in which the SBLEs are delivered. Simulation communities differ with reference to simulation-based terminology used, as well as teams involved in SBLE design and execution. In some international simulation centres, the educator is not necessarily directly involved with the SBLE execution.

An educator in the simulated environment is defined by the PennState Hershey Clinical Simulation Center as a *"specialist in the theory and practice of simulation education who has the responsibility for developing, managing, and/or implementing educational activities"* (PennState Health, 2016:3). This definition of an educator within the simulated environment is almost identical to the definition provided for a simulationist by the Healthcare Simulation Dictionary (see concept clarification), except for mention of competency in simulation-based theory and practice, which indicates the similar meaning of these simulation-based terms. A facilitator is, furthermore, defined as an individual who is involved and who is required to provide indirect assistance, supervision or guidance in relation to the enactment and/or delivery of SBLEs (Lopreiato *et al.*, 2016; PennState Health, 2016) – this definition does not explicitly state their involvement in the design process of

SBLEs. In the South African healthcare simulation context, educators are, however, directly involved during all SBLE phases (Spies, 2016), mostly due to a shortage of healthcare educators trained in simulation (Swart *et al.*, 2019; Spies, 2016). For the purpose of this South Africa-based study, the term educator is, henceforth, interchangeable with both facilitator and instructor, as it is possible that the educator is required to fulfil all roles relating to SBLE design and implementation. The researcher, therefore, advises that the role of the educator in a framework should be clarified.

Six of the articles included specifically identify the role of the educator during simulated activities as that of a facilitator (Guinez-Molinos *et al.*, 2017; Jeffries *et al.*, 2015; Chiniara *et al.*, 2013; Zevin *et al.*, 2012; McClusky & Smith, 2008; Binstadt *et al.*, 2007). These authors propose that the educator provides facilitation during SBLEs with varying degrees of involvement, from post-simulation debriefing to active participation during the simulated session. Only articles that focus on the attainment of practical skills describe the facilitator's role as being that of providing synchronous feedback during the execution of the SBLE (Zevin *et al.*, 2012; McClusky & Smith, 2008; Binstadt *et al.*, 2007), as synchronous feedback is advocated primarily for procedural skill SBLEs (Chiniara *et al.*, 2013; Zevin *et al.*, 2012). The educator role is, therefore, dependent on the objective, design and learning outcomes related to each individual SBLE.

Providing **feedback** in SBLEs is one of the essential aspects that ensure that learning takes place (Cook *et al.*, 2013; Motola *et al.*, 2013; McGaghie *et al.*, 2010). Jeffries *et al.* (2015), Chiniara *et al.* (2013), Motola *et al.* (2013), Zevin *et al.* (2012) and McClusky and Smith (2008) include the provision of feedback in their respective frameworks; however, only three frameworks (Chiniara *et al.*, 2013; Motola *et al.*, 2013; McClusky & Smith, 2008) specifically mention decisions regarding the source, type and timing of the feedback prior to the SBLEs. For the purpose of this study a distinction is made between feedback and debriefing (see concept clarification), with feedback included in the planning theme referring specifically to the identification of the format, timing and source through which process-oriented feedback should be provided. The identification of SBLEs requiring debriefing, including the method used during the debrief, is also included in the feedback element, as this would influence the preparatory arrangements and training prior to the implementation of the SBLE. The importance and structure of debriefing will be discussed as part of the implementation theme (*cf.* Section 3.6.2), as debriefing is a unique learning tool associated with SBE.

Synchronous feedback and feedback following practical-skills-based SBLEs are advised, to ensure that alternative approaches to practical skills are demonstrated and practiced (Khamis *et al.*, 2016; Zevin *et al.*, 2012) in the presence of an expert. However, when the learning objective is integration of specific concepts, synchronous feedback could alter the learning experience by creating facilitator dependence (Chiniara *et al.*, 2013) and, therefore, immediate feedback following SBLE conclusion, in the form of debriefing, is preferred (Chiniara *et al.*, 2013). Delaying feedback after the conclusion of the SBLE might be more feasible and logistically attainable, but the effectiveness of doing so does not measure up to that of synchronous and immediate feedback (Chiniara *et al.*, 2013). The researcher notes the usefulness of including feedback in the framework planning phase, and ensuring department-level development and training (Khamis *et al.*, 2016; Motola *et al.*, 2013), in order to plan, identify and incorporate appropriate feedback and/or debriefing methods effectively, as required by the individual SBLEs.

Chiniara *et al.* (2013) describe the choice of educational methods under the heading **instructional methods**, which subsequently became the descriptive theme for the various educational methods mentioned in the articles that were included. It should be noted that a variety of typology regarding the classification of educational methods utilised in simulation is evident, with some articles describing simulation-based instructional methods as simulation modalities (INACSL Standards Committee, 2016a; Lopreiato *et al.*, 2016). For the purpose of this study, instructional methods refer to the overall educational methods, irrespective of the mode of simulation, utilised during the SBLEs.

Various instructional methods, in addition to those noted in the included articles, may be considered when designing SBLEs (INACSL Standards Committee, 2016a; Lopreiato *et al.*, 2016). Deciding on an instructional method is essential during the planning phase, as it has a direct impact on the simulated experience (Khamis *et al.*, 2016; Chiniara *et al.*, 2013; Cook *et al.*, 2013; Binstadt *et al.*, 2007) and subsequent SBLE effectiveness. The instructional methods alluded to in the included articles include self-directed learning (Chiniara *et al.*, 2013; Motola *et al.*, 2013; Binstadt *et al.*, 2007), instructor-based learning (Chiniara *et al.*, 2013; Motola *et al.*, 2013; Binstadt *et al.*, 2007; McClusky & Smith, 2008), peer-led learning (Motola *et al.*, 2013), ML/DP (Khamis *et al.*, 2016; Zevin *et al.*, 2012; McClusky & Smith, 2008), theoretical testing (Khamis *et al.*, 2016) and the use of video recordings (Khamis *et al.*, 2016; McClusky & Smith, 2008). Although Jeffries *et al.* (2015) describe the importance of creating an interactive and collaborative learning environment, this description does not detail specific instructional methods, but rather focusses on the skills and abilities of the facilitator in facilitating a student-centred learning environment. Jeffries *et al.* (2015) was, therefore, not included in the descriptive theme of instructional methods. The terms instructor-based and facilitator-led are interchangeable in the definitions provided by Chiniara *et al.* (2013) and the PennState Hershey Clinical Simulation Center's definition of instructor (PennState Health, 2016) and, for the purpose of this study, refer to the same concept.

Due to ML/DP being synonymous with simulation practice and constructivist learning theories, these two instructional methods will be discussed as an independent descriptive theme. The researcher recommends that educators carefully deliberate on which instructional methods they would be using to achieve the proposed learning outcomes, in order to optimise the student learning experience.

The instructional methods **mastery learning (ML) and deliberate practice (DP)** were collapsed, as both require repetition of a SBLE by a student in order to demonstrate skill acquisition (McGaghie *et al.*, 2010). The only observable difference between ML and DP is that ML requires students to achieve a predefined performance standard before progressing to the next task (Lopreiato *et al.*, 2016; Cook *et al.*, 2013), while DP requires students to participate in a systematically designed activity with the aim of improving a skill in a specific domain (Lopreiato *et al.*, 2016), which is not linked to a measured level of performance.

In simulation best-practice as described by pioneers of SBE, ML was indicated as a key aspect (McGaghie & Harris, 2018; Cook *et al.*, 2013; Issenberg *et al.*, 2005) that resulted in better skill execution and maintenance. Reflecting on the frameworks proposed by Khamis *et al.* (2016), Zevin *et al.* (2012) and McClusky and Smith (2008) indicates that the majority of elements included focus on technical skills proficiency within a surgical curriculum, and ML might not be as feasible when aiming to generalise this framework to non-technical skills and immersive SBLEs. However, research indicates that ML with rigorous DP is a strong learning approach for training knowledge, skills, and professionalism in healthcare students (McGaghie & Harris, 2018). The researcher advises that careful consideration should be given to its inclusion in accordance with the educational pedagogy utilised in the curriculum.

Scaffolding SBLEs according to the student's experience level (Khamis *et al.*, 2016; Jeffries *et al.*, 2015; Zevin *et al.*, 2012; McClusky & Smith, 2008; Binstadt *et al.*, 2007), with a gradual increase in complexity, is essential to facilitate meaningful learning (Spies, 2016). Scaffolding of simulated activities is aimed at developing student confidence, managing cognitive load and enhancing the principle of constructivist learning, which results in the achievement of desired learning outcomes and producing students who can care for complex patients competently. The concept of scaffolding correlates with SBE best practice systematic reviews (Cook *et al.*, 2013; McGaghie *et al.*, 2010; Issenberg *et al.*, 2005), which agree that it is essential for proficiency-based training that task complexity increases from novice to advanced learners (Khamis *et al.*, 2016; Binstadt *et al.*, 2007).

Increasingly, thinking in education is being dominated by a shift in focus towards an outcome- or competency-based education approach (Quirk & Harden, 2017), and has resulted in curricula being adjusted. As early as 2004, Gaba (2004) envisioned a healthcare curriculum requiring expected engagement in SBLEs by students to facilitate the attainment of all learning outcomes. Simulation best practice dictates that curricular integration (ASPiH Standards Project Team, 2016; Khamis *et al.*, 2016; McGaghie *et al.*, 2010; Issenberg *et al.*, 2005) of simulation is integral to the success of simulation use, consequently requiring careful **curriculum development**.

The overarching education model for curriculum development should support the integration of simulation. Educators must be able to identify which educational method, whether simulation, problem-based learning, didactic lectures, self-directed learning or role-play, to name a few, would be most successful in achieving the desired learning outcomes (Motola *et al.*, 2013). Educators are required to acknowledge that simulation does not compete with other strategies, but should work synchronously within the curriculum. All stakeholders involved – educators, simulation experts and educationalists – are essential during curriculum development to ensure a goal-oriented and sustainable (Motola *et al.*, 2013) application of simulation.

As the current research study aimed to develop a framework for simulation integration, a detailed discussion of aspects of curriculum design falls beyond the scope of this study. However, frameworks are designed around basic principles of curriculum design and, therefore, the researcher consulted Kern's framework for curriculum development (Li-Sauerwine & King, 2018; Sweet & Palazzi, 2015) and the ADDIE framework for instructional design (Patel *et al.*, 2018; Almomen *et al.*, 2016) during the design of the framework for simulation integration.

It is essential to ensure that educators engaging in any of the phases of simulation integration are appropriately **trained**, and this requirement should be addressed during the framework planning phase (Khamis *et al.*, 2016; Jeffries *et al.*, 2015; Motola *et al.*, 2013). Educator competence (see concept clarification) regarding the use of simulation (Khamis *et al.*, 2016; Motola *et al.*, 2013) and simulation modalities utilised (Jeffries *et al.*, 2015) in line with best practice, proficiency in the art of debriefing (ASPiH Standards Project Team, 2016; Motola *et al.*, 2013; Binstadt *et al.*, 2007) as well as constructive feedback (INACSL Standards committee, 2016b) is vital if this educational method is to be used optimally. It is concerning that only three articles explicitly state the necessity for educator training in the delivery of SBE – which leads the researcher to assume that proficiency prior to the integration of any new educational strategy is taken for granted. Another reason for the omission may be that, due to advances in simulation-based practice internationally, the majority of educators involved in SBE have attended Train the Trainer programmes, and are competent in simulation utilisation. In the South African context, with SBE still developing and few educators trained to competency in SBE (Swart *et al.*, 2019), explicitly stating the importance of competency training prior to simulation integration is, according to the researcher, essential.

Learning outcome achievement is dependent on, among other factors, trained educators (Motola *et al.*, 2013), as educators who are more accustomed to a traditional lecture format might, despite their best intentions, revert to a habitual didactic class presentation (Binstadt *et al.*, 2007), thereby contradicting the student-centredness of SBE. Educator reflection after the SBLE is recommended, and the necessary reflection skill is essential for enabling the educator to adjust scenario content and/or fidelity, and debriefing methods or implementation strategies to ensure that a positive learning experience transpires. Educator training is, therefore, an essential component of ensuring the success of framework implementation.

Although many forms of healthcare assessment are reported in literature, including workplace-based, written, peer- and self-assessment, quality assessment depends on adherence to good assessment criteria (Norcini *et al.*, 2011). Literature addressing **assessment** describes assessment criteria as assessment validity, reproducibility, feasibility, reliability, educational benefits, credibility and assessment results and feedback that support future education, taking into consideration the assessment purpose and stakeholder perspectives (Norcini *et al.*, 2011). In addition, Norcini and McKinley (2017) describe the necessity of purposeful assessment in healthcare education. It should be noted that the term assessment refers to student assessment with learning outcome achievement, and not assessment of the programme, which will be discussed in Section 3.6.3. Assessment provides evidence of not only student performance, but also the possible effect of the simulated training (Khamis *et al.*, 2016) which could assist with programme evaluation and quality improvement (INACSL Standards Committee, 2016a).

The simulated environment is viewed as a safe learning environment (ASPiH Standards Project Team, 2016), as it allows students to rectify their demonstrated behaviours without direct consequences on patient care; traditionally it has been used for only formative assessments (ASPiH Standards Project Team, 2016). Formative assessment, based on constructivist principles (McGaghie & Harris, 2018), is by nature an active learning process during which students learn by being observed whilst they take part in an educational activity, followed by the facilitator commenting on their performance. Debriefing is classified as a form of formative assessment (Fey *et al.*, 2014). Debriefing will be discussed as part of the implementation phase (*cf.* Section 3.6.2), due to debriefing forming and integral part of SBLE execution.

Summative assessments are cumulative and assess outcome achievement at the end of a specific time period (Norcini & McKinley, 2017); students receive a score with little or no performance-based feedback. A challenge facing health professions education is the ability to assess students' competencies in an authentic environment (Ryall *et al.*, 2016), which led to an interest being shown in using simulation as part of summative assessment opportunities (Ryall *et al.*, 2016; Kalaniti & Campbell, 2015). Considering the shrinking training platform and decreased patient availability, healthcare educators are necessitated to investigate alternative, authentic learning and assessment environments.

In addition to formative and summative assessments, students are encouraged to engage in self-assessment and reflection after the completion of a simulated activity (Nestel & Gough, 2018). Self-assessment has the advantage of being an individualised activity that involves students assessing their own skills and experiences, compared to debriefing, which is mostly a group-based activity (Nestel & Gough, 2018; Humphreys, 2013). Peer assessment, which is only mentioned in one included article (Guinez-Molinos *et al.*, 2017), has the ability to offer a unique assessment perspective, however, fear of reprisal makes peer-assessment a delicate assessment strategy (Sridharan *et al.,* 2019; Duers, 2017). With students expected to develop lifelong learning skills during their undergraduate study years (Appendix D), the inclusion of peer assessment is advised, as it transfers power to the student and encourages students to take responsibility for their own learning (Sridharan *et al.,* 2019; Anderson & Neild, 2007).

Using simulation in summative practical-skills-based assessment and formative assessments is described in three of the articles (Guinez-Molinos *et al.*, 2017; Khamis *et al.*, 2016; Zevin *et al.*, 2012). The study by Motola *et al.* (2013) describes the assessment of both technical and non-technical skills (see concept clarification), but does not clarify if these assessments were summative or formative in nature. McClusky and Smith (2008) only mention non-specified objective practical-skills-based assessment. The framework by Jeffries *et al.* (2015) includes the achievement of both course and SBLE outcomes, but does not provide clarity regarding how these outcomes should be assessed and was, therefore, not included.

It is evident that various sources of assessment of SBLEs are available, and it is the educator's prerogative to decide which type of simulation-based assessment, if any, to include in the programme.

If it is to support learning, the purpose, development, construction and scoring interpretation of a simulation-based assessment is of the utmost importance. It is imperative to ensure, during the planning phase, that the simulation-based training provided is aligned with the learning outcomes and its chosen assessment (ASPiH Standards Project Team, 2016). To ensure students psychological safety, educators should not use simulation as part of student assessments, especially summative assessments, unless students were afforded the opportunity to train in a similar environment and with simulation modalities (ASPiH Standards Project Team, 2016).

In contrast to McClusky and Smith's (2008) proposed assessment instrument design, which is included in the development phase, the literature review of healthcare simulation best practices by Khamis *et al.* (2016) makes no mention of designing specific assessment instruments. The importance of both summative and formative feedback is, however, included, which would indicate that some form of assessment is required. Literature (Nestel & Gough, 2018) mentions that educators often include informal rating scales and tools to assist both simulation participants and educators in providing more objective feedback, but these tools do not equate to a standardised assessment instrument. Literature, furthermore, advises that all instruments that will be used during both formative and summative simulation-based assessments should be ready and available prior to the commencement of the SBLEs (Nestel & Gough, 2018). Students should have the opportunity to use either the same instruments or similar instruments to those that will be used by assessors and/or facilitators (Sridharan *et al.,* 2019; Guinez-Molinos *et al.*, 2017) prior to being assessed in the simulated environment, to enable them to familiarise themselves with the area and equipment. Therefore, the need to develop the required assessment instruments during the planning phase is evident. Only three articles (Guinez-Molinos *et al.*, 2017; Zevin *et al.*, 2012; McClusky & Smith, 2008) specifically mention the development of assessment instruments to be used in SBLEs. Contrary to the frameworks of Zevin *et al.* (2012) and McClusky and Smith (2008), which only propose practical-skills-based assessment instruments, the study by Guinez-Molinos *et al.* (2017) suggests a more robust, once-off development of assessment instruments for the various curricular competencies to be assessed utilising simulation, prior to the SBLE design. Only one article refers to piloting the SBLEs and assessment instruments (Motola *et al.*, 2013) and, although a run-through of the scenario or testing of an assessment instrument ensures accuracy, department time constraints might not allow for this important phase (Nestel & Gough, 2018). The validity and reliability of developed assessment instruments should also be considered, especially when utilising SBLEs for summative assessment purposes, and the authors advise using standardised assessment instruments (Nestel & Gough, 2018; Khamis *et al.*, 2016; Zevin *et al.*, 2012; Aggarwal *et al.*, 2007).

In light of the increasing utilisation of healthcare simulation for both formative and summative assessments, assessment in the simulated environment should be considered when integrating simulation in a healthcare programme. However, from the above discussion it is evident that assessment in the simulated environment is complex and necessitates attention to the various components related to the development of aligned and clear assessment instruments. Reflecting on the additional; personnel time required for assessment planning and development, in addition to time needed for SBLE development and integration, the researcher recommends that careful thought should be given to using SBLEs for assessment purposes. The researcher, therefore, advises that simulation and formative assessment is integrated, first, through the use of debriefing, and once the SBLEs have been implemented and evaluated, the integration of aligned summative assessment may continue as deemed necessary and appropriate.

Khamis *et al.* (2016) advises that identified practitioner shortcomings, as well as societal and institutional needs, should also be assessed; in turn, Guinez-Molinos *et al.* (2017) only consider student needs, in order to identify areas where simulation would benefit the programme. Needs may vary between communities, institutions and healthcare disciplines (Khamis *et al.*, 2016), thereby necessitating contextual research through execution of **needs analyses**, to ensure that simulation addresses the identified needs of the patient populations in the areas of healthcare practice, those of student populations and of individual institutions. A matter of concern is that needs analyses were not explicitly included in all frameworks, possibly because authors viewed this as a separate phase that takes place prior to the planning and implementation of any new education strategy. In line with Kern's framework for curriculum development, the researcher is of the opinion that, especially in the diverse and resource-constrained South African context, needs analyses are vital when integrating simulation in the national physiotherapy programme.

3.5.3 Data analysis: Implementation

The second analytical theme identified was **IMPLEMENTATION**, which directly follows the planning phase described in 3.5.1 and 3.5.2, and relates to the activities directly before, during and after each SBLE. Three descriptive themes namely, student preparation, student goal setting and debriefing were identified in this analytical theme. All included articles (n=8) made specific mention of providing post-simulation instructor-led debriefing, highlighting the importance of this crucial element in the simulation process. McClusky & Smith (2008) described terminal feedback to be provided following a SBLE in order to shape student behaviour, which is viewed in the context of this study as debriefing.

Student preparation prior to students partaking in SBLEs was included in six articles. Of these, three articles advocated for student orientation regarding the SBLE expectations and simulated environment prior to commencement of the SBLE, also known as briefing. Three articles specified theoretical student preparation is required, with two articles citing a pre-simulation knowledge test as a pre-requisite for SBLE participation.

Only one article recommended that students should, in addition to the stated learning outcomes, set their own personal goals prior to the SBLE.

3.5.4 Discussion: Implementation

The second analytical theme, **IMPLEMENTATION**, in the context of this study, refers to aspects relating to the preparatory activities prior to the SBLE, as well as debriefing following conclusion of the SBLE.

As with educator competence, **student preparation** is essential when implementing SBLEs. In order to optimise learning during the SBLE, all parties involved should be made aware of exactly what is expected of them (Nestel & Gough, 2018; INACSL Standards Committee, 2016a). Student preparation will also assist to ensure a more streamlined SBLE. Theoretical preparation prior to SBLE participation, and which requires the provision of a theoretical foundation with written assessments (Zevin *et al*., 2012) or self-directed assignments (Binstadt *et al*., 2007), is included in three articles. However, the study by McClusky and Smith (2008) does not specify if the completion of any assignments or assessments following theoretical preparation is required prior to participating in SBLEs. It should be mentioned that these studies were all performed in a specialised medical field and were designed for practical-skills-based training, which might be easier to assess with the use of online tests and assignments than the evaluation of clinical reasoning or communication skills. However, theoretical preparedness of students prior to engagement in an SBLE is essential (Welman & Spies, 2016) and may be implemented in various formats. However, the essence remains that students should have the necessary skills expected in the SBLE and understand precisely how the SBLE links to their curricular content.

Simulation is resource intensive and time consuming, which requires educators to consider if pre-simulation assessments are attainable and would benefit the achievement of SBLE outcomes. Active learning forms part of the foundation of simulation-based learning, with learning during and after the SBLE being the primary priority; therefore, it could be reasoned that pre-assessment might not be required for all SBLEs.

Three articles specifically mention student orientation as part of of student preparation for simulation (Guinez-Molinos *et al*., 2017; Jeffries *et al.*, 2015; Binstadt *et al.*, 2007). As not all students are familiar with a simulated environment, and do not all know what to expect in terms of logistics and specific session outcomes, this lack of information might cause uncertainty and fear (Nestel & Gough, 2018; Jeffries *et al.*, 2015), which may hamper the learning process. Emotions are intertwined with the learning process (Welman & Spies, 2016) and negative emotions adversely affect learning that transpires in the SBLE. If students are required to take responsibility for the design of simulated scenarios, preparation is of the utmost importance (Guinez-Molinos *et al.*, 2017), as students should be familiar with the environment and the simulation modality being used. Being prepared for and oriented about what an SBLE entails is essential for ensuring a valuable and accurate learning experience within a psychologically safe learning environment.

One article (Jeffries *et al.*, 2015) devotes a section in its framework to describing the self-directed and student-centred nature of the simulated environment. When comparing the original framework of Jeffries (2005), on which the 2015 modified framework proposed by Jeffries (2105) is based, the interaction between students and educators is emphasised, especially regarding goal setting on the part of the student. Individual goal setting is emphasised in relation to achieving self-directed practise. The most recent adaptation of the NLN Jeffries Simulation Framework (Jeffries *et al.*, 2015) does not explicitly state, as in the original framework (Jeffries, 2005), the requirement for students to set their own individual learning goals. The researcher, however, considered it useful to explore the need for students to, in addition to setting learning objectives, set their own goals with regard to what they wish to learn from the SBLEs. With simulation being an active educational method that relies on students being motivated, self-directed and taking responsibility for their learning (Jeffries *et al.*, 2015), the inclusion of individual **goal setting** could possibly be useful in the framework.

Debriefing is a cornerstone of SBE, as reflection, self-exploration and the formative assessment of learning (Cheng *et al.*, 2018; INACSL Standards Committee, 2016d; Chiniara *et al.*, 2013; Motola *et al.*, 2013) are essential for learning. The essence of debriefing is the specific discussions, related to set learning objectives, which are elicited during the debrief process (Chiniara *et al.*, 2013). Student knowledge is improved by debriefing discussions led by a trained facilitator, by exploring participant feelings and goals, assessing learning objective achievement, exploring reasoning processes, affirming positive behaviours and addressing unfavourable behaviour in a constructive manner (Cheng *et al.*, 2018; Chiniara *et al.*, 2013; Motola *et al.*, 2013).

The task of debriefing is complex (Cheng *et al.*, 2018; Chiniara *et al.*, 2013; Motola *et al.*, 2013), ranges from unstructured to structured, and can be scheduled at various time intervals (Cheng *et al.*, 2018; Eppich & Cheng, 2015b). As discussed (Section 3.5.2), the educator should determine the timing and method of debriefing prior to the SBLEs, so that it aligns with the intended learning objectives and enables the required logistical arrangements. Discussion of debriefing methods is beyond the scope of this research study.

It is evident that debriefing is an essential learning tool (INACSL Standards Committee, 2016d) that is utilised in simulation, and that the debriefing session should be facilitated by a competent facilitator (INACSL Standards Committee, 2016d) to encourage reflective learning and reinforce the positive aspects related to the simulated activity.

3.5.5 Data analysis: Evaluation

All but three of the included articles (n=5) cited **EVALUATION** of the programme as playing an integral role in the effectiveness of the simulation integration, with two articles advising on the need for programme validation.

3.5.6 Discussion: Evaluation

The researcher grouped programme evaluation and programme validation under the analytical theme of **EVALUATION,** as these two aspects require different tools during the evaluation process.

It is critical that educators **evaluate** the implemented SBLEs, as well as the programme (Nestel & Gough, 2018; Khamis *et al.*, 2016) to assess the effectiveness of the programme in assisting students to achieve the desired learning objectives. In addition, evaluation of the programme provides educators, administrators and funders with an idea of the programme success, feasibility and limitations (Nestel & Gough, 2018; Adamson, 2015), further curricular or programme adjustments required and the future use of the programme. Evaluation may be performed by students, educators and simulated patients, and evaluation tools used may include formal assessment scoring, informal written and/or verbal reflections, or post-simulation surveys (Khamis *et al.*, 2016; Jeffries *et al.*, 2015; Motola *et al.*, 2013; Zevin *et al.*, 2012; Binstadt *et al.*, 2007). The framework by Jeffries *et al.* (2015) notes the value of including the outcomes of simulation training in relation to the patient as well as the healthcare system in its entirety, to demonstrate educational gains achieved by simulation integration.

Satisfaction surveys, as well as observational student ratings, are viewed by literature as low-level evaluation metrics (McGaghie *et al.*, 2010), with Adamson's (2015) systematic review identifying the need for quality assessment of the effectiveness of simulation in preparing healthcare students for practice. These outcomes could include skill performance, patient care, specific organisational outcomes and a comparison of outcomes achieved utilising a variety of simulation activities versus other teaching and learning activities. Although reference to quality programme evaluation methods and instruments, including student assessment instruments that may be used as part of programme evaluation, are lacking in literature (Adamson, 2015; Beattie *et al.*, 2010) the execution of programme evaluation is essential and should follow best practice guidelines.

Methods of **validating** both programmes and programme evaluations may include using standardised education models, such as the Kirkpatrick training evaluation model, existing national requirements and standards, or expert consensus and literature reviews to develop programme/metric content validity (Khamis *et al.*, 2016; Motola *et al.*, 2013; Zevin *et al.*, 2012).

The Kirkpatrick training evaluation model is generally used to evaluate the success of a programme (ASPiH Standards Project Team, 2016), and includes four successive evaluation levels. The first evaluation level, *reaction*, measures the satisfaction of all SBLE participants, can be obtained using verbal or written feedback (Ohtake *et al.*, 2013), and should confirm content relevance (ASPiH Standards Project Team, 2016). Levels 2 and 3, *demonstratable knowledge, skills, attitudes and behaviours* gained from the SBLEs, can be obtained from educator or peer-based assessments (Kurt, 2016). Even if teaching and learning are applied successfully, it remains uncertain if it truly benefits the healthcare organisation, and educational institutions are under constant pressure to justify the training investments made (Tamkin *et al.*, 2002). *Organisational performance*, Level 4 of the model, is more challenging to measure, as a variety of factors may influence the demonstrated skills, improved patient safety and educational costs incurred (Kurt, 2016). For the learning to move beyond the student and affect the healthcare organisation is a time-consuming process and improved outcomes may only be observed at a later stage (Tamkin *et al.*, 2002). Thus, literature advises that quantitative information (e.g., fewer errors, alternative training costs, time saved), qualitative information (e.g., patient satisfaction and safety, service delivery, care quality), and information related to cost and value contribution, are gathered to obtain a well-rounded view of organisational benefits (Bukhari *et al.*, 2017; Tamkin *et al.*, 2002).

In 1994, Phillips proposed a fifth level for the Kirkpatrick training evaluation model for measuring performance in organisational training, namely, the value of the training to the organisation (Bukhari *et al.*, 2017; Tamkin *et al.*, 2002). Although monetising qualitative benefits of simulation-based training is challenging, the value measurement methodology described (Bukhari *et al.* 2017) may be utilised to identify tangible and intangible values added by training programmes, which can subsequently be quantified by means of the Phillips return on investment (ROI) methodology. Expanding on the work of Phillips, Bukhari *et al.* (2017) present an integrated framework, considering both the abovementioned methodologies (Phillips' ROI methodology and value measurement methodology), to enable calculation of ROI, including all tangible and intangible values and benefits of simulation-based training. The ROI framework described by Bukhari *et al.* (2017) enables institutions to monetise the value of simulation-based training by, firstly, identifying the key impact measurement of the simulator, for example, care costs and number of complications. Secondly, the training effects of the simulator are isolated and monetised, depending on the effects identified. Control groups, forecasting and performance estimation questionnaires may be used to isolate training effects (Bukhari *et al.*, 2017). Finally, the costs incurred by the simulator, namely, initial costs and operational costs, are utilised to calculate the ROI by means of a formula recommended by the literature (Bukhari *et al.*, 2017). The researcher advises that the framework by Bukhari *et al.* (2017) is considered to assess the value of a programme that integrates simulation, by considering qualitative, quantitative and financial information that has been collected in relation to simulation integration.

The onus would rest on the educators responsible for simulation integration to select the most applicable method to ensure programme evaluation validity. Without these criteria the simulation programme might not enjoy further institutional support (Khamis *et al.*, 2016).

3.5.7 Data analysis: Revision

The theme relating to **REVISION** of the programme integrating simulation yielded only one descriptive theme, namely, adjustments, which was included in two of the articles (Motola *et al.*, 2013; Zevin *et al.*, 2012).

3.5.8 Discussion: Revision

A continuous process of programme evaluation and revision (Motola *et al.*, 2013; Zevin *et al.*, 2012) is required to ensure that the programme is achieving optimal results, and to identify and implement required programme **adjustments**. Only two articles mention an aspect of programme revision (Motola *et al.*, 2013; Zevin *et al.*, 2012), probably because, in education practice, programme revision is seen as an implicit part of programme development and implementation.

Adjustments to the programme should be done in accordance with the programme's identified strengths and weaknesses (Zevin *et al.*, 2012) and should include identification of a sustainable method of programme continuation. Advances in simulation technology and educational best practices (Sabus & Macauley, 2016; McGaghie *et al.*, 2010) should also be considered when revising and adjusting a SBE programme, to ensure the best methods are used for student training. Ensuring the programme continuously meets the needs of the institution, educators, students and the society it serves, is essential and the researcher acknowledges the value of including adjustments as part of the framework to ensure programme sustainability.

Additionally, one article (Khamis *et al.*, 2016) includes the curricular implementation of the revised framework as a separate element to consider. Considering that the overarching aim of a framework is the re-administration of the adjusted programme, the researcher did not deem it necessary to include it.

3.6 CONCLUSION

When integrating simulation into a programme, the planning phase is the most extensive phase, which undoubtedly requires thorough preparation by the educators involved, to ensure the provision of an environment conducive to learning. For simulation to be integrated effectively, considerable support, including resource acquisition, SBLE development, educator training and involvement in simulation execution, is essential. The SBLE should be designed by taking into account the stipulated programme outcomes, with the curriculum planned in such a way that it allows for the execution of the SBLEs in line with the chosen pedagogy. In accordance with published research, all articles that were included considered constructive learning outcome alignment and the inclusion of post-simulation debriefing to be essential. Constructively aligning learning outcomes calls for detailed planning. The scenario presented to the students serves as the foundation for learning and ensures the SBLE is presented in a manner that is perceived as "real" by the students, and in line with their theoretical and practical experience levels – which is crucial in facilitating learning. Considering South Africa's unique social and educational environment, the researcher deems it essential that needs analyses be performed prior to curriculum and subsequent programme development, to ensure the programme addresses all stakeholder needs.
The implementation of ML/DP should be done in accordance with the applied education theory, due to practicality issues accompanying such practice.

Although evidence of the effectiveness of simulation-based assessments remains elusive, a shrinking training platform and patient safety concerns has increasingly caused simulation to be utilised for summative, non-immersive, practical-skills-based assessments in healthcare education.

When evaluating the applicability of SBLEs for assessment purposes, it is essential to remember that the simulated environment is designed to be a safe environment, and introducing summative assessment, especially in an immersive simulated environment, should be considered carefully to safeguard the students' psychological safety.

In conclusion, the study identified four analytical themes, supported by 18 descriptive themes that are deemed essential for consideration when designing a framework for the integration of simulation in a healthcare programme. The generated and described analytical and descriptive themes were utilised by the researcher to develop statements to be included in the Delphi survey to construct a conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme.

In the next chapter, the Delphi survey will be presented, including the methodology, results and discussion of the results, with the aim of developing a conceptual framework for the integration of simulation in the South African physiotherapy programme.

CHAPTER 4

DELPHI SURVEY

4.1 INTRODUCTION

In this chapter, the Delphi survey methodology utilised during the second phase of the study will be discussed. The results of the survey will be presented in the form of graphs, figures and tables, followed by a discussion of the results obtained.

All published frameworks available for curricular integration of healthcare simulation were designed and developed in first-world contexts, as mentioned in Chapter 3. Developing countries, including South Africa (Singh, 2015), experience challenges when adopting strategies designed for a developed economy. Challenges, including lack of funding and resources, national healthcare deficits and difficulties, inadequate educator qualifications and an underprepared and diverse student population (WCPT, 2019; ASSAf, 2018; Frantz, 2007; Kent & de Villiers, 2007), set South African healthcare education apart from that of many other countries and, therefore, it warrants contextual research.

The full integration of simulation in South African healthcare programmes is still being met by resistance (*cf.* Sections 1.1 & 2.4.3), and no published national physiotherapy research into the use of and/or integration of simulation is currently available. Due to the paucity of national simulation-based research, the researcher was compelled to consider collecting data from a diverse healthcare education population, including international participants with experience of simulation integration.

A Delphi survey has the unique ability to collect data anonymously from participants, thereby preventing undue influences, such as group conformity and bias, and enables free expression of opinions (Avella, 2016; Morgan *et al.*, 2007). A Delphi survey is, furthermore, advantageous because valuable expert opinions are obtained from people who are, potentially, at various geographical locations (Morgan *et al.*, 2007). This is particularly valuable when exploring relatively unknown concepts, or when aiming to design a new framework, guidelines or policy (Arthur *et al.*, 2013), which was the aim of this study phase. Therefore, a Delphi survey was deemed appropriate to obtain expert opinion (Avella, 2016; Savin-Baden & Major, 2013) regarding the elements to be included in a conceptual framework for simulation integration in the South African undergraduate physiotherapy context. Inclusion of participants from abroad meant that input from experts with extensive experience regarding the integration of simulation could be gathered, whereas South African experts were able to provide contextualised feedback.

4.2 RESEARCH QUESTION

The research question posed in order to answer the problem statement (see Section 1.2) was:

- What are the perspectives and recommendations of experts in South Africa and abroad in the fields of healthcare simulation and healthcare education regarding the elements to be included in a conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme?

4.3 OBJECTIVES

The objective was:

- To identify the elements to be included in a conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme by means of a Delphi survey amongst experts in South Africa and abroad in the fields of healthcare simulation and healthcare education.

4.4 RESEARCH METHODOLOGY

4.4.1 Study design

A non-experimental descriptive research design utilising a Delphi survey was used.

4.4.2 Study methodology

A classic Delphi survey is characterised by a first-round survey comprising open-ended questions, followed by a second round consisting of opinions, provided by panel members, in the form of closed-ended statements (Arthur *et al.*, 2013). Iteration during the execution of a Delphi survey is used to refine views, while controlled feedback enables the researcher to inform panel members of other perspectives and opinions the participants should deliberate on. In line with the constructivist paradigm, it is essential to achieve shared understanding on the specified topic (Savin-Baden & Major, 2013), which is achieved by means of the iterative process.

A modified Delphi survey, comprising selected closed-ended statements obtained from various sources (Hasson & Keeney, 2011), rated according to a Likert scale (Arthur *et al.*, 2013), was identified as the most suitable research method to answer the research question (*cf.* Section 4.2). A modified Delphi survey was selected, as information pertaining to elements proposed for inclusion in a framework for the integration of simulation in a healthcare programme, in the form of closed-ended statements, had been sourced previously, during the systematic review (*cf.* Chapter 3). Researchers who use a Delphi survey are advised to focus on the content validity of their statements, which was achieved by the systematic review process (*cf.* Chapter 3), rather than to optimise the Likert scale width, as a too-large scale width may result in response errors (Felix, 2011). Likert scales with five to nine response options are generally preferred for collecting information on participant attitudes and behaviours regarding proposed items (Felix, 2011), and prevent a convergence around the middle point of the scale. However, as the researcher aimed to collect input regarding the value for framework inclusion of each posed statement, a three-point Likert scale, as utilised in Frantz's 2007 study, was deemed acceptable. By utilising the Delphi method, the researcher aimed to solicit further expert opinion by providing space under each statement for additional suggestions or comments by participants (Arthur *et al.*, 2013; Okoli & Pawlowski, 2004).

During a Delphi survey, it is important that the aim should be to reach consensus on each statement posed. Recommendations indicating the achievement of consensus in Delphi surveys range from 51% to a cautious 71% (Slade *et al.*, 2016; Polit & Beck, 2012; Boulkedid *et al.*, 2011). Consensus for this research study was defined as 70% or above of panel members agreeing on the inclusion or exclusion of a statement, which was in line with previous Delphi surveys in similar research areas (McMillan *et al.*, 2016; Slade *et al.*, 2016; Morgan *et al.*, 2007). Stability was declared when individual panel member option selections remained similar across survey rounds, with suggestions provided for the specific statement not resulting in further content or contextual changes, additions or omissions (Slade *et al.*, 2016; Vázquez-Ramos *et al.*, 2007; Fitch *et al.*, 2001).

4.4.3 Target population

The target population consisted of experts in South Africa and abroad in the fields of healthcare education and healthcare simulation (*cf.* Tables 1.1 & 4.2). The participants had to comply with at least one of the following inclusion criteria in order to be viewed as an expert by the researcher:

- Editor or author of a chapter in a textbook(s) on relevant healthcare simulation..
- Speaker at national and/or international conferences with a focus on healthcare simulation.
- Conducted own research in the use of relevant healthcare simulation.

- Author of a published, peer-reviewed research paper on the use of simulation in physiotherapy and/or relevant healthcare simulation.
- Either international or national physiotherapy academics, chosen for their physiotherapy education and simulation expertise.
- Managers of healthcare simulation units.

**See the concept clarification section for the definition of relevant healthcare simulation.*

Note that it was not deemed applicable to include years of experience as a criterion, as the use of simulation in healthcare education has only gained widespread acceptance and momentum in the past decade and has recently delivered a large amount of research from younger academics. As there was no South African literature on the use of simulation in undergraduate physiotherapy education, local simulation experts in similar healthcare professions, for example, nursing, medicine and occupational therapy, were considered for inclusion. It was assumed that experts in other healthcare fields would be able to provide expert input, as healthcare curricula are committed to teaching science and healthcare with the aim of improving patient care (All Allied Health Schools, n.d.) and share several clinical skill commonalities (Thurling, 2017).

4.4.4 Description of sample

A purposive sample of healthcare educationalists from South Africa and abroad, in both physiotherapy and/or other healthcare fields, as well as healthcare simulation experts, were identified by the researcher in collaboration with the study promoters according to the criteria listed in Section 4.4.3. Experts who were identified were invited to participate in the Delphi survey and to provide holistic and in-depth insight into the elements considered essential for inclusion when developing a framework for simulation integration in the South African undergraduate physiotherapy programme. Experts were selected based on the stated inclusion criteria (*cf.* Section 4.4.3) and their willingness to participate (Boulkedid *et al.*, 2011).

A ratio of 1:2 international:national experts was decided upon by the researcher. The majority of participants were experts in South Africa, and were expected to provide a contextualised point of view that is unique to the South African environment and educational challenges. As no simulation-based research in the South African undergraduate physiotherapy programme had been published at the time of study execution, it was necessary to include physiotherapy experts from other countries too. The researcher aimed to find a balance between expert insight into and knowledge of the unique healthcare environment South African healthcare educators are facing. Table 4.1 depicts the experts recruited for the Delphi study.

Table 4.1: Expert panel recruited for Delphi survey

AREA OF EXPERTISE	N	NATIONALITY	PROFESSION
Healthcare educationalist and simulation expert (conducted simulation-based research, did congress presentations, published work)	6	2 International 4 National	**National:** Nursing educationalist and simulation expert (n=1), General* (n=3) **International:** Physiotherapy (n=1), General* (n=1)
Medical simulation expert (conducted simulation-based research, did congress presentations and published work)	6	3 International 3 National	**National:** Medical specialist** (n=3) **International:** Medical specialist***(n=3)
Healthcare simulation facility directors	2	2 National	NA
Physiotherapy educationalist with simulation expertise (congress presentation, currently not published in SBE)	1	1 National	NA

**A participant described as "general" is a qualified healthcare professional working in a simulation unit or centre with various healthcare professions students.*

***National medical simulation experts included two anaesthesiologists and one general medical practitioner.*

****International medical simulation experts included two anaesthesiologists and one surgeon.*

4.4.5 Sample size

Literature advises a small Delphi sample size of approximately 10-18 experts (Boulkedid *et al.*, 2011; Okoli & Pawlowski, 2004), to minimise obtaining false consensus and to enhance data reliability (Hasson & Keeny, 2011). Therefore, five international and ten national experts who satisfied the inclusion criteria were identified by the researcher and study promoters. The experts who were identified were invited to participate in the Delphi survey via an emailed information letter detailing the study aims and procedure (*cf.* Appendix M) (Boulkedid *et al.*, 2011).

4.4.6 Pilot study

Pilot studies are usually not associated with Delphi surveys, as a test for instrument validity and reliability is not the objective (Avella, 2016; Trevelyan & Robinson, 2015), instead, the survey should be well designed and comprehensive on the chosen subject (Avella, 2016). However, as the researcher made use of a self-designed survey, the inclusion of a pilot study to obtain outside expertise to ensure that all statements were clear and unbiased, that the survey was well structured, and to establish the time required to complete the survey (Avella, 2016), was deemed necessary.

Avella (2016) advises consulting one or more expert participants for a Delphi pilot study. Therefore, one healthcare educationalist who is knowledgeable about SBE, who is also a Delphi survey expert, was included in the pilot study of the Delphi survey.

The pilot study participant received two weeks, the same time allocated for survey completion in the main study, to provide feedback regarding the clarity of survey instructions, language and grammar and survey comprehensiveness regarding the topic. The researcher received electronic feedback from the pilot study participant, who suggested amendments to clarify certain statements to enable the researcher to collect more specific and detailed information. A detailed description of amendments proposed by the pilot study will be described in Section 4.4.6.1.

As the pilot study was not analysed for subsequent rounds, no results are included in the main survey's data.

4.4.6.1 ***Amendments following the pilot study***

The changes advised, as tabulated in Appendix N, relate to the clarification of statements identified, to improve ease of answering, as well as the inclusion of additional statements.

The term simulated activity/scenario, which was used in the majority of statements, required clarification, as the participant indicated that the terms are understood as two different concepts in simulation education. The term was, subsequently, adjusted to simulated-based learning experience, which is defined by the Healthcare Simulation Dictionary as a variety of activities representing actual or potential educational or clinical practice situations (Lopreiato *et al.*, 2016). One question relating to logistical arrangements of SBLEs was omitted after the pilot study, as it was viewed as repetition of a previous statement. It was suggested during the pilot study that questions pertaining to the process of curriculum development be added to the survey, however, the researcher did not add any questions, as the process of curriculum development did not fall within the scope of this framework.

Statements focussing on the execution of needs analyses were moved from the end to the beginning of the planning theme, to allow for a more logical flow in statement presentation. Aspects regarding non-technical training were also moved to form part of the more appropriate outcomes section, as it was suggested that it would fit better as an outcome than as a separate section within the implementation theme.

No technical problems regarding the online completion of the survey were reported, and approximately 30 minutes was needed for survey completion.

The suggested amendments were made by the researcher and verified by both study promoters for quality assurance purposes.

4.4.7 Data collection

Following ethics approval (*cf.* Section 3.4.2.3) the first survey round was developed by the researcher (*cf.* Appendix O). The first Delphi survey round comprised closed statements compiled from the completed systematic review (*cf.* Chapter 3), and contained all the elements included in the published frameworks focussing on curricular simulation integration. Experts included in the survey will henceforth be referred to as panel members in accordance to Delphi methodology (Thurling, 2017; Avella, 2016; Trevelyan & Robinson, 2015).

Panel members received a detailed information leaflet (*cf.* Appendix M) describing the purpose and structure of the Delphi survey, as well as an informed consent form to be completed and returned to the researcher prior to study participation (*cf.* Appendix P). The electronically distributed instruction leaflet provided a short literature review relating to the study context, study aim and rationale, study-specific ethical considerations, instructions for survey completion, the composition of subsequent survey rounds and the procedure for reporting following each survey round. In an attempt to decrease participation dropout, the instruction leaflet ensured that panel members understood the researcher's expectation clearly, and also understood the Delphi method clearly.

Bearing in mind that some panel members were not from South Africa, or did not have a background in physiotherapy, contextual clarification was deemed necessary. A short document explaining the South African undergraduate physiotherapy programme, student population and healthcare context was provided to all panel members for clarification and to increase the validity of the obtained data (*cf.* Appendix Q).

The time limit of two weeks for submission of the completed survey was clearly indicated on the information leaflet. Participants were made aware that, by completing and returning the consent form, they were providing informed consent for study participation. The signed informed consent documents were safeguarded by the researcher on a password-protected computer and external hard drive, for recordkeeping purposes.

Panel members were provided with the researcher's contact details, if any queries arose or if participants preferred to return the completed survey by any means other than an online submission.

The researcher opted to use SurveyMonkey® as a data collection tool. As SurveyMonkey® is based online, it enabled easy survey adjustment as well as timely survey delivery, return and analysis of data collected from a widely distributed pool of panel members (Avella, 2016; Grisham, 2009). This rapid form of distribution also enabled a speedy turnaround time between survey rounds (Okoli & Pawlowski, 2004).

SurveyMonkey® depicts results on a bar graph per statement, displaying results as percentages. Data accuracy is ensured by SurveyMonkey® allowing results and panel member comments to be exported as a PDF document, which can be copied directly into text. If panel members had opted to return the completed survey in any way other than via the online tool SurveyMonkey®, the researcher would have been required to transfer the data manually in an Excel spreadsheet for further analysis, however, this was not necessary during the course of this study.

Panel member anonymity facilitates free and unhindered responses (Avella, 2016; Okoli & Pawlowski, 2004), and avoids group bias (Boulkedid *et al.*, 2011), both of which were ensured by panel members receiving individual emails that did not indicate the full email recipient list. Panel members were, however, not anonymous to the researcher, which allowed the researcher to follow up when clarification was required (Okoli & Pawlowski, 2004).

Following completion and return of each survey round, data was meticulously analysed by the researcher. Analysis was followed by a consensus meeting with the study promoters, to ensure that all comments and suggestions had been addressed and were accurately incorporated during the following round, thereby limiting the introduction of bias (Avella, 2016; Hallowell, 2009).

Data saturation is achieved when the repeated rounds yield either a convergence of panel member opinions, or individual response stability per statement (Arthur *et al.*, 2013; Vázquez-Ramos *et al.*, 2007; Fitch *et al.*, 2001). The Delphi process continued until data saturation was achieved during Round 3 of the survey. As this research study utilised a three-point Likert scale, statistical analysis beyond the reporting of percentages was not feasible. Stability was declared when panel member responses remained similar across survey rounds and no further suggestions that resulted in content or contextual changes to the posed statements were elicited (Slade *et al.*, 2016; Boulkedid *et al.*, 2011; Vázquez-Ramos *et al.*, 2007; Fitch *et al.*, 2001).

In accordance with standard Delphi survey procedure, panel members received a two-week period in which to complete the survey; if they did not respond, they received an electronic reminder after one week, and again two days prior to the completion deadline (McMillan *et al.*, 2016; Slade *et al.*, 2016; Boulkedid *et al.*, 2011).

4.4.8 Data analysis

For each statement posed to panel members, SurveyMonkey® displays the results as percentages in a graph, indicating how many panel members declined to answer a specific statement, and providing all comments or suggestions made for each statement provided. Data was analysed as percentages to assess if consensus had been achieved per statement, as only three options (Essential, Useful, Not applicable) were provided to panel members for consideration. Due to limited justification regarding selected options or opinions related to posed statements provided by panel members, content analysis of panel member comments could not be performed.

Although 61% of the Delphi surveys included in the systematic review of Boulkedid *et al.* (2011) did not mention providing panel members with feedback between survey rounds, literature (Tricco *et al.*, 2018; Avella, 2016; Trevelyan & Robinson, 2015) advises that individual feedback, group ratings and detailed descriptions of all relevant comments are included in detailed reports to panel members between rounds. The aim of a detailed report is to inform panel members of the extent of consensus, and to provide group and individual responses, to assist with decision-making in subsequent Delphi rounds (Trevelyan & Robinson, 2015; Boulkedid *et al.*, 2011). In order to minimise a situation of groupthink and dominance, undue influence by panel members could be limited by sending the panel all non-consensus-achieving statement results, and including only an individual panel member's selection and any relevant choice justifications posed by fellow members (Avella, 2016; Trevelyan & Robinson, 2015; Hsu & Sandford, 2010). However, during the execution of this Delphi survey, only statements achieving consensus were summarised in the detailed report to panel members completing the survey round, as no comments or justifications resulted in statement context being changed. Providing panel members with statistical results while providing no supporting information obtained via content analysis of panel member comments, could have yielded less accurate study results, and would introduce collective unconscious (Hallowell, 2009). All statements achieving consensus were removed from subsequent rounds to limit survey length and optimise participation (Trevelyan & Robinson, 2015).

Statements that failed to achieve 70% consensus, as well as new or adjusted statements, were formulated into the subsequent survey rounds according to panel member comments and the outcome of a consensus meeting between the researcher and study promoters (Avella, 2016; Hsu & Sandford, 2010; Hallowell, 2009). The consensus meeting between the researcher and the study promoters ensured that all suggestions were accurately incorporated into the subsequent rounds (Slade *et al.*, 2016) and minimised researcher bias (Avella, 2016).

4.5 RELIABILITY AND VALIDITY

Although literature states that the Delphi method overlaps both quantitative and qualitative research processes (Hasson & Keeney, 2011), for the purpose of this study, the Delphi survey was executed in a quantitative manner, which necessitates a discussion of reliability and validity.

4.5.1 Reliability

Reliability was achieved during the Delphi survey by ensuring that statements were unambiguous and clear, and that all administration and procedures were standardised by performing a pilot study. The Delphi survey was performed according to a specific time schedule, which allowed two weeks for completion of each survey round, thereby preventing or minimising participant fatigue (Creswell, 2012). The researcher reassured panel members throughout the study that they would remain anonymous, and that their data would be dealt with confidentially, which resulted in unbiased completion of the survey rounds (Slade *et al.*, 2016).

Verification of data and subsequent statement adjustments by the researcher in collaboration with research promoters, as well as continuous iteration and feedback between panel members, increased study reliability (Avella, 2016; Hallowell, 2009).

4.5.2 Validity

Because the panel included members from South Africa and abroad, and members who did not all have a physiotherapy background, the researcher opted to provide all panel members with a description of the undergraduate South African physiotherapy programme, to ensure more contextualised results.

Content and face validity was achieved by ensuring comprehensive coverage of the subject through a systematic review process (Hasson & Keeney, 2011). The statements posed to panel members were constructed mindfully to elicit all opinions and perspectives (Savin-Baden & Major, 2013; Creswell, 2012; Polit & Beck, 2012; Botma *et al.*, 2010).

Purposefully selecting a sample of experts with extensive knowledge on the subject of healthcare education and healthcare simulation for inclusion in the survey also enhanced the validity of the data, as they were able to provide guidance and authority regarding what should be included in the framework (McMillan *et al.*, 2016)

Data authenticity was ensured by verifying the adjustments made between survey rounds during a consensus meeting between the researcher and the two study promoters following each survey round.

4.6 ETHICAL CONSIDERATIONS

Approval for the study was obtained from the Health Sciences Research Ethics Committee at the UFS, South Africa (HSREC 108/2017) (*cf.* Appendix E). The contact details of experts identified for inclusion were obtained by the researcher from their published and/or presented research, their professional affiliations with tertiary educational institutions or involvement with international and/or national special interest groups for simulation or simulation centres. Voluntary participation was emphasised and panel members were reminded that they could withdraw at any time during the study without repercussions.

As the electronic Delphi survey was sent to each panel member individually, individuals remained anonymous with regard to each other, which encouraged freedom of expression (Avella, 2016; de Vos *et al.*, 2011). Obtained data was safeguarded on a password protected computer, to which only the researcher has access, and back-up copies of data collected will be stored for seven years on an external hard-drive in a locked safe according to the Good Clinical Practice Guidelines. As the data was presented in group format, panel members remain unidentifiable.

An information leaflet (*cf.* Appendix M) was provided to panel members, detailing the Delphi survey procedure and research aims, after which informed consent was obtained from all panel members (*cf.* Appendix P). Panel members were informed that failure to complete the Delphi survey within the two-week time limit set by the researcher, would be viewed as study withdrawal.

The researcher ensured a transparent research process throughout the Delphi study by providing panel members with a comprehensive information leaflet relating to the study procedure, and a detailed report following each completed round (De Vos *et al.*, 2011).

4.7 RESULTS

In this section, the results of the Delphi survey will be presented in the form of graphs, figures and tables.

4.7.1 Delphi Round 1

A response rate of 93% (n=14) had been achieved on conclusion of Round 1 of the Delphi survey. Of the 14 panel members who participated, 36% (n=5) were based abroad and 64% (n=9) were based in South Africa. Only one locally-based panel member dropped out during Round 1.

Upon conclusion of Round 1, 47% (n=44) of statements achieved inter-panel consensus. A summary of these statements were distributed electronically to all panel members via individual emails (Appendix R). Table 4.2 depicts a summary of all statements on which consensus had been achieved during the three survey rounds, including the value assigned (Essential, Useful, Not applicable) to each statement by the panel members.

The remaining 50 statements were adjusted (n=50), collapsed (n=14) or expanded (n=2) according to panel member suggestions, and after the outcome of the consensus meeting with the study promoters.

4.7.1.1 *Adjustments following Round 1*

All adjustments to the posed statements were in accordance with panel member comments and suggestions and the outcome of the consensus meeting, which was described in Section 4.4.7. The consensus meeting between the researcher and study promoters ensured accurate data analysis, and that relevant changes were made to the remaining statements in preparation for Round 2 of the survey.

Appendix S provides a summary of all statements that failed to achieve consensus and, where relevant, indicates the adjustments made according to panel members' suggestions and/or following the outcome of the consensus meeting. No comments provided clear justification for panel members' option selection, but panel members did propose language, terminology and grammatical changes for ease of understanding and alignment with SBE. It should be noted that some comments were not applicable to the current research study's aims and objectives, or were irrelevant to the posed statement, and did not warrant change. These comments were excluded from data analysis.

Due to some panel members expressing uncertainty regarding the meaning of the option "Not applicable", the researcher adjusted the answering options to include "Uncertain" as from survey Round 2. Clarification about when to select "Not applicable" or "Uncertain" improved the section detailing survey completion instructions.

4.7.2 Delphi Round 2

Round 2 of the Delphi survey consisted of 38 statements posed to the 14 remaining panel members. The exact same manner of distribution and survey completion procedure were followed as for Round 1 of the survey.
A response rate of 86% (n=12) was achieved during Round 2, with two national panel members opting out of the survey. Of the panel members participating in the second round, 42% (n=5) were panel members from abroad. A response rate of 58% (n=7) was obtained from local panel members.

On conclusion of Round 2, 34% (n=13) of statements achieved inter-panel member consensus and were removed from the subsequent survey round (*cf.* Table 4.2). Although panel members' comments resulted in the grammatical and language-based adjustment of 10 of the remaining 25 statements (*cf.* Appendix T), no comments required content-based statement revisions and, therefore, a consensus meeting was deemed unnecessary.

A short report providing a summary of statements for which consensus had been achieved, was again distributed to all panel members who took part in Round 2 of the survey (*cf.* Appendix U).

4.7.2.1 *Adjustments following Round 2*

Adjustments made following Round 2 of the Delphi survey included minor adjustments to wording, with no rephrasing of statements. No new comments or suggestions that necessitated contextual changes to statements or the generation of new statements were proposed. All adjustments made following Round 2 of the survey are provided in (*cf.* Appendix T).

4.7.3 Delphi Round 3

In total 25 statements were included in the third survey round and were subsequently distributed to the 12 remaining panel members. As with previous rounds, SurveyMonkey® was used to distribute the survey electronically to the remaining panel members.

In Round 3, a response rate of 92% (n=11) was achieved. A total of 36% (n=4) panel members from abroad and 64% (n=7) from South Africa completed Round 3 of the Delphi survey. Only one panel member from abroad opted out of the third survey round. A total of 32% (n=8) of the 25 statements posed to panel members during Round 3 of the survey achieved consensus (*cf*. Table 4.2).

An overall Delphi response rate of 73% (Figure 4.1) was achieved.

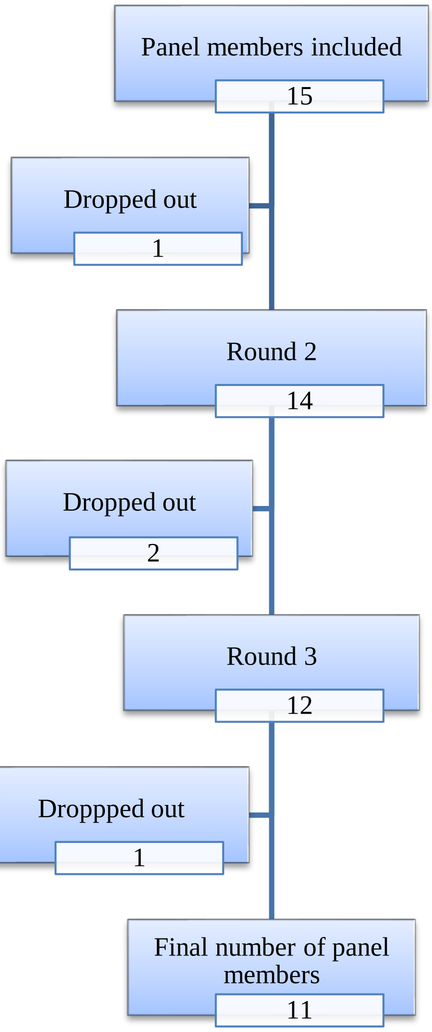

Figure 4.1: Panel member dropout (compiled by the researcher, Van der Merwe, 2020)

An overall dropout rate of 27% (n=4) was observed during the Delphi study, with the majority of panel member dropping out (n=2) during Round 2. Reasons for dropout were not explored.

Figure 4.2 depicts the distribution of panel member‘s geographical origin during all three Delphi survey rounds.

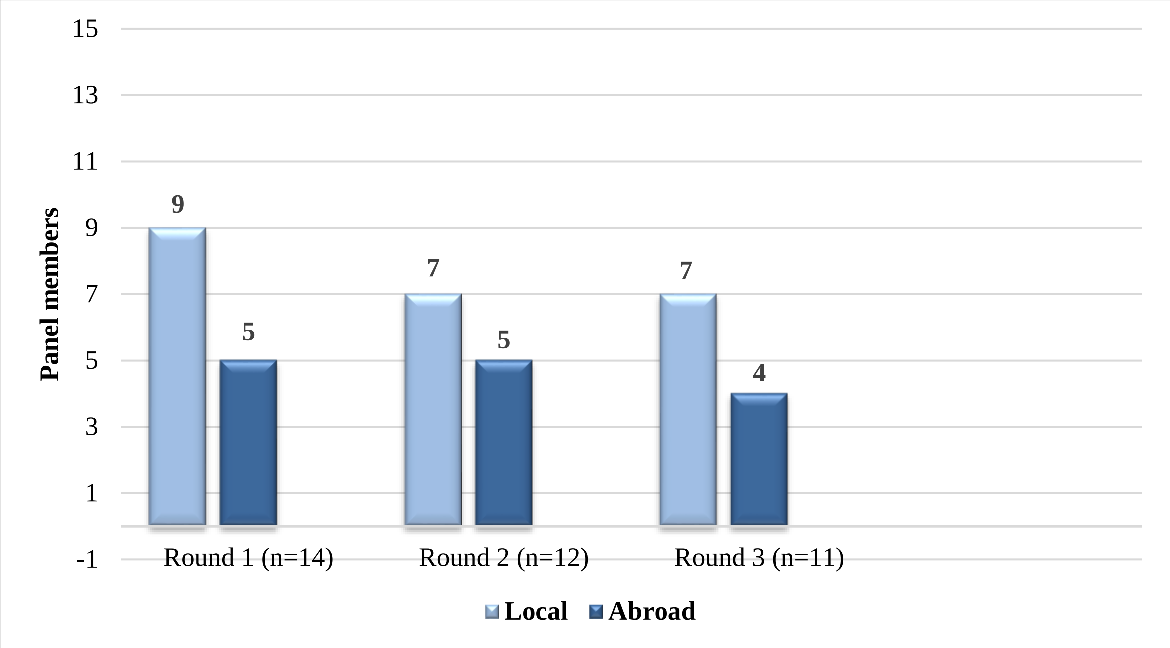

Figure 4.2: Panel member distribution

In Round 3, 36% (n=4) of panel members were from abroad, and 64% (n=7) were from South Africa.

4.7.3.1 *Adjustments following Round 3*

Following data analysis, the remaining 17 statements, on which consensus had not been achieved, demonstrated no change in individual panel member responses over the course of the three rounds. Therefore, the centralisation of panel members' opinions, including no further comments proposed for the remaining statements, meant all 17 statements had reached stability (Arthur *et al.*, 2013; Frantz, 2007; Fitch *et al.*, 2001). Even though statements relating to assessment and ML/DP showed a difference greater than 10% between rounds for the most frequently selected option, individual panel member responses on these statements did not change between rounds. It is possible that participant dropout between rounds resulted in the calculated percentages seeming to vary between rounds. Round 3 of the survey was, therefore, viewed by the researcher as the final survey round.

A final report detailing the remaining statements for which consensus was achieved, was sent to panel members, with an indication that the third survey round would be the final survey round (*cf.* Appendix V).

4.7.4 Statements achieving consensus

Inter-panel member consensus was achieved for 47% (n=44) of the 94 statements presented to panel members during Round 1 of the Delphi survey (*cf.* Figure 4.3). During Round 2, 34% (n=13) of the 38 statements achieved consensus, while 32% (n=8) of the 25 posed statements achieved inter-panel member consensus during the third, final round (*cf.* Figure 4.3).

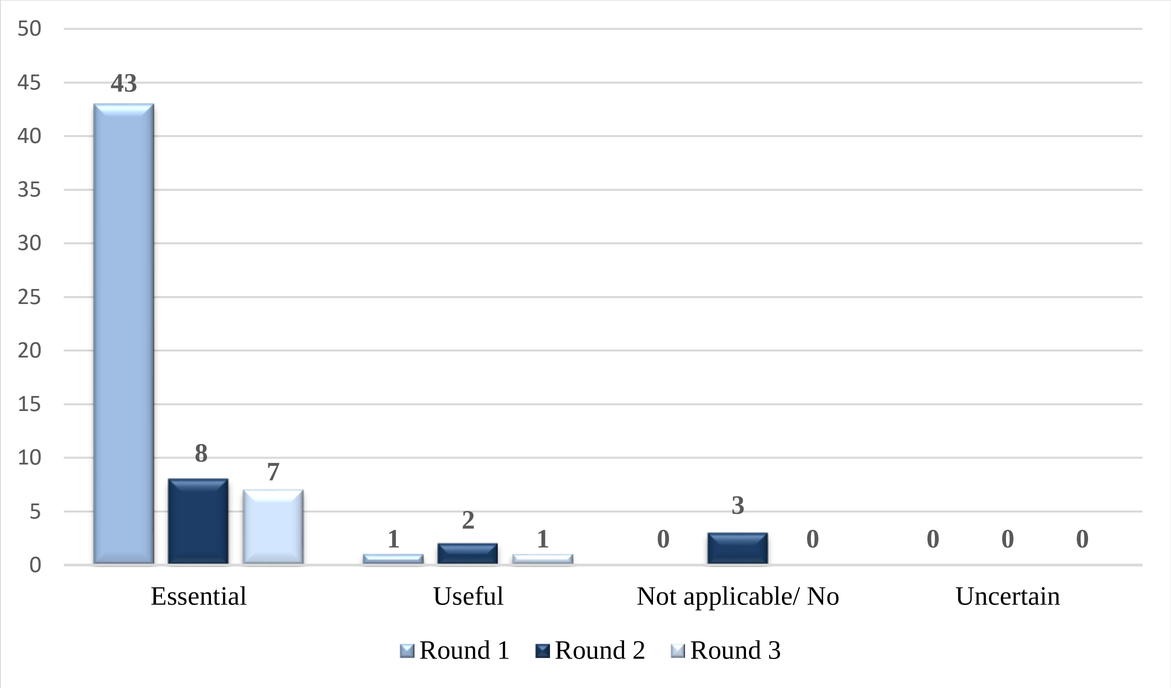

Figure 4.3: Statements achieving consensus

Round 1 (n=94); Round 2 (n=38); Round 3 (n=25)

Number of statements achieving consensus for each option (Essential, Useful, Not applicable/No, Uncertain) per round is indicated in various shades of blue.

All statements for which consensus or stability was achieved during the Delphi survey were grouped together and are summarised in Table 4.2 and Table 4.3 respectively.

Table 4.2: Statements achieving inter-panel member consensus during the Delphi survey

**The percentage consensus achieved is indicated under the corresponding importance option; Round refers to Delphi round where consensus was achieved.*

***Italic sections refer to additional clarification provided to panel members.*

***Blue** shading indicates survey Round 1, **Yellow** shading indicates survey Round 2 and **Green** shading indicates survey Round 3.*

CONSENSUS STATEMENTS RELATING TO PLANNING		Round	Essential	Useful	Not applicable/ No	Uncertain
NEEDS ANALYSES	A needs analysis identifying institutional needs, which could be addressed by the integration of simulation into the programme, must be performed during the planning phase.	1	93%			
	A needs analysis identifying discipline specific needs, which could be addressed by the integration of simulation into the programme, must be performed during the planning phase.	1	93%			
CURRICULUM DEVELOPMENT	All involved stakeholders (educators, simulation experts, educationalists etc.) must collaborate to ensure curricular integration of simulation.	1	79%			
	A standardised educational model should be useful when designing a simulation programme, but must allow for contextual flexibility.	2	75%			
	All involved stakeholders (educators, simulation experts, educationalists etc.) must collaborate in the process of developing a curriculum, which integrates simulation.	1	71%			
	All involved stakeholders (educators, simulation experts, educationalists etc.) must assess where simulation will be used best, as opposed to other teaching strategies, to ensure optimal learning.	1	71%			
TRAINING	All educators involved in the facilitation of simulated-based learning experiences are required to receive training prior to facilitating these learning experiences.	1	93%			
	All educators involved in providing feedback following simulated-based learning experiences are required to receive training prior, to prepare them in the art of providing meaningful feedback.	1	79%			

	CONSENSUS STATEMENTS RELATING TO PLANNING (cont.)	Round	Essential	Useful	Not applicable/ No	Uncertain
TRAINING	All educators involved in the facilitation of simulated-based learning experiences are required to receive training in debriefing.	1	71%			
	All involved stakeholders (educators, simulation experts, educationalists) involved in the development of simulated-based learning experiences are required to receive training on how to integrate and develop these learning experiences.	1	71%			
	All personnel involved in the development of simulated-based learning experiences are required to receive orientation regarding the available faculty/institutional resources, which could be applicable to their field.	3	73%			
OUTCOMES	Specific learning outcomes for each simulated-based learning experience must be carefully developed prior to the learning experience.	1	100%			
	Educators must identify which of their intended subject/module/programme outcomes could be better achieved by the use of simulation-based activities, and plan such learning experiences accordingly.	1	86%			
	Educators must ensure constructive alignment between each simulated-based learning experience's outcomes and the subject/module outcomes.	1	86%			
	Detailed learning outcomes for each simulated-based learning experience must be constructed.	1	86%			
	Interprofessional simulated-based learning experiences must include a non-technical training component.	1	79%			
	Non-technical training aspects, according to the stated learning outcomes, should increasingly be embedded in simulated-based learning experiences (from simple to complex) as the outcomes for the learning experiences become more complex.	2	75%			

	CONSENSUS STATEMENTS RELATING TO PLANNING (cont.)	Round	Essential	Useful	Not applicable/ No	Uncertain
DESIGN	The content of each simulated-based learning experience must be carefully developed prior to the learning experience.	1	93%			
	The logistics for each simulated-based learning experience must be planned carefully regarding the time frame of each simulated-based learning experience.	1	93%			
	The simulated-based learning experience time frame should include planning, preparation, setup, training of standardised patients (if used), actual simulation and dismantling. **Feedback and mastery learning are addressed under separate headings.*	1	93%			
	Simulated-based learning experiences must be designed according to the stipulated learning outcomes.	1	93%			
	The logistics regarding which simulation modality/modalities are to be used to achieve the required learning outcomes must be planned carefully for all simulated-based learning experiences.	1	86%			
	Educators must identify the team/group composition for each simulated-based learning experience.	1	79%			
	The level of fidelity required for each simulated-based learning experience must be considered by educators and planned accordingly.	1	79%			
	Simulated-based learning experiences can be designed by students, with educator facilitation.	1		79%		

	CONSENSUS STATEMENTS RELATING TO PLANNING (cont.)	Round	Essential	Useful	Not applicable/ No	Uncertain
RESOURCES	Educators must identify the specific available simulation modalities, which could best achieve each of the individual learning outcomes.	1	100%			
	Time must be allocated specifically for simulation planning and scenario development for all involved educators.	1	86%			
	Available financial resources must be identified to assist with the implementation of simulation within the programme.	1	86%			
	Personnel (educators and support staff) as well as participants must be identified who will be able to assist with each of the planned simulated-based learning experiences.	1	86%			
	Facilities equipped for hosting simulated-based learning experiences may be shared between health care disciplines (e.g. medical and allied health science students). **These facilities should be designed in such a way as to be able to accommodate the needs of various health care disciplines (e.g. ward setting, consultation room, skills training areas).*	2	83%			
	Simulation experts, which could include experts from other disciplines where deemed necessary, should be identified and included in the initial planning process.	3	82%			
	All available institutional simulation modalities should be identified and considered for use, as is deemed appropriate to achieve the set learning outcomes for each individual simulated-based learning experience.	3	73%			
	A simulation team or committee should be established to assist with the general administrative duties (e.g. recruitment and training) when utilising simulated patients for identified simulated-based learning experiences.	3	73%			

	CONSENSUS STATEMENTS RELATING TO PLANNING (cont.)	Round	Essential	Useful	Not applicable/ No	Uncertain
EDUCATOR ROLE	The role of the educator must be clearly defined prior to the simulated-based learning experience.	1	71%			
INSTRUCTIONAL METHOD	When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator should provide the student with access to the course content, required resources and detailed outcomes for the learning experience.	2	83%			
	The educator is required to provide orientation to all involved stakeholders (educators, students, facilitators), with regards to the course content, outcomes and required resources which will be addressed/utilised during the simulated learning experience. **Instructional methods refer to the specific techniques utilised for learning and can be self-directed learning or instructor-based learning (Chiniara et al. 2013:e1384).*	2	83%			
	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide training of all involved stakeholders (educators, facilitators, simulated patients, students) prior to the learning experience with regards to the specific expectations and outcomes of the learning experience.	1	79%			
	The instructional method to be utilised during each simulated-based learning experience must be identified during the planning phase of the programme.	1	79%			
	When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator should provide student training prior to the learning experience with regards to the resources (e.g. equipment) which will be utilised.	1	79%			

	CONSENSUS STATEMENTS RELATING TO PLANNING (cont.)	Round	Essential	Useful	Not applicable/ No	Uncertain
INSTRUCTIONAL METHOD	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator should provide the student with access to the course content, required resources and detailed outcomes for the learning experience.	2	75%			
	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to a trained facilitator and debriefer during and after the learning experience.	1	71%			
SCAFFOLDING	Simulated-based learning experiences must be incorporated and structured according to the level of the student. The complexity of the simulated-based learning experiences must therefore increase from novice to expert as the student progresses in the programme	1	93%			
	Simulated-based learning experiences would tend to move from basic cognitive, non-technical and technical skills training for novice students, towards more complex patient scenarios in which the mentioned skills should be integrated as well.	2	75%			
FEEDBACK	When simulated-based learning experience feedback will be provided must be decided upon during the simulation planning phase (during or following completion of the learning experience).	1	86%			
	How simulated-based learning experience feedback will be provided must be decided upon during the simulation planning phase (simulator, facilitator/peer/self).	1	79%			

	CONSENSUS STATEMENTS RELATING TO PLANNING (cont.)	Round	Essential	Useful	Not applicable /No	Uncertain
MASTERY LEARNING/ DELIBERATE PRACTICE	Attainment of an educator's set benchmark during formative assessments could be peer-assessed, while the educator is only responsible for assessing benchmark achievement during summative assessments.	3		73%		
ASSESSMENT	A specific assessment tool for each summative simulated-based learning experience should be developed, according to the desired learning outcomes, during the planning phase.	2	83%			
	A self-assessment element should only be included in simulated-based learning experiences identified by the educator. Therefore, not every learning experience should have an element of self-assessment embedded.	2			75%	
	A specific assessment tool (formative/summative) for each simulated-based learning experience must be developed during the planning phase.	1	71%			

CONSENSUS STATEMENTS RELATING TO IMPLEMENTATION		Round	Essential	Useful	Not applicable/ No	Uncertain
STUDENT PREPARATION	Students should be orientated at the beginning of the debriefing/feedback session regarding what will be evaluated/discussed as well as the method of feedback to be used for the simulated-based learning experience.	3	82%			
	Students should receive simulation related orientation (logistics of the session, timing of feedback/debriefing, outcomes) only at the beginning of the module and at no further time.	2			75%	
	Students are only required to complete an informal formative assessment (e.g. online multiple-choice questionnaire) of theoretical knowledge before participating in simulated-based learning experiences relating to technical skills training.	2			75%	
	Students should receive simulation related orientation (logistics of the session, timing of feedback/debriefing, outcomes) at the beginning of the module and again prior to each simulated-based learning experience.	3	73%			
STUDENT GOAL SETTING	It is necessary for students, in addition to the set learning outcomes, to set individual goals applicable to each of the planned simulated-based learning experiences.	2		83%		
DEBRIEFING	The specific debriefing method and tool used for each simulated-based learning experience should be decided upon prior to the simulated-based learning experience to ensure facilitators are trained in the method utilised.	3	100%			
	When debriefing of each simulated-based learning experience will take place must be decided upon during the planning phase (immediately following completion of the learning experience, or at a later stage).	1	85%			
	Students must be debriefed by a trained facilitator, following the completion of each simulated-based learning experience.	1	85%			

CONSENSUS STATEMENTS RELATING TO EVALUATION		Round	Essential	Useful	Not applicable /No	Uncertain
EVALUATE	A form of programme evaluation is required once simulation has been integrated into the programme.	1	100%			
	Feedback from educators involved in the simulated-based learning experiences is required for programme evaluation following simulation integration.	1	100%			
	Feedback from students partaking in the simulated-based learning experiences is required for programme evaluation following simulation integration.	1	100%			
	Summative assessments, using standardised assessment tools, should be used for programme evaluation following simulation integration.	2		75%		
VALIDATION	Existing national requirements and standards, as proposed by the national regulating body (Health Professions Council of South Africa), must be used when designing a simulation programme to validate the programme.	1	77%			
	Expert consensus and literature reviews must be used when designing an integrated simulation programme in order to validate such a programme.	1	77%			
CONSENSUS STATEMENTS RELATING TO REVISION		**Round**	**Essential**	**Useful**	**Not applicable /No**	**Uncertain**
ADJUSTMENTS	Adjustments to the programme following simulation integration must be made according to the feedback received from all stakeholders and participants.	1	92%			
	Adjustments to the programme following simulation integration must be made according to the new technological advances or educational best practices identified.	1	77%			

Table 4.3: Statements achieving stability during the Delphi survey

*The percentage stability achieved is indicated under the corresponding importance option; Round= Delphi round where stability was achieved.
**Italic sections refer to supplemental clarification provided to panel members.
***Green** *shading indicates survey Round 3.*

STABILITY STATEMENTS RELATING TO PLANNING (cont.)		**Round**	**Essential**	**Useful**	**Not applicable**	**Uncertain**
NEEDS ANALYSES	Identified societal needs should form the background context of simulated-based learning experiences, depending on the desired learning objectives for each planned learning experience.	3		64%		
EDUCATOR ROLE	The educator's role in formative simulated-based learning experiences, not used for formal assessment, would be that of facilitator and providing feedback.	3	64%			
	The educator's role in summative simulated-based learning experiences is that of post-simulation feedback/debriefing and discussion. **Further options regarding assessment will be explored in Theme 3.*	3	40%	40%		
MASTERY LEARNING/DELIBERATE PRACTICE	Students should be allowed to redo all formative simulated-based learning experiences until they have reached their individual level of satisfaction. * *This would be dependent on the course structure, available time and resources.*	3		55%		
	Educators should identify which formative simulation-based learning experiences, according to the set learning outcomes, should be repeated until an educator's set benchmark is achieved. **This would be dependent on the course structure, available time and resources.*	3		55%		
	Attainment of the educator set benchmark for identified summative simulated-based learning experiences, should be assessed by the educator at all times. **Options for peer- and/or self-assessment are provided in the following questions.*	3	55%			

	STABILITY STATEMENTS RELATING TO PLANNING (cont.)	Round	Essential	Useful	Not applicable / No	Uncertain
MASTERY LEARNING/ DELIBERATE PRACTICE	Attainment of the educator set benchmark for identified formative simulated-based learning experiences, should be assessed by the educator at all times. **Options for peer- and/ or self-assessment are provided in the following questions.*	3		45.5%		
ASSESSMENT	All simulated-based learning experiences should have an element of self-reflection.	3	64%			
	Educators should identify which simulated-based learning experiences are to be used for summative assessment. Only these identified assessments should be performed on a one-to-one student-educator basis.	3	55%			
	Educators should identify which simulated-based learning experiences could accommodate a peer-assessment element, and it should be implemented as such.	3	55%			
	Educators should identify which simulated-based learning experiences are to be used for formative assessment. Only the identified assessments should be performed on a one-to-one student-educator basis. **An element of peer-assessment could be added if deemed appropriate by the educator.*	3	45.5%			

STABILITY STATEMENTS RELATING TO IMPLEMENTATION		Round	Essential	Useful	Not applicable /No	Uncertain
STUDENT PREPARATION	Students are required to complete an informal formative assessment (e.g. online multiple-choice questionnaire) of theoretical knowledge before participating in specific educator identified simulated-based learning experiences.	3		64%		
	Students are required to complete an informal pre- and post-formative assessment (e.g. online multiple-choice questionnaire) when participating in specific educator identified simulated-based learning experiences (technical and non-technical training). **Debriefing could be utilised as a post-formative assessment.*	3	45.5%			
	Relevant theory pertaining to each individual simulated-based learning experience must be completed prior to the students participating in the learning experience. **The simulated-based learning experience may be used to identify theoretical gaps and needs.*	3	45.5%			
STUDENT GOAL SETTING	Students are encouraged to revisit the specific simulated-based learning experience outcomes, as well as their individual goals, as they progress through the module/programme/academic year.	3	64%			

STATEMENTS RELATING TO EVALUATION		Round	Essential	Useful	Not applicable /No	Uncertain
EVALUATE	Informal evaluations (e.g. satisfaction surveys in the format of checklists/ rating scales) completed by all educators, participants (e.g. simulated patients) and students involved in simulated-based learning experiences, could be used for programme evaluation following simulation integration.	3		64%		
	Formative student assessments, using standardised assessment tools, should be used for programme evaluation following simulation integration. **Questions pertaining to further programme evaluation methods are provided in the following questions.*	3		45.5%		

4.7.5 Summary of Delphi survey

In collaboration with the study promoters, the researcher chose 15 experts purposively, in accordance with suggested Delphi sample sizes recommended by available literature (Khamis *et al.*, 2016; Arthur *et al.*, 2013; Morgan *et al.*, 2007; Okoli & Pawlowski, 2004), and invited these experts to participate in the Delphi survey. As the nature of the Delphi survey is to pose speculative and challenging statements to panel members, it is imperative to include experts in the field (Okoli & Pawlowski, 2004) who can provide reasoned decisions, and which lending itself to collecting more valuable results (Mozuni & Jonas, 2017; Avella, 2016; Hsu & Sandford, 2010). Both Mozuni and Jonas (2017), as well as Hasson and Keeney (2011), advise against increasing a Delphi panel size, as it may lead to information overload and incoherent panel member responses, resulting in decreased generalisability of the results that are obtained, and false consensus.

In order to draw from a larger expert pool, both experts from South Africa and abroad were included in the Delphi survey assimulation research in South Africa is still relatively unexplored. After conclusion of the Delphi survey, the distribution of international and national panel members satisfied the intended ratio of 1:2, with four international and seven local panel members completing the survey process. Panel member distribution remained equal throughout the survey, with data not skewed by a majority of either South African or international perspectives between survey rounds (Zevin *et al.*, 2012). Zevin *et al.* (2012) note in their study that Delphi results should be viewed in the context of the geographical location of included panel members, which could potentially influence the reliability and generalisability of the data. However, including a larger number of South African healthcare education and/or simulation experts guided the research to obtaining a more contextualised view.

An overall response rate of 73% was achieved for the Delphi survey, which is similar to other healthcare-based Delphi surveys, which report response rates of between 26% and 100%, with the majority of studies reporting a response rate in the low 70s (McMillan *et al.*, 2016; Arthur *et al.*, 2013; Zevin *et al.*, 2012; Frantz, 2007). Even though every effort was made to prevent panel member dropout, four panel members dropped out during the Delphi survey, with two panel members dropping out in the second survey round. The reasons for dropout are unclear and were not explored; however, anecdotal comments from two panel members, who both completed all three survey rounds, indicate that they experienced the Delphi survey as being quite lengthy during Round 1. As the researcher distributed a summary of all statements achieving consensus to panel members following the completion of Round 1, indicating that the majority of statements had achieved consensus, the decrease in survey length should have been evident. It is speculated that the panel member dropping out after Round 1 might have discarded the invitation to participate in the second round before opening the survey link, as they expected the survey to be as lengthy as the first, despite the summary report indicating the reduced survey length. Another aspect contributing to dropout could have been the repetition of certain statements, or variations of similar statements. Repeating certain statements with varied wording was done specifically, to ensure that the data collected was reliable and to accommodate certain elements that might be present in more than one of the framework phases. During the execution of the Delphi survey, no significant differences were observed between similar statements posed to panel members.

The researcher, furthermore, aimed to limit panel member dropout by implementing a time limit for completing each survey round, and sending reminder emails to non-responders prior to the due date (Zevin *et al.*, 2012). Speeding up the turnaround time may have limited the dropout, as only four panel members dropped out during this study.

After the first Delphi survey round, a total of 50 statements required adjustment, according to panel member comments and suggestions and the outcome of the consensus meeting, even though a pilot study had been conducted, and the researcher took all necessary steps to present unambiguous and clear statements to panel members, adjustments were, nonetheless, required. As the panel members were from various healthcare disciplines and healthcare settings, it was expected that some panel members would require more clarification on certain statements, as varying use of terminology and individual focus areas could have led to misinterpretation of statements (Spies, 2016; Gough, 2016; Garrett *et al.*, 2011). No comments and suggestions made by panel members throughout the Delphi survey, at any stage, altered the purpose or meaning of the proposed statements, instead, changes allowed for clarification and greater ease of reading.

4.8 DISCUSSION

Results will be discussed according to the four themes emerging from the systematic review (*cf.* Tables 3.3 & 4.4). The statements under each theme are grouped into related sections with informing sub-sections, where applicable, to facilitate discussion, and not according to any research methodology principles (*cf.* Table 4.4).

Table 4.4: Summary of sections for discussion

THEME	SECTION	SUB-SECTION
4.8.1 Planning	4.8.1.1 Development	None
	4.8.1.2 Physical resources	None
	4.8.1.3 Human aspect	None
4.8.2 Implementation	4.8.2.1 Student preparation	i Briefing
		ii Theoretical preparation
	4.8.2.2 Student goal setting	None
	4.8.2.3 Debriefing	None
4.8.3 Evaluation	4.8.3.1 Evaluate	None
	4.8.3.2 Validation	None
4.8.4 Revision	4.8.4.1 Adjustments	None

Words bolded in the text indicate the conceptual framework elements, as depicted in Figure 4.4 at the end of the chapter.

4.8.1 Planning

4.8.1.1 *Development*

Providing a solid evidence base for well-structured SBLEs (Park *et al.*, 2013; Ricketts, 2011) grounded in student and institutional needs (Khamis *et al.*, 2016; Chung *et al.*, 2012) is crucial when aiming to integrate SBLEs. Panel members reiterated the necessity of both institutional and discipline-specific **needs analyses** that refer to various resources, for example, analysing of stakeholder surveys, and identifying gaps in student performance and institutional objectives. The view of the panel members is supported by standards of best practice in simulation (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016b). Considering the call for curriculum decolonisation by students (Section 2.3.2), the advent of the 4IR, which requires reconsideration of curricula, and an emerging adult learner population entering tertiary education institutions, ensuring that SBLE outcomes are aligned with student and institutional needs is essential. Aligning learning and SBLE outcomes will result in goal-oriented development of authentic SBLEs, which consider the needs of a culturally and socio-demographically diverse South African student population. Most South African students' integration in tertiary education is impacted negatively by their impoverished and resource-constrained (Schreiber & Yu, 2016) schooling background. A decrease in government funding (*cf.* Sections 2.1.1 & 2.4.2) also negatively impacts the availability of both human and physical resources in tertiary healthcare education, and an extensive institutional investigation into the practicality and benefits of integrating simulation is essential, to establish the possibility of utilising this education strategy.

Education institutions are ethically obliged to produce healthcare graduates who are capable of attending to the healthcare needs of communities, which differ greatly in terms of socioeconomic status, healthcare beliefs and practices (Young, 2016). Bearing in mind the changing South African healthcare environment, the epidemiological transition taking place in South Africa, the undergraduate student profile and students' lack of preparedness for tertiary education, as well as increasing physical and human resource constraints facing the South African healthcare system (*cf.* Sections 2.1.2, 2.2.2 & 2.3.2), it is essential to develop curricula that meet both student and societal needs (Labuschagne *et al.*, 2014; Unger & Hanekom, 2014). Khamis *et al.* (2016) advocate for a societal needs analysis to inform a healthcare programme before integrating simulation into a curriculum. However, in this study, panel members were of the opinion that a societal needs analysis might be useful merely when planning SBLE integration. With the South African healthcare governing body (HPCSA) continuously monitoring university adherence to internationally benchmarked minimum criteria expected of undergraduate healthcare students, societal needs might not be optimally met when integrating simulation in line with only student and institutional needs. In a culturally, linguistically and ethnically diverse country (*cf.* Section 2.1.2), considering the challenges faced by healthcare practitioners, as well as the shift towards primary healthcare (*cf.* Section 2.1.2), the researcher is of the opinion that it is essential to include a societal needs analysis when integrating simulation, to ensure that students are equipped to practice in the various South African healthcare settings.

Simulated-based learning experiences are most valuable when they are fully integrated into and complement an existing curriculum (Cook *et al.*, 2013; Motola *et al.*, 2013; McGaghie *et al.*, 2010; Issenberg *et al.*, 2005; Gaba, 2004). In light of simulation being utilised merely in pockets of certain South African healthcare education disciplines (*cf.* Section 2.4.3.1), the development of an expertly revised **curriculum** that integrates SBLEs is vital. Delphi panel members considered it essential that expert SBE educators and healthcare educationalists collaborate in the development and evaluation of a revised curriculum. Healthcare educationalists have specialised knowledge regarding the general principles and methods of education, and will view the programme as a whole, by considering the inclusion of a variety of educational methodologies. SBE experts will have the ability to identify existing curricular components that could benefit from the addition of SBLEs, or replacing certain components by SBLEs, which would enhance achievement of undergraduate physiotherapy programme outcomes. To ensure a sustainable and valid revised curriculum, the researcher is of the opinion, supported by Delphi survey results, that SBLEs should be designed in accordance with a contextualised, standardised education model, with SBLEs being scheduled and mindfully executed to ensure a systematic approach to simulation integration. The importance of acknowledging the role contextual differences play when aiming to integrate standardised education models is undeniable (Chung *et al.*, 2012) and disregarding these language, cultural and educational system differences could result in reducing the educational impact on students.

A single South African university adjusted their undergraduate physiotherapy curriculum to include less content delivery and more problem-solving activities (Unger & Hanekom, 2014), with the aim of addressing challenges brought about by the shift in disease burden and changing student population (*cf.* Section 2.5.1). It should, however, be highlighted that integration of SBLEs was not mentioned explicitly in this redesigned curriculum, though the need is evident for healthcare educators to reconsider their curriculum designs, and to adjust them to the South African healthcare and education milieus.

Any programme innovation and/or integration would require educator preparation, with preparation taking into account curricular content, reasons for the proposed changes, as well as the educator's role in the programme (Leinster, 2013). Literature reiterates the importance of institutional and departmental buy-in when adjusting an existing curriculum, as inertia and organisational barriers could lead to suboptimal SBLEs (Motola *et al.*, 2013; McGaghie *et al.*, 2010). Employing Kotter's eight steps to change may go a long way to achieving the successful integration of simulation by, firstly, creating an urgency for change and, following this, establishing a guiding team to drive the strategic integration of simulation (Kotter, 2012). Fear of change and unfamiliarity feed resistance to the integration of new education strategies (Labuschagne, 2012), especially with regard to simulation. Because simulation is not fully integrated in South African healthcare education, and because only anecdotal evidence is available about the use of simulation in South African physiotherapy education, accredited **training** programmes (Train the Trainer programmes) are essential for equipping educators to use SBLEs mindfully, as national healthcare educators are mostly involved during all phases of SBLE design and implementation. By empowering personnel in authentic SBLE design, using available simulation modalities and debriefing training should decrease educator resistance to the integration of SBLEs. As the integration of simulation is becoming a reality in South African healthcare education environments, educators may acknowledge the benefits of this educational method, and it may result in greater involvement by educators, thereby ensuring the sustainability of the simulation-based integration (Kotter, 2012). Generic, critical cross-field outcomes tailored by SAQA describe specific exit-level outcomes (*cf.*

Appendix C) expected of physiotherapy graduates, which, together with the healthcare graduate attributes stipulated by the HPCSA (*cf.* Appendix D), guide South African physiotherapy educators when they integrate simulation into the undergraduate physiotherapy programme. Although no graduate attributes have been published by the HPCSA for physiotherapy students specifically, all healthcare students in South Africa are expected to demonstrate the generalised attributes published by the Medical and Dental Professions Board of the HPCSA (Chetty *et al.*, 2018; HPCSA, 2014) (*cf.* Appendix D). Whether developing learning outcomes for a programme integrating simulation, or objectives to design a single SBLE, the basic principles relating to the process remain the same. Identifying outcomes best suited to the use of SBLEs may be achieved by enlisting the assistance of experts in the healthcare simulation field. The achievement of the stipulated outcomes should be measured, and using a ranking model, such as the Kirkpatrick Model (INACSL Standards Committee, 2016f), is advised in standards of simulation best practice. Outcome achievement should be assessed in the following four domains: reaction, learning, behaviour and results (INACSL Standards Committee, 2016f).

Best-practice guidelines stipulate that individual SBLE learning objectives should be constructively aligned with both institutional and programme outcomes (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016a; Spies, 2016), to ensure that educators are teaching what is being assessed. This sentiment was echoed by panel members' responses. Published simulation-based best practices for healthcare education (Adamson & Prion, 2015; Cook *et al.*, 2013; Motola *et al.*, 2013; McGaghie *et al.*, 2010; Paskins & Peile, 2010; Issenberg *et al.*, 2005) indicate that detailed curriculum and individual SBLE learning **outcomes** and objectives are essential for guiding and assessing the effectiveness of both the programme and the SBLE. It is of the utmost importance that the stipulated scenario and curriculum outcomes inform authentic scenario design, the choice of simulation modality, and the team members involved.

A lack of clear, coordinated communication within healthcare teams has been cited as one of the major reasons for negligence in patient care (Weller & Civil, 2018; Kohn *et al.*, 2000). This finding highlights that it is essential that healthcare professionals develop teamwork skills and a collaborative nature in providing quality person-centred care (Weller & Civil, 2018; HPCSA, 2014; Harden & Laidlaw, 2012) in their practice. Historically, healthcare disciplines were taught in professional silos, which is being challenged, as modern healthcare is multifaceted and often fragmented (Weller & Civil, 2018). Patients often move between primary, secondary and tertiary healthcare facilities and are consulted by numerous healthcare professionals during the duration of a single illness (Weller & Civil, 2018; Thistlethwaite & Vlasses, 2017). This is especially true in the South African healthcare setting, where patients move between four levels of healthcare (*cf.*

Appendix A). Often, healthcare facilities are short-staffed or ill equipped, and patients are confronted by overcrowded waiting rooms (Young, 2016; Scheffler *et al.*, 2015), or have to wait months for scheduled appointments at healthcare facilities. Adding to the likely time delay in receiving treatment, the majority of healthcare personnel rotate either within or between healthcare facilities. Due to the rotation of healthcare personnel, there is only a small probability that a patient will receive a follow-up appointment with the same healthcare practitioner, which substantiates the necessity for emphasising improved interprofessional teamwork and communication as a prerequisite for continuity in patient care. SBLEs have the distinct advantage of exposing the interprofessional team to scenarios that encourage communication, teamwork and collaborative practice skills (Thurling, 2017; Thackray, 2013). To ensure the provision of effective healthcare, developing this crucial graduate attribute should enjoy attention when SBLE curricular outcomes are developed and aligned (*cf.* Section 2.3.2).

Panel members were of the opinion that skills (technical and non-technical) cannot be trained in isolation and that all skills should be viewed as equal. The distinction between these two skill sets is also questioned in literature, as the distinction results in compartmentalisation of education practices (Kneebone *et al.*, 2017). Panel members suggested that non-technical training aspects should be embedded increasingly according to a student's experience level, where relevant to the SBLE, and in accordance with the stated learning objectives. A framework for simulation integration should, according to the researcher, aim to train both technical and non-technical skill in uni- as well as interprofessional SBLEs.

As the nature of SBE lends itself to facilitating the training of multiple skills (Weller & Civil, 2018; Kneebone *et al.*, 2017; Kohn *et al.*, 2000) during one learning experience, acquisition of the required HPCSA professional graduate attributes (*cf.* Appendix D), for example, collaboration and leadership, can be facilitated easily during simulated activities. Since the onset of the 4IR, healthcare educators are faced with the task of adapting teaching and learning strategies to increase the employability of students by providing them with unique attributes, such as teamwork, improved communication and leadership capabilities, so that they can cope with the complex dynamics of modern-day healthcare (World Economic Forum, 2019; Hussin, 2018; Griesel & Parker, 2009). Therefore, the integration and attainment of the desired graduate attributes, such as collaboration, a person-centred care approach and the facilitation of effective carer-patient communication, is essential for ensuring the employability of students (World Economic Forum, 2019; Vogenberg & Santilli, 2018; Griesel & Parker, 2009). Heightened rates of depression, burnout and suicidality of South African healthcare professionals (Isaacs, 2019) has resulted in national introspection. Tertiary institutions are required to bridge the gap between what is taught at tertiary level and what is expected of the professional in their working environment (Griesel &

Parker, 2009). Consideration of the incorporation of a “human factor” approach in healthcare education is vital for training healthcare graduates to develop resilience and mindfulness regarding both individual practice and own limitations. Mentally preparing healthcare professionals for adverse events, limited resources and multifaceted patient consultations and treatments, weigh just as much as theoretical preparation for clinical practice. Using SBLEs in training for healthcare professionals can develop the skills required to navigate difficult and emotional situations (Jacques *et al.*, 2011). The researcher strongly advocates for SBLEs to be integrated with these non-technical training aspects in mind, not to only to provide better preparation of graduates for practice, but also to instil the value of self-care.

The **design** of simulation-based scenarios are informed by researched best-practice guidelines, professional regulatory body requirements, curriculum outcomes and detailed SBLE learning objectives (Nestel & Gough, 2018; INACSL Standards Committee, 2016e; NLN Board of Governors, 2015; HPCSA, 2014). Literature reviews identifying the best-practice guidelines for designing SBLEs have been published and are continuously updated according to new research (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016b; Motola *et al.*, 2013; McGaghie *et al.*, 2010; Issenberg *et al.*, 2005; Gaba, 2004), and have been incorporated by many educators. After content development, a suitable timeframe for physical preparation prior to and following the completion of the learning experience, identification of the best-suited simulation-based modality and level of fidelity, team or group composition, as well as the specific instructional method to be employed in the execution of the learning experience, is vital. Well designed and thoughtfully planned SBLEs are integral to optimising student learning and achieving learning objectives, rendering the above-mentioned aspects essential for inclusion during the SBLE design process. A systematic review of the NLN/Jeffries Simulation Framework elements refers to published literature that indicates that student involvement during the simulation-based planning and design phase helped to meet the needs of the students (Kapur, 2015). However, undergraduate students have limited clinical experience and theoretical background pertaining to possible conditions or situations that are to be enacted with simulation; neither do the students have knowledge regarding the principles of simulation design. The researcher, therefore, does not deem it essential to include students’ input during the design process of a framework for simulation integration.

The development of scenario content in alignment with the stipulated learning objectives, chosen **instructional method** and student experience level (ASPiH Standards Project Team, 2016; Khamis *et al.*, 2016; Jeffries *et al.*, 2015; Mori *et al.*, 2015; Zevin *et al.*, 2012) is of the utmost importance. Exposing students to SBLEs without preparing them beforehand, including theoretical, logistical or psychological preparation, will result in cognitive overload. Further discussion pertaining to student preparation is covered in Section 4.8.2.1. **Scaffolding** of SBLEs facilitates learning, as the students' emotional state during the SBLE directly influences knowledge retention (Kalaniti & Campbell, 2015), because a rise in stress hormone levels during the learning experience induces focussed attention and memory retention. Therefore, experiential learning through the design of SBLEs with attainable challenges according to student experience levels should prepare students better for challenging clinical practice than traditional educational strategies would.

Even though positive effects relating to skills transfer to the clinical setting have been demonstrated (McGaghie & Harris, 2018), the practice of both **mastery learning and deliberate practice** (ML/DP) are, according to both literature (Motola *et al.*, 2013) and panel member comments, extremely time consuming and resource intensive. When aspiring that all students achieve the set education objectives, the time required to achieve the objectives (McGaghie & Harris, 2018) should be considered, as it varies amongst students and poses a significant resource burden when integrating SBLEs.

The overarching aim of the statements presented to panel members was to identify if and when SBLE repetition should be integrated into the curriculum, thereby, focusing on the core similarity between deliberate practice and mastery learning, which resulted in the amalgamation of these two concepts (see concept clarification). Only one statement pertaining to ML/DP achieved consensus in the Delphi survey, which could indicate panel members' hesitation when confronted with published best practices (ASPiH Standards Project Team, 2016; Cook *et al.*, 2013; McGaghie *et al.*, 2010; Issenberg *et al.*, 2005) and the realistic impact on department time and resources. As ML/DP is mostly utilised when aiming to facilitate technical/practical-skills-based training (ASPiH Standards Project Team, 2016; Khamis *et al.*, 2016; Zevin *et al.*, 2012), comments by panel members highlighted the need for consideration of all skills to be included when employing ML/DP. Ultimately, the aim of training students is for them to master all programme content (Ambrose *et al.*, 2017). If the elements of mastery are considered (*cf.* Appendix W), it is clear that mastery is not based solely on the acquisition of individual skills, instead, it involves a progression, from skills competence to skills integration, towards identifying when to apply the acquired skills. When a student has successfully moved through all the phases, this would indicate that mastery has been achieved.

Physiotherapy programmes are often structured in smaller modules that are taught in isolation, and integration occurs later in the programme or during clinical exposure; consequently, the retention of challenging manual skills is not optimal (Mori *et al.*, 2015). In a systematic review of the use of SBLEs in physiotherapy, the authors suggest that deliberate skills practice might lead to long-term skills retention (Mori *et al.*, 2015). However, considering the impact of the 4IR (World Economic

Forum, 2019; Butler-Adam, 2018; Hussin, 2018) and the attributes required of physiotherapy graduates by SAQA and the HPCSA (*cf.* Appendices A & B), skill integration is more of a necessity than demonstrating only single-skill mastery. Therefore, integrating a combination of skills during an SBLE could be more useful for achieving optimal learning. A consideration could be that the educator uses ML/DP opportunities for only selected critical skills, in accordance with SAQA and HPCSA guidelines, and structures the SBLEs in a way that allows this process.

Peer assessment utilising precise measurement instruments could play an important role in providing formative feedback with the aim of adjusting student behaviour and performance. When opting to include ML/DP in educator-identified SBLEs, panel members were in consensus that benchmark attainment may be peer assessed during formative assessments, with the educator being responsible for assessing benchmark achievement during summative assessments. Adding a peer-assessment element to ML/DP sessions would assist to free up educator time and could be beneficial for both the student and peer, as peer assessment has been shown to increase student learning, contribute to collaboration skills and foster reflection (Duers, 2017; Kim-Godwin *et al.*, 2013; Berragan, 2011; Anderson & Neild, 2007). As ML/DP is deeply embedded in the constructivist learning theory as part of experiential learning (*cf.* Table 2.2), formative assessments will provide students with the necessary feedback to reflect on and make sense of their experiences (Kolb *et al.*, 2000), with the aim of identifying implications for action. This action cycle can then be measured by means of summative assessment, either in a clinical or simulated environment, to ascertain if skill mastery has occurred, thereby completing Kolb's cycle for experiential learning and assessing the top tier of Miller's pyramid of clinical competence (Miller, 1990).

Statements relating to the identification of SBLEs that should be repeated, until either students' individual satisfaction level, or until the educator-set benchmark has been achieved, failed to achieve consensus. An additional statement was introduced by a panel member, relating to students being permitted to redo all SBLEs until they have achieved their individual level of satisfaction. Although this statement only achieved stability regarding its usefulness, there may be value in allowing highly motivated students the opportunity to refine their skills. As stated with all ML/DP statements, these actions should be dependent on the course structure, available time, and resources.

4.8.1.2 *Physical resources*

When developing or adjusting a programme, careful consideration should be given to the **resources** required to deliver and sustain the programme, as planning will result in valuable time and resources being saved (ASPiH Standards Project Team, 2016; Leinster, 2013; Motola *et al.*, 2013).

When considering available resources that would aid simulation integration, it is imperative to be aware that the term resources refers to both physical (e.g., venue, equipment, consumables) and human resources, and resources are essential for developing a viable programme (Swart *et al.*, 2019).

Consideration of available financial resources, allocated to programme development for simulation integration, is needed to guide the planning and extent of the integration endeavour (Sabus & Macauley, 2016; Zevin *et al.*, 2012). Initial costs for simulation-based learning are immense in relation to the acquisition of equipment and consumables (Motola *et al.*, 2013; Østergaard & Dickman, 2013; Chung *et al.*, 2012), especially in the wake of the free tertiary education movement in South Africa (*cf.* Section 2.3.2). The researcher is, therefore, in agreement with published literature (Guinez-Molinos *et al.*, 2017), the national government (South Africa, 2014) and panel members' opinions, that collaboration between healthcare disciplines, and sharing facilities, are essential to minimise both the initial and running costs of simulation integration. Delphi panel members also clarified that the above-mentioned shared facilities should be designed in a way that not only accommodates the needs of various healthcare disciplines and limits costs, but also fosters essential interprofessional collaboration.

Careful planning of and research into institutionally available simulation modalities that would serve the programme goals are essential (Motola *et al.*, 2013; Østergaard & Dickman, 2013; Zevin *et al.*, 2012) and should inform the framework for simulation integration. Educators are required to stay abreast of changing technology and uses of SBE (Kneebone *et al.*, 2017), as these advances may result in the development of economically more viable simulation methods. Additionally, institutions might approach private-sector stakeholders, simulation equipment suppliers, and private and government healthcare providers to procure donations, equipment or consumables that might be ideal for using in a simulated environment. These partnerships could minimise costs related to upgrading equipment, and limit day-to-day running costs. It should be taken into account that the integration of simulation-based learning should not be equated with high costs and high-technology facilities (Kneebone *et al.*, 2017); instead lateral, resource-smart thinking could ensure simulation-based learning for all.

All phases of SBLE integration require that educators trained in the integration of simulation (Leinster, 2013) invest a substantial amount of time (Swart *et al.*, 2019; Sabus & Macauley, 2016; Binstadt *et al.*, 2007). In the current tertiary education milieu, where educators are experiencing increased pressure to produce research outputs, supervise and teach larger numbers of students and still ensure that graduates acquire the required clinical skills (Tjønneland, 2017; South Africa, 2014; Labuschagne, 2012), it is not surprising that time is a scarce commodity. The researcher supports the recommendation by literature (Motola *et al.*, 2013) that time should be scheduled for simulation planning and development, which would, in turn, encourage educator acceptance and ensure successful integration of an effective and sustainable programme. The likelihood that more time will be required for the execution of SBLEs should also be considered in the schedule of the programme.

A simulation team, consisting of support personnel, simulation experts and educators from healthcare disciplines (ASPiH Standards Project Team, 2016; Zevin *et al.*, 2012), should be identified for involvement and assistance during both the planning and implementation of SBLEs. When aiming to integrate simulation into the physiotherapy programme and to ensure success of the programme, it is essential to include experts in healthcare simulation in the planning phase. In addition to content-expert involvement, dedicated support personnel who are able to assist educators in scenario set-up, thereby minimising educator time spent preparing for a simulation-based scenario, are also required.

The simulation team's composition, however, depends on personnel availability, interdepartmental collaboration and the availability of dedicated simulation facilities. At the majority of South African universities (Swart *et al.*, 2019), dedicated healthcare simulation units employ support personnel who can assist educators with practical SBLE logistics. The researcher recommends that physiotherapy educators make full use of simulation facilities and advocates for collaboration to establish a partnership and a memorandum of agreement with simulation facilities and dedicated support personnel to assist educators with logistical arrangements pertaining to SBLE execution.

Standards of best practice in simulation guide educators to compile a clear strategic plan that aims to address organisational needs (ASPiH Standards Project Team, 2016), taking into account the possibility of student intake increasing (Motola *et al.*, 2013), and the effect larger student numbers would have on the sustainability of the programme. The researcher advises that careful consideration should be given to educational strategies, in conjunction with available physical and human resources, when integrating simulation into the South African undergraduate physiotherapy programme, most notably during the design of SBLEs. A clearly identified need for, and ability to develop and sustain the adjusted programme, should ensure acceptability of and benefits for both students and educators.

4.8.1.3 *Human aspect*

The changing context of healthcare delivery and education (*cf.* Sections 1.2, 2.1.2, 2.2.2 & 2.3.1) requires that educators adjust their education approaches to ensure increased student participation rates. One way of overcoming some of the challenges is for educators to be **trained** in a variety of teaching strategies.

Literature mentions the detrimental effects that untrained, or insufficiently trained educators, could have on the integration of SBLEs; the most notable effect is on the failure to achieve learning objectives (Khamis *et al.*, 2016; Motola *et al.*, 2013; Chung *et al.*, 2012). Panel members also indicated the necessity of involving well-trained stakeholders (educators, simulation experts, educationalists) in the development and integration of SBLEs for specific programmes. With resources being a primary concern when developing SBLEs, panel members were of the opinion, and are supported by literature, that educators should be knowledgeable regarding the resources available for use in SBLEs, to optimally and accurately design SBLEs (Guinez-Molinos *et al.*, 2017; Khamis *et al.*, 2016; Jeffries *et al.*, 2015; Chiniara *et al.*, 2013; Motola *et al.*, 2013; Zevin *et al.*, 2012; Binstadt *et al.*, 2007).

Another vital component of simulation-based training relates to the facilitation of both the SBLE and the **feedback**/debriefing during or following the experience (Cheng *et al.*, 2018). The Delphi survey statements were subdivided, into statements focussing on general facilitation training, debriefing training and feedback training. Statements on debriefing training were repeated, and consistency in the responses were obtained for the necessity of facilitator debriefing training indicating response validity. Facilitators are required to develop proficiency in providing constructive feedback, debriefing and SBLE facilitation, by completing accredited Train the Trainer programmes. As suggested by panel members, and in agreement with literature emphasising the importance of facilitator training and preparation (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016e), facilitators proficient in facilitation, debriefing and providing feedback will ensure enriched learning and procedural consistency.

Facilitation during healthcare simulation is a complex task (INACSL Standards Committee, 2016e; Adamson, 2015; Chung *et al.*, 2012), about which there is a paucity of South African simulation research, which indicates limited simulation integration. The researcher suggests that contextualised (Chung *et al.*, 2012) educator training is a necessity. Educator training in the arts of SBLE facilitation, providing constructive feedback, and debriefing should be included in the conceptual framework, to ensure a uniform teaching, evaluating and certification strategy for integrated SBLEs.

In accordance with the traditional educator role, healthcare educators are expected to be able to develop learning outcomes related to programme content, engage in student teaching and learning, set and assess theoretical paper-based assessments and perform student assessments of practical skills in the clinical environment. Healthcare educators are encouraged to complete institution-based training aimed at equipping them with the previously mentioned skills, and expose them to a variety of educational methodologies, which they may utilise in their teaching and learning (Van Wyk *et al.*, 2019). However, the generational cohort at tertiary education institutions, in conjunction with the increased integration of simulation in healthcare education, challenges the traditional educator role. Although they are still required to know the basics of teaching and learning, educators are now expected to, in addition to fulfilling the role of educator, also assume a facilitative role. In South African healthcare education, educators are, therefore, expected to fulfil the majority of, if not all, roles related to SBLE implementation, and the role of an educator was defined as such for this research study (see concept clarification).

With educators moving between the roles of instructor and facilitator during SBLEs (Østergaard & Dickman, 2013) specifying the **educator role** prior to the learning experience was deemed essential by Delphi panel members. However, no consensus could be reached regarding the specific role of the educator during either formative or summative assessments. This may be because best practice guidelines suggest that educators are required to step away from their educator role, and become facilitators during SBLEs (INACSL Standards Committee, 2016b). The Delphi results indicate that the absence of universal, standardised simulation terminology might have caused panel members to interpret the term educator incorrectly, as an instructor of learning, rather than a facilitator of learning.

As feedback and/or debriefing are essential components of all simulation-based activities (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016d) it is expected that the educator fulfils the role of facilitator, and encourages self-reflection on the part of the students, which would make further role clarification unnecessary. Another possible reason for failure to achieve consensus could be that South African panel members viewed the role of the educator as interchangeable and synonymous with that of facilitator, as South African educators are directly involved throughout the SBLE planning, implementation and evaluation phases (*cf.* Section 3.5.2) (Spies, 2016). As SBLEs are currently not used in South Africa for summative assessments, other than for assessing practical skills in some healthcare disciplines, the statement could have posed challenges for panel members who are not familiar with this practice.

The inability to achieve consensus on statements pertaining to the educator role during either formative or summative assessments, leads the researcher to conclude that educators should be advised how to identify the purpose and objectives of each planned SBLE, in order to clearly determine the educator's role accordingly.

Debriefing and feedback are undoubtedly the cornerstones for learning after engagement in SBLEs (Nestel & Gough, 2018; Kalaniti & Campbell, 2015). However, literature describing the design of SBLEs is unclear on the distinction between feedback and debriefing. Nestel and Gough (2018) even go as far as labelling the phase directly after SBLE as being both debriefing and feedback. The INACSL Standards Committee (2016) clearly states that the two aspects differ (INACSL Standards Committee, 2016b), with both being equally important for SBE, however, again, no clear differentiation is made. As the aim of feedback is not necessarily to guide self-reflection, and is, instead, related more to providing information to improve understanding of performance aspects (Lopreiato *et al.*, 2016), debriefing and feedback were dealt with separately for the purpose of the Delphi survey, because the researcher believes they encompass two different concepts (see concept clarification).

Panel members were in agreement that, to ensure a meaningful learning experience, identifying when SBLE feedback will be given is essential during the planning phase (Krackov *et al.*, 2017; Harden & Laidlaw, 2012). Feedback should be provided to students as soon as possible after the learning experience, however, the reality of scheduling and convenience often dictates when feedback is provided (Krackov *et al.*, 2017). During the planning phase, the nature of the learning experience guides the educator regarding when feedback is to be provided. For instance, certain experiences that focus on motor skill training and lower-order cognitive activities could benefit from immediate feedback, and reinforce the acquisition of accurate knowledge and skills. SBLEs where students engage in higher-order tasks may benefit from a delay in feedback, to allow time for thought processing.

According to expert opinion provided in this Delphi survey, it is also essential to determine who will be responsible for providing the feedback, and this should be determined during the simulation-planning phase, to ensure accurate planning and preparation. When utilising SBLEs, feedback can be provided by various sources, including the facilitator, peers, computers, simulators or simulated patients (Lopreiato *et al.*, 2016). The researcher is of the opinion that both feedback timing and source should be considered during the SBLE planning phase. Feedback from numerous perspectives, together with reflection (Kneebone *et al.*, 2017), is critical for helping the student make sense of the learning experience and implementing sound adjustments for future practice. Early identification regarding the source and timing of feedback would also allow for the necessary educator and facilitator training to occur prior to the SBLEs.

An increasing interest in the use of summative, high-stakes testing has seen simulation-based experiences being used in summative **assessments** of healthcare professionals (West & Parchoma, 2017; ASPiH Standards Project Team, 2016; McGaghie *et al.*, 2010). A systematic review by Ryall, Judd and Gordon (2016), investigating the use of simulation-based practical skills assessment across healthcare professions, demonstrates that these assessments can be utilised effectively, though no proof of its effectiveness as a standalone assessment tool is currently available. SBLEs are viewed as safe (ASPiH Standards Project Team, 2016; Kalaniti & Campbell, 2015; Østergaard & Dickman, 2013), forgiving learning experiences where formal assessment could potentially lead to undue fear (Dennis *et al.*, 2016; Jones & Sheppard, 2008) that could hinder the learning experience. Maintaining a safe learning environment could possibly explain why stability was only achieved on statements relating to the student:educator ratio during formative and summative assessments, as SBLEs are not routinely used during either immersive or practical-skills-based assessments in South African healthcare education (*cf.* Section 2.3.2). Practical-skills-based assessments are, however, used for both formative and summative assessments that require healthcare students to demonstrate skills on their peers, simulated patients, task trainers and manikins, but these summative assessments are not designed and labelled as SBLEs. The design of these practical-skills-based assessments in accordance with simulation-based best practice would provide students with a standardised practice and assessment opportunity.

The importance of valid and reliable assessment tools when utilising SBLEs for assessment purposes is mentioned in several documents (ASPiH Standards Project Team, 2016; INACSL Standards committee, 2016c; Zevin *et al.*, 2012; Founds *et al.*, 2011), and was confirmed by panel members. Interestingly, the importance of the assessment tools does not correlate with standards of best practice when no mention is made of assessment tools when discussing formative assessment (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016c). The researcher is, thus, led to believe that simulation best practice does not acknowledge the necessity of an assessment tool during formative assessments, as the debriefing would be viewed as sufficient. The decision to include specific assessment tools may be due to local educationalists making use of self-compiled checklists and rating scales to provide student feedback during SBLEs, which does not constitute formative and summative assessment as described in the concept clarification. It is imperative that valid and reliable assessment tools are developed and tested prior to being utilised in SBLEs for assessment purposes.

Even though panel members did not reach consensus regarding whether the educator should identify which SBLEs should and could accommodate a peer-assessment element, panel members indicated that it may be useful to incorporate in the simulation-based framework enlisting peers to assist with formative assessments, with facilitators assessing summative assessments. Peer assessment is a valuable learning tool, as it fosters teamwork and collaboration, allows for self-reflection and, if feedback is provided in a constructive manner, is perceived as less threatening than feedback provided by the educator (Kim-Godwin *et al.*, 2013; Jones & Sheppard, 2008). As reported by Sridharan *et al.* (2019), students assess their peers with accuracy and precision during formative assessments, but peer grading bias is evident when peers are assessed in summative assessments, where grading contributes to a student’s final mark. It is, therefore, imperative, according to the researcher, to clearly define the roles of students with regard to their inclusion in the assessment process, as well as provide the necessary assessment training (Sridharan *et al.*, 2019).

Duers (2017) indicates the need for peer assessment to be structured by a well designed peer assessment form that will enable students to provide constructive and meaningful feedback. Although peer assessment was deemed useful enough to include in the framework, panel members indicated being uncertain about including self-assessments in SBLEs, resulting in the adjustment to the term self-reflection in the Delphi survey, to provide a better illustration of the internal reflection process required of the student. Self-reflection, as with peer-assessment, is a valuable and necessary tool that can enhance student learning (Duers, 2017; Sabus & Macauley, 2016; Norcini & Friedman, 2013). Panel members were of the opinion that self-reflection should form part of some, but not all SBLEs, however, no clarity was provided by panel members to justify their opinions. The ability to engage in reflection is an integral skill required by the HPCSA of all graduating health sciences students (HPCSA, 2014). In light of the 4IR, preparing students with problem-solving, teamwork, reasoning and reflection skills, rather than only generic knowledge and clinical skills, is essential (Barnett, 2012), as students are expected to identify their professional and personal shortcomings and subsequently plan and adapt to address these shortcomings. As a form of peer assessment or self-reflection might not suit every SBLE, the researcher deems it essential for educators to refer back to each SBLE’s objectives and, where appropriate, to include peer assessment and/or an element of self-reflection.

4.8.2 Implementation

4.8.2.1 *Student preparation*

Even though briefing is reported to be an integral part of SBE, little attention is paid to the process by published literature (Gough, 2016; Lioce *et al.*, 2015). The importance of **student preparation** is that, to enhance meaningful learning during the SBLE the preparation, especially the briefing of students, should align directly with the debrief process (Nestel & Gough, 2018; Kalaniti & Campbell, 2015).

In order to describe the student preparation discussion better, two separate headings, briefing and theoretical preparation, will be utilised as sub-sections. Both the ASPiH (2016) and INACSL (2016) use the term *briefing* to describe student orientation to the simulated environment and the expected learning objectives, whereas Nestel and Gough (2018) distinguish between *orientation* of students and *briefing* of department members and simulated patients involved in the SBLE. Briefing, in the view of the researcher, encompasses the preparation of all parties involved in preparation of the SBLE (Lopreiato *et al.*, 2016) and, therefore, the researcher will discuss both student and facilitator preparation under briefing, and not orientation.

<u>Briefing</u>

All original statements posed to panel members regarding student preparation required adjustment after the completion of Round 1 of the Delphi survey (*cf.* Appendix S). Student briefing aims to guide achievement of learning objectives (Jeffries *et al.*, 2015), establishes a safe learning environment based on trust, integrity and respect (ASPiH Standards Project Team, 2016; Gough, 2016) and is, thus, essential for preparing students for SBLEs. Panel members highlighted the importance of student briefing at the beginning of the module and again prior to the SBLE; the importance was confirmed in a follow-up statement indicating that it is not sufficient for the briefing to occur only at the commencement of the module. Current student populations desire structure and detailed directions and value experiential learning (*cf.* Table 2.1) that culminates in prepared students who are more likely to fully engage with SBLEs (*cf.* Section 4.8.1.1). Irrespective of the instructional method, orienting students to course content, resources to be utilised, and learning objectives is essential. Prepared students will be comfortable in the simulated environment (Jeffries *et al.*, 2015). which will, in turn, enable more authentic engagement with the simulated scenario (Spies, 2016) and, thus, optimise learning (ASPiH Standards Project Team, 2016; Zevin *et al.*, 2012). As South African students enrolled in healthcare programmes originate from diverse backgrounds, and because simulation has not been fully integrated in national healthcare education, orientation to the environment, learning objectives and outcomes, technology and learning methods is essential. Briefing will ensure that a safe learning environment is maintained, in which students are aware of exactly what is expected of them and how they can achieve the learning outcomes.

Briefing should also include both the method and objectives of the debriefing/feedback. Considering how little SBLE integration exists in South Africa, students might not be accustomed to the process of debriefing, or might not know how to receive and process constructive feedback, even though the generational cohort currently at tertiary institutions expects frequent feedback (*cf.* Table 2.1). The researcher supports the Delphi panel members' opinions regarding the inclusion of two student briefing sessions. One briefing session should occur at the beginning of the module, and may be in written or recorded format (INACSL Standards Committee, 2016b) to allow for standardisation, save educator time and allow for follow-up clarification by students, with the second provided verbally prior to each SBLE (INACSL Standards Committee, 2016b).

<u>Theoretical preparation</u>

Equal numbers of panel members indicated that providing basic theoretical knowledge required for participation in the SBLE prior to the SBLE was essential and useful. As mentioned in Section 4.8.2.1, it is essential for students to be prepared prior to engaging in a SBLE, including theoretical preparation and ensuring that participants are equipped with basic knowledge and skills to achieve the SBLE objectives (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016b) and prevent cognitive overload. One panel member stated that SBLEs enable facilitators to identify theoretical needs, which could explain why the posed statement achieved only stability, as theory can be built upon or revisited throughout a module and programme, according to the needs that are identified.

All but one statement relating to the need for assessments before or after students participate in SBLEs remained in dissensus. Panel members were of the opinion that completing preparatory, informal formative assessments was not only required prior to practical-skills-based SBLEs, but varied opinions were elicited as to when and for which SBLEs these assessments should be used. Preparatory assessments are valuable tools for ensuring student readiness for an SBLE. However, as SBLEs may be utilised to attain practical, procedural, team-based or non-technical skills (ASPiH Standards Project Team, 2016), the researcher advises that including informal theoretical assessments prior to participating in a SBLE should depend on the nature and outcomes of the specific SBLE.

Of all systematic review articles included, only frameworks relating to practical-skills-based training included a mandatory pre- and/or post-test section (Khamis *et al.*, 2016; Zevin *et al.*, 2012), which might be due to practical and procedural skills receiving more attention in the literature than non-technical skills assessment (Watkins *et al.*, 2017). The researcher refers to the concept clarification, which explains that informal knowledge testing prior to or after SBLEs is not meant to be interpreted as formal formative or summative assessment, but rather as part of the student preparation process. Even following concept clarification and rephrasing during the Delphi survey, this might have been unclear to panel members, as no specific mention was made to these statements not being linked to any form of formal assessment.

In the researcher's opinion, the inclusion of informal preparatory assessments would be best left to the educator's discretion, as pre-testing is only one method of encouraging student preparation (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016b) and the various methods of student preparation available could have also resulted in statements not achieving consensus.

4.8.2.2 *Student goal setting*

Although the statement did not achieve consensus, the majority (64%) of panel members were of the opinion that it could be beneficial to encourage students to revisit the learning objectives, as well as their own **individual goals** for the SBLEs prior to engaging in the SBLEs. Adamson's (2015) systematic review of simulation practice literature pertaining to the NLN/Jeffries Simulation Framework mentions that adult students are able to address their self-directed learning goals in the simulated environment. As discussed in Section 2.3.4, South African undergraduate students could be classified as potentially emerging adult learners, and requiring them to reflect on what they do not know might present challenges. The researcher believes the inclusion of individual goal setting might not be applicable to the current framework, because members of the student population are still developing their self-regulation skills. However, considering that self-regulation is an expected graduate attribute, students should be encouraged to individually revisit the learning objectives set for each SBLE to foster self-directed learning. This is a necessary action that facilitates responsibility for their own learning, encourages self-refection and deserves a mention in the conceptual framework.

4.8.2.3 *Debriefing*

Effective **debriefing** is viewed as the most important component of learning after an SBLE (Cheng *et al.*, 2018; ASPiH Standards Project Team, 2016; INACSL Standards committee, 2016d; Chung *et al.*, 2012), especially after immersive SBLEs, therefore, it necessitates the use of formally trained (Cheng *et al.*, 2018; Decker *et al.*, 2013) facilitators during the debriefing session. Panel members corroborated their previous opinion (Section 4.8.1.3) by stating that it is essential to ensure student debriefing is led by a facilitator trained in the art of debriefing. When considering Kolb's experiential learning cycle, learning is dependent on both experience integration and reflection (INACSL Standards Committee, 2016d; Chmil *et al.*, 2015). The facilitator fulfils the important role of facilitating the student (McLeod, 2017) in identifying inconsistencies between experience and theoretical understanding, thereby assisting with the conceptualisation of adjustments required for future implementation. Skilled debriefing must be included in the framework for simulation integration, as it promotes reflection thinking, and results in students developing a degree of self-regulation and individual goal-oriented practice.

Unfortunately, potentially emerging adult learners generally struggle with critical thinking skills (Hussin, 2018; Keystone Academic Solutions, 2018; Holyoke & Larson, 2009) (*cf.* Table 2.1). Facilitators, therefore, have the task to assist students to develop critical thinking skills by guiding them in a positive reflection exercise, as reflection encourages critical thinking (Dorn, 2014). The diversity in the South African student population challenges the debriefing process. Not only does the facilitator have to be skilled in the process of debriefing, but must also have the ability to engage with a variety of students in a constructive manner, to create a safe space for discussion and exploration. Most South African healthcare educators are still novices in the field of debriefing and simulation and, therefore, accredited courses for debriefing are advised to ensure a standardised approach to debriefing. The debriefing process should be one that explores student experiences and thought processes; debriefing facilitators should be encouraged to avoid regressing to didactic lecturing approaches.

Not only is facilitator training in the art of debriefing required, but training and preparation for the debriefing method and tools to be utilised when facilitating a SBLE debrief was confirmed as essential by panel members and literature (Cheng *et al.*, 2018; INACSL Standards Committee, 2016d). Simulation design best practices acknowledge that a debriefing method should be identified during the SBLE design phase – a phase which might not occur during the curriculum planning phase, but only later, when individual SBLEs are designed (INACSL Standards Committee, 2016b; Sabus & Macauley, 2016). The SBLE team composition must be identified prior to the learning experience, as it has a direct effect on the type of debriefing procedure utilised.

Debriefing may be done at three levels: individual, team or class level, and careful attention should be paid to ensuring that the debriefing method aligns with the purpose and intended objectives of the SBLE (Bearman *et al.*, 2018; Sabus & Macauley, 2016). Considering the time challenges in an already busy programme, consideration should be given to incorporating team debriefing, where appropriate. Some learning may be lost when debriefing in larger groups, and this should be acknowledged. To ensure consistency within the SBLE, the researcher supports identifying the intended debriefing method and tool, which should be aligned with SBLE learning objectives, during the individual SBLE design phase. Doing so will allow educators and students to become familiar with the method utilised, and will result in effective debriefing in a constructive environment.

In the sub-section relating to student preparation (*cf.* Section 4.8.2.1), panel members indicated that students should be informed when feedback and/or debriefing will be provided, as the sub-section refers specifically to orienting students to the SBLEs. Literature indicates and Delphi panel members were of the opinion that the timing of debriefing should be decided upon during the planning phase of both the curriculum and each individual SBLE. Debriefing can occur at different time points during SBLEs (Cheng *et al.*, 2018) and the stipulation of debriefing timing should occur prior to the SBLE, to plan the experiences, and should align with the intended SBLE learning objectives. In line with the scope of the study, information pertaining to identifying if debriefing occurs during, directly after or at a later stage was not required.

4.8.3 Evaluation

4.8.3.1 *Evaluate*

Results obtained from the Delphi survey are similar to that of published literature, and highlight the importance of programme **evaluation** (ASPiH Standards Project Team, 2016; Gough, 2016; Zevin *et al.*, 2012; Kneebone, 2005) to prove the relevance and effect of simulation-based programmes, as required by administrators and funders (Adamson & Prion, 2015). Leinster (2013) states that every educational endeavour requires a well-designed evaluation strategy. Unger and Hanekom (2014) advocate for programme evaluation to safeguard the responsible use of resources and evaluate the impact of a renewed curriculum on the skills and attributes displayed by graduating students. The researcher supports the inclusion of programme evaluation strategies and agrees with the recommendation made by the Association for Simulated Practice in Healthcare (ASPiH), that a SBE expert of the training institution oversees the design of a programme that integrates simulation. In light of the shortage of South African healthcare educators, it might be challenging to appoint one educationalist to oversee the development and continuous evaluation and adjustments of a programme integrating simulation, but if the programme is to be sustainable, it is essential. The researcher proposes interdepartmental collaboration amongst SBE experts, who can assist to develop and evaluate simulation integration and drive integration in the respective departments. Facilitation of regular auditing to ensure programme content remains relevant to organisational goals, clinical needs and programme outcomes (ASPiH Standards Project Team, 2016), is essential and, therefore, various methods of programme evaluation will be described below.

According to panel members, student, educator and facilitator feedback regarding satisfaction and perceived learning gained from the programme is essential and aims to ensure the sustainability of such a programme (Motola *et al.*, 2013; Zevin *et al.*, 2012). Supporting evidence of the benefit of introducing simulation in a programme, based on improved results compared to traditional education strategy results, is required to advocate for programme continuation despite the cost involved. Delphi panel members regarded using informal evaluation tools (e.g., satisfaction surveys, verbal feedback or written reflection) for programme evaluation as possibly only useful, with no consensus being reached by panel members. However, when selecting programme evaluation methods, educators are advised that the choice should be based on the information required by stakeholders (Adamson & Prion, 2015), to motivate for continued funding in line with outcomes demanded by stakeholders. Therefore, a variety of evaluation formats may be utilised during the programme evaluation process. Quantitative methods (e.g., questionnaires and surveys) may be used to evaluate cost-effectiveness and satisfaction with the programme, where qualitative personnel and student interviews could provide information on the perceived clinical relevance of the programme.

Delphi panel members considered using summative assessment results for programme evaluation to be useful for inclusion in the conceptual framework, while using formative assessments only reached stability by the final survey round. It should be considered that a variety of factors, including clinical training, experience and theoretical teaching, impacts on a student's performance in a summative assessment. Assessments of a formative nature would not provide sufficient information regarding the attainment of learning outcomes, as the learning process is continuous and develops towards the desired outcomes, whereas summative assessments provide a specific measurement of outcome achievement. Literature states that student assessments indicating learning outcome attainment are required for programme evaluation (ASPiH Standards Project Team, 2016; Gough, 2016; Harden, 2013), though the extent to which SBLEs have been integrated in a programme would influence the chosen evaluation tools. As investigation of all possible evaluation sources and tools falls beyond the scope of the study, no specific evaluation tools and options were provided to panel members for deliberation.

Due to the varied use of SBLEs in healthcare education, the researcher views the design of programme evaluation methods incorporating feedback from all involved stakeholders, and possibly summative assessments, essential during the planning phase, to ensure detailed programme evaluation.

4.8.3.2 *Validation*

Due to the relatively sparse governance of SBE by an overarching organisation (Nestel & Gough, 2018), with none currently reported in South Africa (Swart *et al.*, 2019), it is deemed essential by both the researcher and panel members to consult national regulating body requirements to **validate** the implemented programme (Khamis *et al.* 2016), thereby ensuring that students continue to achieve the set learning objectives and programme outcomes. Validation of a programme incorporating SBLEs is required to ensure constructive alignment (Spies, 2016) of consistent and purposeful learning experiences within the mandated requirements. Requirements, as expected by the HPCSA and SAQA, should inform simulation practice standards, to maximise the potential and acceptance of simulation use in healthcare education.

According to Motola *et al.* (2013), developing best practice guidelines direct educators to effective integration of SBLEs in a programme. Panel members were in agreement with available literature (Nestel & Gough, 2018; Khamis *et al.*, 2016; Spies *et al.*, 2015; Sinz, 2007), deeming it essential to incorporate current literature and expert consensus when aiming to validate a programme following simulation integration. The exponential growth in simulation-based research necessitates that integrated SBLEs adhere to current best practices, are applicable to the context in which the programmes are presented, and ensures the provision of a relevant and valid education programme.

4.8.4 Revision

4.8.4.1 *Adjustments*

Feedback regarding stakeholder satisfaction with SBLEs are integral to identify programme limitations (INACSL Standards Committee, 2016b). To ensure stakeholder satisfaction and educational improvement, programme **adjustments** should be made according to essential feedback from all stakeholders involved (Nestel & Gough, 2018; Motola *et al.*, 2013; Adler *et al.*, 2009).

New technologies and best-practice guidelines are essential when adjusting a programme that integrates simulation. As technologies are continuing to develop exponentially, healthcare simulation communities are required to adapt their processes (Khamis *et al.*, 2016) and training to ensure safe, high-quality education. These improvements may relate to less expensive equipment being produced, or improved availability of equipment that is more suited to the educator's individual requirements. It is essential for educators to match the desired learning outcomes with the simulation modalities that will best achieve the outcomes, as complex, technologically advanced simulators are not always required. Considering limited resources at tertiary institutions in South Africa, educators should adjust the programme to ensure that learning outcomes are achieved with the least cost incurred.

4.9 CONCEPTUAL FRAMEWORK DEVELOPMENT

The results discussed in this chapter indicate that panel members are generally in agreement with the published literature regarding the essential elements required for planning and integrating SBLEs. The necessity of thoughtful development of the curriculum, with meticulous SBLE design, according to resource availability, desired learning outcomes and the needs of both the institution and students, were indicated as essential. A definite need for educator competency in the delivery of the programme, especially debriefing methods, were also viewed as vital for optimising student learning.

The data collected during the Delphi survey enabled the development of a conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme (*cf.* Figure 4.4). The conceptual framework depicts three themes that influence each other, with solid line arrows indicating cause and effect (Malamed, 2019) of themes on each other. Elements encased in solid boxes depict the themes where included elements are most suited (Malamed, 2019). The fourth theme, revision, is encased by dashed lines, with dashed lines linking revision to all themes, as potential adjustments (Malamed, 2019) that are required may be applicable to any theme or individual element and, therefore, the theme of revision "feeds" into all sections. A back and forth movement between evaluation and revision is represented by means of two directional arrows, as adjustments brought about by evaluation would require re-evaluation to ensure a more satisfactory programme outcome.

4.10 CONCLUSION

The need for thorough planning is evident from the Delphi survey and, to ensure optimal integration, requires consideration before commencing the simulation integration process. Upon commencement, the development of a curriculum, based upon the needs of both students and institution, which is enacted by competent educators in SBE, is essential for guiding further simulation integration. Delphi survey results emulate simulation best practice, by reiterating the importance of constructively aligning the learning outcomes with the programme content and SBLE design, to ensure meaningful learning experiences.

Aspects relating to student preparation, student assessment and ML/DP yielded the least consensus. Unstandardised terminologies used in SBE, the varied roles South African educators are required to fulfil in relation to simulation use, and the lack of utilisation of SBLEs for assessment purposes, might have impacted on panel members' opinions regarding what may be possible in a resource-constrained environment. Although international panel members were able to provide valuable insights into optimal simulation integration, they might not have a clear understanding of the unique South African context, which may hamper the practicality of the suggestions they provided.

As the Delphi survey included lengthy statements, which might have been difficult to respond to, the researcher suggests that pilot study participants should be selected carefully before a Delphi survey is implemented. Statements should be concise and focus on a single aspect, and, to obtain diverse opinions, pilot studies should include at least two to three Delphi survey experts. The researcher advises that Delphi piloting should include piloting of the feedback process, to ensure the optimal use of the Delphi methodology. The researcher is of the opinion that content experts are not essential during the piloting process, instead, experts well versed in the Delphi methodology could help to ensure the correct study execution.

To ensure the practicality and credibility of the conceptual framework for the South African context, the conceptual framework was subject to a validation meeting. The validation meeting procedure and results are described in the next chapter.

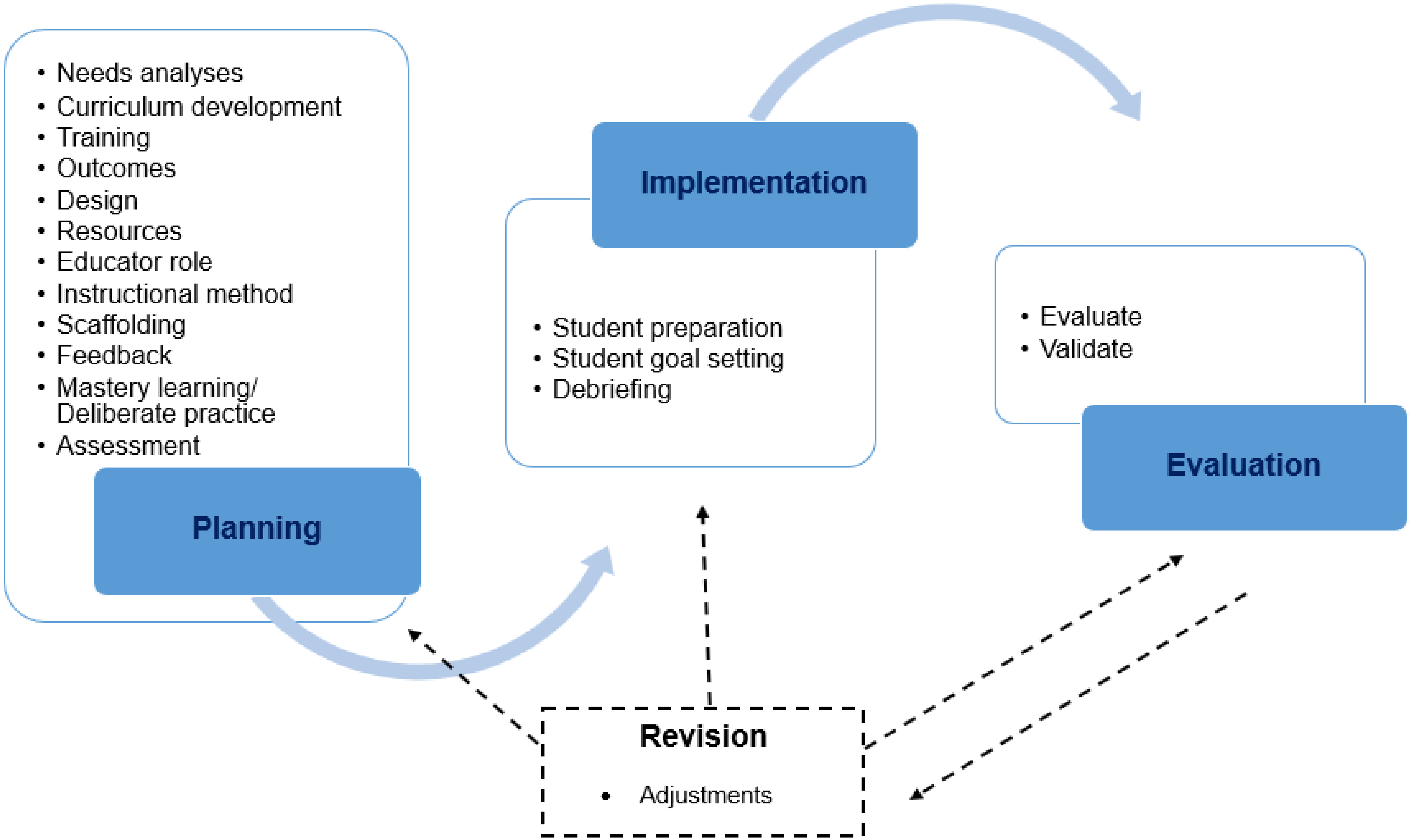

Figure 4.4: Conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme

(compiled by the researcher, van der Merwe, 2020)

CHAPTER 5

VALIDATION MEETING

5.1 INTRODUCTION

After the conceptual framework had been designed, the researcher endeavoured to contextualise the framework for the South African undergraduate physiotherapy programme. In this chapter, the methodology of the validation meeting will be described, and the results obtained by means of qualitative content analysis will be presented, with a discussion related to the elements to be included in the final framework.

It is essential that researchers pose their problem statements within the context of either a conceptual or theoretical framework (Chalmers, 1982 as cited in McGaghie *et al.*, 2001). A difference between a theoretical and conceptual frameworks is that a theoretical framework provides a general theory within which a study belongs, whereas a conceptual framework draws on a variety of theories, findings and frameworks that guide the research process (Adom *et al.*, 2018; McGaghie *et al.*, 2001). A conceptual framework refers to a researcher's own constructed model, which is used to explain interconnected key concepts and relationships in the exploration of the research problem (Adom *et al.*, 2018). During Phase 2 (*cf.* Chapter 4) of this research study, the researcher developed a conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme.

All articles that were included (*cf.* Table 3.1) and from which elements for framework inclusion were obtained, were published in developed countries, which resulted in a conceptual framework that did not take into account the unique South African healthcare education context (*cf.* Section 1.2). Contextualising research is essential for ensuring that the needs of the population are met. Disparity in the resources that are available, varying educator competency and cultural differences (Chung *et al.*, 2012) challenge the implementation of simulation-based frameworks that were designed for developed countries in a developing country. The conceptual framework that was developed by the researcher after the systematic review and Delphi survey (*cf.* Figure 4.4) was subject to a validation meeting to ensure its credibility and finalise the framework for the integration of simulation in the South African undergraduate physiotherapy context.

The conceptual framework was presented to a selected panel of South African educationalists and simulation experts, to explore participants' views (Creswell, 2012) and stimulate new ideas that had not been anticipated at the onset of the research study (Botma *et al.*, 2015). When the goal is to contextualise challenges that are encountered, especially in the changing healthcare milieu, the investigation into new curriculum models often comprises qualitative research (Devadas, 2016). A validation meeting was, therefore, held as part of the exploratory process. The meeting had a flexible structure and comprised questions being asked to facilitate critical review of the framework that had been developed (Botma *et al.*, 2015; Cohen & Crabtree, 2006; Tastle *et al.*, 2005). The data obtained during the validation meeting was applied to finalise, contextualise and enhance the credibility of the framework that was developed.

In this chapter, the methodology and results of the validation meeting will be described, and will be followed by a discussion of the results. The chapter will conclude with the description of the framework finalisation process, and the researcher will present the framework.

5.2 RESEARCH QUESTION

The following research questions were addressed:

- What are the opinions of South African experts in the fields of healthcare simulation and/or physiotherapy education regarding the content of a framework for the integration of simulation in the South African undergraduate physiotherapy programme?
- What should the finalised framework for the integration of simulation in the South African undergraduate physiotherapy programme entail?

5.3 OBJECTIVES OF THE THIRD PHASE

The objectives of the third phase of the study were:

- To discuss, critically review and validate the content of a framework for the integration of simulation in the undergraduate South African physiotherapy programme by means of a validation meeting amongst South African experts in the fields of healthcare simulation and/or physiotherapy education; and
- To finalise a framework for the integration of simulation in the South African undergraduate physiotherapy programme.

5.4 RESEARCH METHODOLOGY

5.4.1 Study design

A qualitative descriptive research design, situated in the constructivist research paradigm, was utilised. The semi-structured group interview process, comprising the validation meeting, enabled collaborative construction and meaning negotiation (Mojtahed *et al.*, 2014) of the framework.

5.4.2 Study methodology

5.4.2.1 *Target population*

For the process of content validation (Slocumb & Cole, 1991), South African experts in healthcare simulation and/or physiotherapy education were approached to support or reject framework elements. Due to the very specific population required to ensure the credibility of the framework content, a purposive sampling method was used. Participants qualified for inclusion if they were currently employed in South Africa to ensure framework contextualisation for the South African physiotherapy context. In addition to their national employment, participants were also required to adhere to at least two of the following inclusion criteria:

- They had to possess research experience and/or publications in healthcare education;
- They were simulation experts (see concept clarification) in healthcare and/or physiotherapy;
- They were members of the NPEF and/or Educational Committee of the HCPSA, and could provide insight into the current focus of healthcare education.

5.4.2.2 *Unit of analysis*

As the validation meeting required the researcher to explore participants’ opinions in depth, a sample of five experts were purposively chosen. According to Devadas (2016) and Creswell (2012), a small sample size is preferable for discussions aiming to elicit a large amount of information from participants by means of questioning (Polit & Beck, 2012). The number of experts included in this semi-structured group interview process correlates with a previous South African healthcare education study that followed a similar process for framework evaluation and critiquing (Botma *et al.*, 2015).

The researcher, in collaboration with the research promoters, identified five suitable candidates through their publications and involvement in national educator forums; each had more than 15 years experience in their respective fields. The researcher, utilising an electronic platform, contacted the prospective participants she had identified. The possible participants were informed of the research study, including the objective and structure of the validation meeting, as well as the reason for their selection. Experts who were unwilling to participate were requested to nominate a suitable replacement in their field of expertise. All participants indicated their willingness to participate and are listed in Table 5.1.

Table 5.1: Validation meeting participants

PROFESSION	AREAS OF EXPERTISE
Medicine	Dean of medical faculty; educationalist with extensive publications; simulation expert; member of the Council of the Academy of Science of South Africa
Nursing	Educationalist with extensive publications; simulation expert
Nursing	Educationalist with extensive publications; simulation expert
Physiotherapy	Educationalist with extensive publications; member of HPSCA education board
Physiotherapy	Educationalist with extensive publications; NPEF member

The validation meeting was structured according to a meeting guide, which assisted the facilitator with the format and sequencing of the questions posed to participants (Devadas, 2016; Creswell, 2012). The meeting guide (Appendix X) comprised open-ended questions and was developed by the researcher based on similar criteria utilised in previous South African research that involved the critical evaluation of a healthcare education framework for the promotion of transfer of learning (Botma *et al.*, 2015). Questions used in the Botma *et al.* (2015) study were amended to achieve the current study objectives. Reliability of the validation meeting was enhanced by utilising the developed meeting guide (Devadas, 2016), which was adjusted further after an exploratory discussion (*cf.* Section 5.4.2.3) to ensure unambiguous, clear questions, and to prompt open and free dialogue without introducing bias (Labuschagne *et al.*, 2014). Using the meeting guide ensured that all interview areas were covered, satisfying both thematic and dynamic study dimensions (Devadas, 2016).

5.4.2.3 *Exploratory discussions*

In preparation for the main study, the researcher conducted an exploratory discussion with one healthcare simulation expert affiliated with the UFS, to identify and clarify any problems with the data collection process or instruments (De Vos *et al.*, 2011; Botma *et al.*, 2010). After the exploratory discussion, the proposed procedural adjustments were made (*cf.* Appendix Y). However, after reflecting on the content of the adjusted meeting guide, the researcher decided that a second exploratory discussion would be beneficial, to ensure that the data solicited from participants would answer the research questions. Therefore, a second exploratory discussion was held with a healthcare educationalist with extensive qualitative research publications. After completion of the second exploratory discussion, content changes were made to the proposed meeting guide (*cf.* Appendix Y).

<u>Amendments after the first exploratory discussion</u>

After the initial exploratory discussion, procedural changes were made to improve the flow of the meeting (*cf.* Appendix Y). These changes included providing more detailed information and background regarding the study aims, preceding study phases and framework, to elicit more directed and goal-oriented input during the validation meeting.

<u>Amendments after the second exploratory discussion</u>

The adjusted meeting guide was subjected to a second exploratory discussion, which assessed the alignment of the meeting guide with the research questions (*cf.* Section 5.2). Content changes were made to the meeting guide to ensure that the research objectives would be met (*cf.* Appendix Z). The question structure was also adjusted to comprise open-ended questions, thereby allowing for increased data validity.

Furthermore, in consultation with the research promoters, a framework finalisation phase was added to the validation meeting process after the second exploratory discussion. This phase enabled the researcher to enhance the framework’s credibility by presenting the finalised framework to the participants to ensure that the interpretation and synthesis of data that had been obtained during the validation meeting, was done correctly by the researcher (Mojtahed *et al.*, 2014; Saldaña, 2010).

5.4.2.4 *Data gathering and construction process*

Ethics approval was obtained for all study phases prior to the commencement of the research study (*cf.* Section 3.4.2.3 & Appendix E).

The Simulation Unit, Faculty of Health Sciences, UFS, was selected as the venue for the face-to-face validation meeting. Once participation had been confirmed, suitable dates for the validation meeting were proposed to participants by means of an electronic program, Doodle™. All participants indicated that 19 February 2019 would be a suitable date, and travel arrangements were made by the researcher for the three participants who did not reside in Bloemfontein.

Each participant received the following documentation via email two weeks prior to the scheduled meeting, in preparation for the discussion (Mojtahed *et al.*, 2014):

- Information leaflet (*cf.* Appendix AA), detailing the study aims, objectives and procedure;
- The conceptual framework (*cf.* Appendix BB);
- Resultant Delphi survey statements informing the framework (*cf.* Appendix CC);
- Concept clarification of concepts related to the research study (*cf.* Appendix DD); and
- A document detailing the graduate attributes required by HPCSA for all healthcare professionals and SAQA-specific graduate attributes for physiotherapy students (*cf.* Appendix D).

As recommended by Mojtahed *et al.* (2014), a semi-structured group interview process, including the use of an adjusted decision-making map format, was utilised to promote participant interaction, foster goal-oriented decision-making and facilitate the co-construction of knowledge.

The validation meeting was facilitated by a personnel member at the UFS who is trained and skilled in facilitating group discussions by means of structured interviews and focus groups. The researcher, facilitator and the research promoters met prior to the validation meeting to brief the facilitator on the research aims, objectives and procedure of the validation meeting, to ensure that accurate data would be collected.

On the day of the face-to-face validation meeting, participants were provided with printed copies of the documents that had previously been provided electronically, to ensure that participants could refer to the conceptual framework and informing statements easily during the discussion. An informed consent document (*cf.* Appendix P) was signed by each participant prior to the meeting commencing.

The validation meeting was held in a private room at the UFS, which ensured confidentiality. Before commencement of the meeting, the researcher introduced each member and provided a short overview of the research process and research aims. The researcher also explained the purpose and procedure, including that audio recording would be done of the meeting, to participants and clarified any questions prior to participants signing the informed consent documents. Participants were made aware that they would be identifiable to the researcher on the audio recordings, but not to the trained transcriber, as participants stated their participant number prior to providing their opinions or commenting during the meeting. The researcher assured participants that their confidentiality would be maintained at all times during and after the study. The recordings and the electronically provided transcriptions were kept safe in the researcher's personal safe on a password protected external hard drive, to which only the researcher has access.

The meeting guide (*cf.* Appendix EE) with its open-ended questions was used to facilitate the validation meeting. Participants were encouraged to voice their opinions and recommendations in an unhindered fashion (Creswell, 2012). Only participant opinions and comments related to the research topic were explored by the facilitator, who put participants at ease and minimised participant fatigue (Creswell, 2012). For this study, a convergent process was used to arrive at the best possible answers regarding the framework and informing elements presented for discussion (Botma *et al.*, 2015; Tastle *et al.*, 2005). Consensus was achieved on inclusion of framework elements when all participants agreed on the value of including an element. Where no consensus could be reached, the discussion was facilitated until data saturation was achieved. Data saturation was defined when no new comments, recommendations or opinions were raised by participants regarding the value of a framework element (Tastle *et al.*, 2005).

The researcher was present during the meeting and made field notes of participants' reactions and suggestions, which, in conjunction with the audio recordings and subsequent transcriptions, allowed for a dependability and/or confirmability audit to ensure data accuracy (Savin-Baden & Major, 2013; Polit & Beck, 2012). The consensus-seeking process and inclusion of the framework finalisation phase served the purpose of member checking (Saldaña, 2010) and enhanced the credibility of the data obtained. Although the researcher was available to provide clarity, if required by participants, the researcher in no way engaged during the data gathering process. By not providing the meeting guide to participants prior to the meeting, and the researcher refraining from answering unrelated questions or presenting own perspectives during the discussion, an environment free of coercion, bias or rehearsed answers was created (Creswell, 2012) and data reliability was ensured. When a participant expressed recommendations regarding a specific informing statement or question, the proposed change was discussed by the facilitator, who ensured that the group's opinion was portrayed in the final statement or answer, and did not reflect only one individual's opinion. No sensitive questions or questions of a personal nature were asked, which safeguarded participants from possible emotional harm.

After the discussion pertaining to the elements deemed essential for framework inclusion, one participant was nominated by the group to visually depict the adjusted framework on a whiteboard. All participants provided input and discussed the changes made to the conceptual framework (*cf.* Appendix BB). Throughout the remainder of the validation meeting, this visual representation (Mojtahed *et al.*, 2014) was available on the whiteboard for reference and discussion purposes, and stimulated knowledge co-construction. Once consensus had been reached on the inclusion/exclusion of an element, or the name assigned to an element or framework theme, the nominated participant adjusted the visual framework accordingly. During the framework finalisation phase, a member checking process was followed (Polit & Beck, 2012) by means of the final four questions in the meeting guide (*cf.* Appendix EE). This member checking process ensured accurate interpretation and, therefore, credibility, of the constructed data (Saldaña, 2010).

Because the researcher was present in the room during the meeting, she familiarised herself with the content and ensured she had an in-depth understanding of the data (Polit & Beck, 2012). Content familiarisation assisted the researcher to interpret data in the correct context, as human behaviour cannot translate into typed transcriptions. The credibility and confirmability of the data was, furthermore, ensured by employing a trained transcriber to transcribe the audio recordings verbatim in an electronic Microsoft Word document. The stated participant numbers were the only identifiers used to indicate which participant provided which comments or suggestions. The credibility of the data was enhanced further by the researcher crosschecking the electronic transcriptions against the audio recordings, thereby ensuring accuracy. No discrepancies were noted. In line with Good Clinical Practice guidelines, both the audio recordings and electronic transcriptions are stored on a password protected external hard drive in a locked safe, to which only the researcher has access.

5.4.2.5 *Content analysis*

The transcribed data was verified and compared with the original recordings by the researcher, to ensure an accurate version of what had transpired during the validation meeting, which enabled the researcher to perform preliminary coding (Saldaña, 2010). The process of manual structural coding, through the studying and immersion in the data, was used to analyse the qualitative data (*cf.* Figure 5.1).

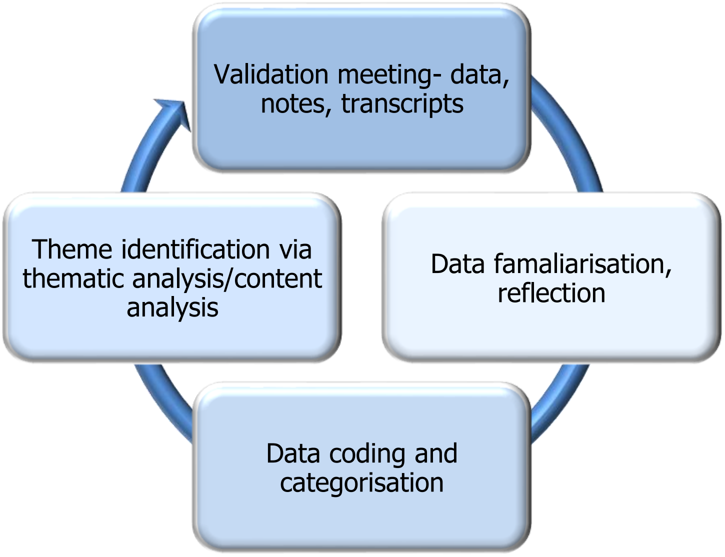

Figure 5.1: Schematic overview of the structural coding process

(Saldaña, 2010) (compiled by the researcher, van der Merwe, 2020)

After data verification, the data was independently reviewed by both the researcher and a qualitative data analyst, and structural codes were identified. Similar structural codes were grouped together into categories and sub-categories, based on the semi-structured meeting guide (Saldaña, 2010). Related categories were grouped further to identify overarching themes (*cf*. Figure 5.1). The qualitative data analyst, who had more than 20 years experience in the field of healthcare-related qualitative research, assisted the researcher with the data analyses process, thereby further enhancing study confirmability and credibility (Polit & Beck, 2012). After the independently performed structural coding, the researcher and qualitative data analyst engaged in a consensus meeting to determine inter-coder agreement. Discrepancies in coding were discussed and resolved (*cf*. Table 5.2) to ensure unbiased and accurate data, and consensus was achieved regarding the identified categories, sub-categories and codes.

Table 5.2: Consensus meeting results following the content analysis process

RESEARCHER	QUALITATIVE DATA ANALYST	REASON FOR CHANGE AFTER DISCUSSION AND REFERRAL TO TRANSCRIPTS
Needs analyses category divided into two sub-categories, namely, Simulation as a strategy, and Curriculum development and design.	Needs analyses category with no sub- categories.	Participants repeatedly referred to two different needs analyses required to assess the need for curricular adjustment and the need to structure the SBLEs.
Additional codes added detailing which stakeholders should be involved in the two different needs analyses.	Codes indicating stakeholders who should be involved in the various needs analyses were combined, as the category did not have sub-categories.	Referred to the division into two sub-categories of the needs analyses theme, necessitating the allocation of stakeholders per sub-category.
Education theory code was grouped under the Responsive curriculum category.	Education theory code was grouped under the Simulation design category.	It was identified that education theory use was indicated by participants to be essential when designing SBLEs.
Scaffolding was grouped under the category Responsive curriculum.	Scaffolding was identified as a category on its own.	Participants reiterated the importance of scaffolding being integrated throughout the design and implementation process, and participants indicated that scaffolding should be represented as a separate category.
Resources were identified as a category.	Resources were grouped under the category Simulation design.	Participants viewed Resources as an integral component when designing SBLEs and indicated it should be integrated into the category Simulation design.
ML/DP was identified as a code within the Debriefing category.	ML/DP was viewed as part of the code Self-regulation in the Debriefing category.	Participants discussed and viewed ML/DP as an element of self-regulation and it is, therefore, suited to the Debriefing category.

RESEARCHER	QUALITATIVE DATA ANALYST	REASON FOR CHANGE AFTER DISCUSSION AND REFERRAL TO TRANSCRIPTS
Terms and type of assessment, as well as peer assessment, was identified as codes within the Assessment category.	No code for terms and type of assessment, or peer assessment, noted in the Assessment category.	It was decided to include the code terms and type of assessment and peer assessment in the framework to identify clearly to both facilitators and students if and how the SBLEs will be implemented when the framework is used for assessment. As participants viewed Assessment as useful and not essential for inclusion when implementing the framework, clarification of the category was deemed essential.
Feedback was identified as a code under the category Evaluate.	No code for Feedback in the category Evaluate.	It was decided to include the code Feedback under the category Evaluate, as the type of feedback required for evaluation was highlighted for inclusion by participants.

5.5 CONTENT ANALYSIS AND DISCUSSION

The content analysis process identified 15 categories, two sub-categories and 44 codes. The researcher and qualitative data analyst independently grouped similar categories they identified into the four themes identified during the systematic review (*cf.* Section 3.5) and the Delphi survey (*cf.* Figure 4.4). The themes identified in both the systematic review and Delphi survey were selected as the themes for the validation meeting, to provide a continuum in the presentation of the data obtained. In addition, a fifth theme was identified, that relates to the usefulness of the framework. The identified categories, sub-categories and codes were confirmed during the consensus meeting between the researcher and qualitative data analyst.

The skilled facilitator did not at any time reign in the discussion, as the freedom provided data with depth and richness (Chetty *et al.*, 2018; Spies, 2016). Statements informing the final framework were adjusted by participants of the validation meeting to inform the framework better (*cf.* Appendix FF). However, as the original statements were obtained from the Delphi survey, the adjusted statements are merely presented for clarification purposes, and no data obtained during the Delphi survey was altered retrospectively.

An overview of the emerging themes, categories, sub-categories and codes are provided in Table 5.3.

Table 5.3: Content analysis summary following validation meeting

THEME	CATEGORY	SUB-CATEGORY	CODE
5.5.1 Planning	Needs analyses	Simulation as strategy	Institutional and discipline
			Cost-benefit
		Curriculum development and design	Continuous
			Contextual
			Circular
			Create design
	Responsive curriculum	None	Integration
			Authenticity
			Collaboration
			Adaptive instructional method
	Learning outcomes	None	Each SBLE
			Constructive alignment

THEME	CATEGORY	SUB-CATEGORY	CODE
			All attributes and competencies
	Scaffolding	None	Curriculum development
			Simulation design
			Learning outcomes
	Simulation design	None	Education theory
			Resources
	Competent facilitator	None	Development
			Competency training
			Role clarification
	Student-centred preparation	None	Part of entire process
			Flexible
			Brief
			Ongoing
5.5.3 Implementation	Debriefing	None	Self-reflection
			Constructive feedback
			Self-regulation
			Goal setting
	Assessment	None	Suitability for model?
			Tool
			Terms and type
			Peer assessment
5.5.5 Programme evaluation	Validation	None	Essential
			Evidence-based
	Evaluate	None	Feedback
			Essential
5.5.7 Programme revision	Review	None	Continuous
5.5.9 Framework	Practicality	None	Cost
			Decentralised training
	Impact		Institutional support
			Collaboration
	Supplementation		Interprofessional use
			No replacement/substitution

The main results emerging per theme will be stated shortly, followed by a discussion of each theme. The results after data analysis will be displayed as figures to provide visual representation of the results obtained (Saldaña, 2010). Themes, categories, sub-categories and codes are indicated by various shapes and shades of blue, as indicated in Table 5.4.

Table 5.4: Results key

	SHAPE KEY
Theme	
Category	
Sub-category	
Code	 

In the following section, themes, emerging categories and sub-categories (supported by quotes), codes and participant numbers will be indicated in text, as indicated in Table 5.5.

Table 5.5: In-text results key

RESULTS	**IN TEXT IDENTIFICATION**
Theme	Bold font in caps
Category	Bold font
Sub-category	Bold italics
Codes	Underlined
Participant quotes	Italic font with participant number as reference
Participant number	"*[x]*" following the quote

To be noted: As participants were seated randomly around the table, the numbers used did not indicate the possibility of identification by anyone other than the researcher.

5.5.1 Content analysis: Planning

Seven categories were identified under the theme of **PLANNING,** as depicted in Figure 5.2.

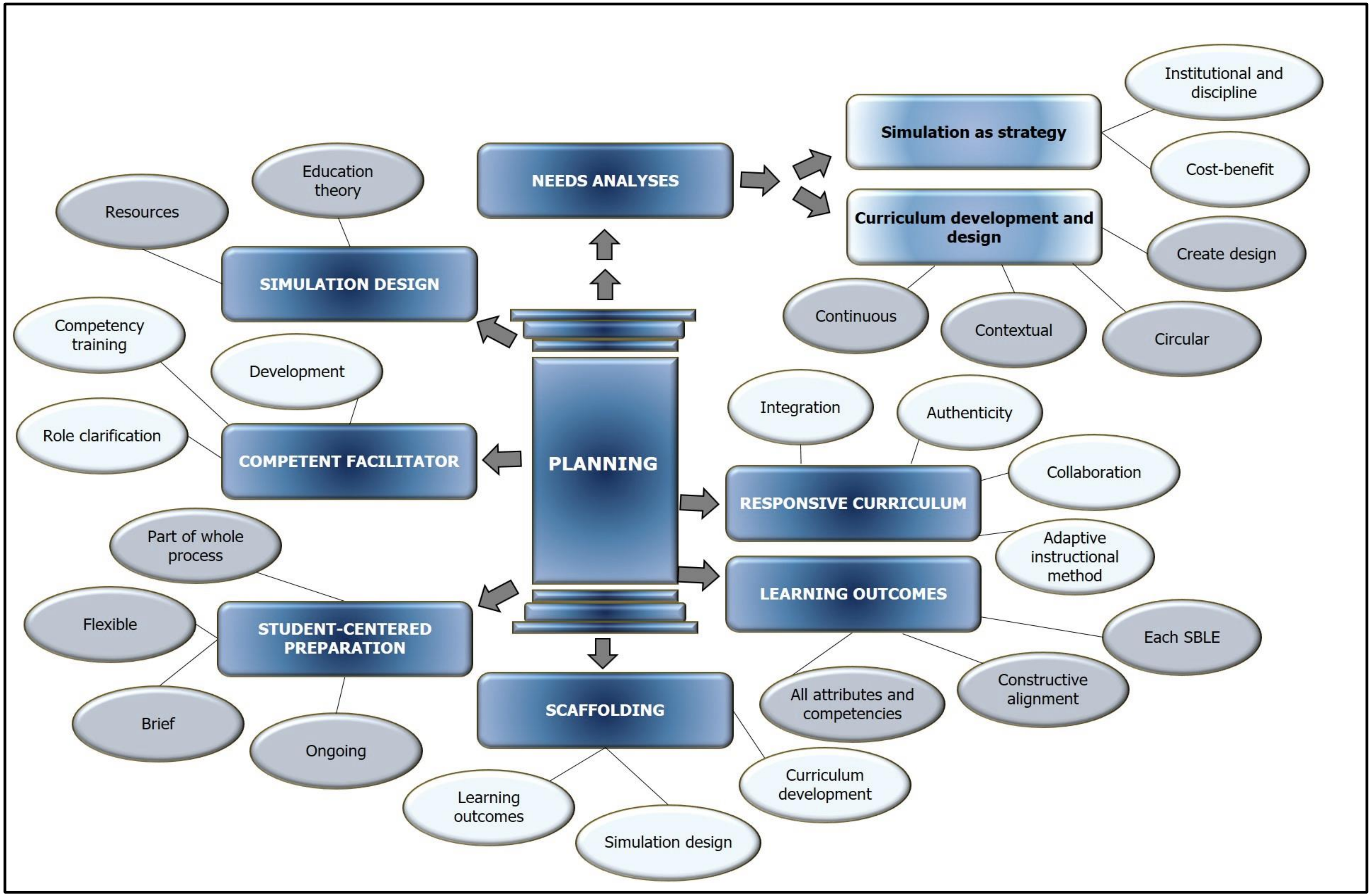

Figure 5.2: Theme 1: Planning

The category **needs analyses** was expanded into two sub-categories, to highlight the importance of identifying needs related to two distinctly different aspects of the programme: the first relates to determining a need for educational adjustment on a discipline level, and assessing the viability of simulation integration on an institutional level; the second relates to a needs analysis, which is required to identify the needs related to the development of the curriculum-integrating SBLEs and the individual SBLEs (*cf.* Section 5.5.2).

Two category name changes were required to reflect standard South African healthcare education terminology better. Curriculum development and outcomes were changed to **responsive curriculum** and **learning outcomes,** which reflect a more adaptable curriculum with reference to specific educational outcomes

> *"to keep the focus on the learning in education" [4]* (*cf.* Section 5.5.2).

Student preparation was adjusted to **student-centred preparation** and moved from the **IMPLEMENTATION** theme to the **PLANNING** theme, thereby demonstrating the student-centeredness of the educational methodology. The continuous process of preparing students for their changing roles during the integration of SBLEs into a programme is illustrated by the inclusion of student-centred preparation under the planning theme (*cf.* Section 5.5.2).

The category **competent facilitator** was created by merging the previously identified categories of training and educator role, highlighting the numerous facilitative competencies required at different stages of the SBLE integration process (*cf.* Section 5.5.2). The previously identified categories, instructional method and resources, were collapsed within the **responsive curriculum** and **simulation design** categories respectively, as both inform the identified corresponding categories (*cf.* Section 5.5.2).

The suitability of the category **assessment** for framework inclusion, in relation to the research outcomes, proved to be challenging for participants. The category was, however, discussed by participants and moved to the **IMPLEMENTATION** theme. Details of the meaning of assessment in terms of the framework that was finalised during the validation meeting is discussed in Section 5.5.4.

Mastery learning/Deliberate practice was also collapsed within the **debriefing** category, due to the art of ML/DP requiring constant self-regulation, self-reflection and goal setting, which are all included in the category **debriefing** (*cf.* Sections 5.5.3 & 5.5.4).

5.5.2 Discussion: Planning

Detailed planning prior to the development, integration and execution of SBLEs is essential (Motola *et al.*, 2013; Issenberg *et al.*, 2005) and multifaceted (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016a). The complexity of **PLANNING** was consistently the most robust framework theme throughout the current study, with this theme consisting of the most identified categories, which indicates the importance and various aspects of the theme. The category **needs analyses** proved to be troublesome to participants of the validation meeting, as the category was described as unidimensional in how it was presented in both the conceptual framework and Delphi survey results.

> *"I was quite distressed that only 64% at the third Delphi round thought that social needs should form the back ground of these [curriculum development]." [2]*

There is no doubt that performing a needs analysis is essential (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016b; Khamis *et al.*, 2016), however, the aim of the needs analysis was unclear to participants.

> *"I think the needs analysis lies on different levels that you need to see where it fits into the curriculum, because not all content is appropriate for simulation. So, there's a needs analysis at content level of what CAN you simulate and will benefit by simulation. But there's also the needs analysis of what is necessary for the community or for the students to learn." [3]*

Consensus was reached among participants to expand the category into the sub-categories of ***simulation as strategy*** and ***curriculum development and design***, to clearly indicate the importance of "hearing" all stakeholders (ASPiH Standards Project Team, 2016; Khamis *et al.*, 2016; Chung *et al.*, 2012; Labuschagne, 2012) during the various planning stages. Clear demarcation of the two different focus areas of the needs analysis lead to constructive discussion regarding what should be assessed during each needs analysis.

When assessing the feasibility of ***simulation as a strategy*** in the undergraduate physiotherapy programme, it is vital to consider both <u>institutional and discipline-specific needs</u>. Student and societal needs are not viewed as essential at this point, as the main driving force for integration is largely dependent on the availability of financial and resource support.

> *"decide is it worth my while and is it better than what's currently in existence. I don't think in that initial analysis you have to involve students, society or anything like that." [4]*

There is no benefit in developing a programme unless there are financial, human and physical resources available to implement the programme. Simulation is associated with high costs, not only for equipment procurement, but also for running expenses (Motola *et al.*, 2013; Østergaard & Dickman, 2013; Chung *et al.*, 2012). In an education environment where government funding is dwindling and a decolonised programme that answers to societal needs is expected (Butler-Adam, 2018; Mekoa, 2018; Tjønneland, 2017), curricular components which could be better served by the integration of simulation for attaining learning outcomes, compared to other, possibly less expensive, educational methodologies, should be investigated. The graduate attributes expected of South African physiotherapy students by the national qualifications authority and professional governing body (SAQA, 2018; HPCSA, 2014) (*cf.* Appendix D) could be trained within the simulated environment. Attributes, for example, communication, collaboration, leadership, management and the ability to act as a health advocate, are easily attainable in an active and feedback-oriented simulated learning environment. Didactic lecturing might not be the best-suited educational methodology for teaching the current tertiary generational cohort (*cf.* Section 2.2.3) how best to adapt their treatment approach, taking into account resource scarcity, and when fostering person-centred care. South African universities' alarmingly low throughput rate (*cf.* Section 2.2.1) makes programme adjustment essential. As government funding rests on the ability of tertiary institutions to demonstrate student throughput and cost-effective resource use, a detailed cost-benefit analysis is essential as part of informed decision-making into integrating SBLEs (Mori *et al.*, 2015; Thackray, 2013) and ensuring a sustainable and successful programme.

All stakeholders should provide input during the ***curriculum development and design*** phase, to ensure a curriculum design that addresses all the expected graduate attributes (Motola *et al.*, 2013) and societal needs (Unger & Hanekom, 2014; Aggarwal *et al.*, 2007), which highlights the importance of needs analyses. Khamis *et al.* (2016) advocate for performing a general societal needs assessment, to ground the curriculum in identified societal needs prior to an institutional assessment identifying student needs. However, South African experts participating in the validation meeting deemed it more appropriate to, initially, assess discipline-specific and institutional needs and identify available resources, as South African healthcare education is currently viewed as a resource-restricted environment (Jansen, 2018; Fomunyam & Teferra, 2017; O'Leary, 2015; Frantz, 2007). Tertiary training institutions are being forced to be less reliant on government funding, and are encouraged to generate third-stream income by increasing research outputs, to encourage more private-sector participation, and to focus on resource mobilisation (World Bank, 2019), in an attempt to alleviate financial constraints and improve training. To achieve government's aim of doubling the Post School Education and Training (PSET) enrolment by 2030, the South African education policy that aims to offer free tertiary education to the majority (90%) of academically eligible students (World Bank, 2019) will, no doubt, negatively affect the national budget. With a weak and unstable economy, which is attributed to corruption, wasteful spending and only a small percentage of the population paying tax (De Jager & Baard, 2019), the implementation of the desired "free" higher education is not currently economically achievable. The current financial climate extends far beyond education, and includes national healthcare, with hospitals being understaffed, and facing a lack of infrastructure due to underallocation of and misappropriation of government funds (Ramaphosa, 2019; Mkize, 2018; Timeslive, 2018). The increased funding allocated to the National Student Financial Aid Scheme (NSFAS) will result in fewer public resources being available for the healthcare sector and healthcare training, and will hamper the call to increase training capabilities and admission capacity. It is the researcher's opinion that innovative resource sharing and careful consideration of an institution's financial position prior to implementing simulation are essential to ensure that the best possible training is provided to students within the financial capabilities of the institution. Following institutional approval and the decision to integrate simulation, planning may continue. Specific contextual needs are to be ascertained from relevant stakeholders (ASSAf, 2018; Khamis *et al.*, 2016; Motola *et al.*, 2013), for instance, students, educators, simulation experts, qualified physiotherapists and the society in which the students will practice.

> *"Contextual analysis is so important. When we get ourselves in situations that are difficult, like in a South African context, where there is a scarcity of resources, often that leads to more innovative practices." [1]*

The needs analysis process is continuous and circular, requiring

> *"constant reflection of what it's doing and what it's achieving" [2]* and should be repeated throughout the integration of the framework to ensure *"every voice, every stakeholder, the student, the potential patients, population, the environment, and all the other role players" [4]*

are continuously heard (ASPiH Standards Project Team, 2016; Motola *et al.*, 2013). By nature of continuous analyses, cost-saving can be incorporated by encouraging assistance from the private sector, and interdisciplinary and interinstitutional resource sharing.

Based on the unique nature of the South African education climate, the researcher advocates for the establishment of an industry advisory board (Quirk & Harden, 2017), to obtain diverse input to identify gaps in the theoretical and clinical teaching environments of healthcare, especially physiotherapy, students. Although many institutions already have advisory boards, the advisory board proposed by the researcher will provide input to guide the decision-making process for programme reform in accordance with government policies. An advisory board is comprised of leaders in the industry who are willing to assist to identify the gaps in graduate knowledge, behaviours, skill and attitude. The advisory board has the additional task of supporting the development of an authentic and responsive curriculum (ASSAf, 2018) which speaks to the evolving needs of the South African population by identifying the most appropriate education strategies and content to address the identified gaps.

The unresponsiveness of current South African higher education curricula has been cited as one of the main reasons for violent student protests that call for curriculum decolonisation (*cf.* concept clarification) (Bitzer & Costandius, 2018; Fomunyam & Teferra, 2017) as students are of the opinion that the current curricula does not take their needs and societal circumstances into consideration. Curricular and responsiveness to student demographics, funding trends, healthcare policies and the increasingly important role of technology is not only vital in ensuring satisfied students or the attainment of graduate attributes, but also in ensuring institutional sustainability (Bitzer & Costandius, 2018). Not only is curriculum decolonisation essential, but just as important as the decolonisation of education and the profession. As highlighted in the study by Padayachee *et al.* (2018), there exists a need for balance between theoretical and contextually relevant curricular knowledge, thus, the need for curriculum decolonisation. The decolonisation of education, in the form of adjusted pedagogical approaches, assessment methods, and curriculum content choices (Ruddock, 2018) are also essential for institutional and societal reform, so that students who graduate possess critical literacy and are able to respond to changing societal and economical needs, serve society and address social injustice (Padayachee *et al.*, 2018). The researcher advises that, in addition to curriculum and educational decolonisation, qualified practitioners must be sensitised to the concept of decolonisation, to ensure that graduates are entering a working environment where the focus is on responsible citizenship and social justice. A working environment in which practising professionals do not adopt a decolonised practice will result in graduates losing valuable attributes gained through a decolonised curriculum and education. By welcoming and embracing the altered professional roles required in a changing society, professionals will assist to ensure the sustainability of the profession in the unknown and complex future world.

Participants, justifiably, proposed the category name change **responsive curriculum** as a name better suiting South African healthcare education terminology (Chetty *et al.*, 2018; Fomunyam & Teferra, 2017; Ogude *et al.*, 2005).

In South Africa, conversations about the influence of the 4IR and its impact on the job market, and subsequently, education, is plentiful. In an economy with an unemployment rate of 29.1% in 2019

(StatsSA, 2020), with 50% of youth being unemployed (Ramaphosa, 2019), and the emerging shift to the digitisation of the job market, job security remains uncertain, and consequently, the definition of graduate employability has evolved. Graduates are expected to understand and manage new technology, and demonstrate adaptability, problem-solving skills, ethically and morally based decision-making processes, and also have the ability to express themselves verbally and in writing (Butler-Adam, 2018; Hussin, 2018). A responsive curriculum should, furthermore, facilitate graduate and educator sensitivity to the changing economic environment, by ensuring that training institutions continue to produce employable graduates (Fomunyam & Teferra, 2017; Ogude *et al.*, 2005).

A responsive curriculum is <u>authentic</u> in nature (Dent *et al.*, 2017), by not only answering the curricular needs identified, but also by considering the choice and design of individual SBLEs.

> *"I think the authenticity must underlie the whole [curriculum development] process and then the specific event has got to be authentic." [2]*

Authenticity, as opposed to object reality (fidelity), refers to a student's subjective interpretation of the programme, curriculum and/or SBLE, and aims to mirror actual professional communities in which they serve (Bland *et al.*, 2014). Authenticity in the context of this study, specifically with regard to SBLE choice and design, addresses all aspects, including physical, psychological and conceptual domains (INACSL Standards Committee, 2016b; Welman & Spies, 2016) to motivate student engagement (Thackray, 2013) and suspension of disbelief (Spies, 2016). Designing a curriculum that speaks to the real-life challenges, lack of equipment, complex patients, and language barriers that students might encounter in their clinical practice, is essential. Authentic curriculum design not only encourages active participation of students in their learning and the integration of theoretical knowledge, but also allows students to demonstrate adaptability and develop problem-solving skills.

<u>Collaboration</u> is an essential aspect when designing a responsive curriculum that shares both expertise and facilities between healthcare professions to maximise expert input and minimise costs (Guinez-Molinos *et al.*, 2017; Kalaniti & Campbell, 2015). Resource sharing also aims to foster interprofessional collaboration, which was highlighted in the recommendations for healthcare education proposed by the ASSAf (2018). Quirk and Harden (2017) note the importance of the educational climate in which students find themselves, which sets the stage for the development of a spirit of teamwork and collaboration. By encouraging interprofessional teamwork through the use of SBLEs (Eppich & Cheng, 2015b; Silberman *et al.*, 2013), the development of a collaborative healthcare workforce is fostered. Not only does collaboration aid healthcare leadership, cooperation

and improved patient care, it also has the ability to improve practitioner knowledge of interprofessional team member roles, resulting in comprehensive and optimal patient care.

It is imperative, when developing a responsive curriculum, to fully integrate simulation, and not to perceive it as competition for other educational methods (Motola *et al.*, 2013). It was, furthermore, recommended by participants that the integrated simulation

> *"must serve multiple purposes and not just your programme's" [4] ,*

especially due to the cost involved in simulation. In a resource-restricted environment, teamwork and cooperation will go a long way to ensure the maintainable curricular integration of simulation by sharing of advice, experiences, human resources, facilities and equipment.

Educational methods, with specific reference to the use of the terminology and instructor-based learning, was debated by participants.

> *"I am very concerned about the use of instructor-based learning. That is totally contradictory to what simulation tries to do." [3]*

The term instructor-based learning (Chiniara *et al.*, 2013), which featured under the instructional method heading, was removed from the framework, and the use of an adaptive instructional method was adopted in its place to illustrate the degree of student-centredness and flexibility required within the curriculum (Quirk & Harden, 2017). Various ways of delivering and facilitating learning is required to adapt to changing student needs regarding the programme, and to encourage active learning.

Learning outcomes are essential for guiding the choice of educational methods, and to identify the skills to be mastered by students. There is no longer a distinction in healthcare training institutions between the terms technical and non-technical skills, as all skills are viewed as equal (Kneebone *et al.*, 2017) and necessary for developing professional graduate attributes (Appendix D). This view is adopted and supported by the researcher. Participant views correlated with published simulation best practices, by highlighting the importance of constructively aligned learning outcomes (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016f; Motola *et al.*, 2013; Issenberg *et al.*, 2005) that address all the required graduate attributes, professional skills and competencies (Dent *et al.*, 2017; Kneebone *et al.*, 2017) throughout both the programme and each SBLE.

Curricular **scaffolding** is

> *"conceptually part of the curriculum, directly influencing simulation design and subsequently feeds into other components" [2]* and is *"not separate from the outcomes" [2]*.

Ensuring that learning outcomes and SBLEs are designed and integrated according to the level of the student throughout the curriculum, is essential (ASPiH Standards Project Team, 2016), and enables learners to build upon prior knowledge and construct new knowledge when engaging with the curriculum content.

When viewing scaffolding through the lens of cognitive load theory, it is evident that experience builds expertise. It is essential that instructional methods and activities build on previously obtained information, to extend the student's working memory, and allow for the processing of more complex activities. The complexity of the learning outcomes and SBLE design must increase from novice, basic competency training (knowledge, behaviour, skills and attitudes), to more complex patient scenarios, in which the mentioned skills and knowledge are to be embedded. Not only should academic material and delivery methods be scaffolded, but consideration should also be given to the practical implications of SBLE integration. Initially, more time is required for student briefing in terms of the simulation methods utilised, equipment used and the process of debriefing. SBLE facilitators should specifically consider the time implications of debriefing, as more time is required for debriefing at the start of the programme, to allow students to become accustomed to the process and develop their reflection abilities.

In conjunction with scaffolding curricular and individual SBLE learning outcomes, the choice of a sound theoretical base when engaging with **simulation design** is essential.

> *"I think it's crucial, essential, that there must be sound educational theory backing what you're doing" [4].*

Education theory provides curriculum developers and SBLE facilitators with an understanding of how students learn and how the education process is to be enacted (Bearman *et al.*, 2018), thereby guiding goal-oriented SBLE design. The implementation of cognitive load theory emphasises the process of scaffolding, by structuring SBLEs according to students' knowledge, experience and programme goals (Bearman *et al.*, 2018; Reedy, 2015), to facilitate optimal learning. Considering the under-preparedness of South African students for the tertiary educational environment (Lange, 2017; Singh, 2015), it should be noted that more time would be required at the beginning of the programme to assist students to adapt to a more self-directed and outcomes-based learning approach with practical application in SBLEs. Experiential learning by means of SBLEs is grounded in constructivism (*cf*. Table 2.2 & Section 2.3.1) and is essential to ensure that students actively participate in the scenario and are afforded the opportunity to discuss and reflect on the activity with active experimentation.

> *"Resources are a crucial element to success" [4],*

and careful consideration of available resources and attention to logistical requirements are vital when designing SBLEs. Not only is attention to physical resources (available and appropriate simulation modalities and technologies, facilities and financial support) essential – human resources are also of the utmost importance. It is widely accepted that the integration of simulation is a time-consuming process (ASPiH Standards Project Team, 2016; Dufrene & Young, 2014; Motola *et al.*, 2013) and the time required for development, implementation and revision is determined by the curricular process related to the programme. As stated by a participant:

> *"If you're thinking about using simulation, you need to acknowledge that it takes time to develop and time needs to be factored in. That's with everything, not just simulation. But to have something, just a reminder, that this is a very time-consuming thing in the initial stages." [4]*

South African healthcare education has a scarcity of human resources (ASSAf, 2018) and training institutions have the responsibility to foster a supportive institutional climate to ensure educator availability and competency with regards to transformative educational strategies. In order to engage with a changing generation of learners, blended learning principles, such as the use of simulation, are increasingly being implemented by South African academic institutions as part of their revised teaching and learning strategies. As reported by Swart *et al.* (2019), one of the biggest perceived barriers to SBE in South Africa is the lack of protected educator time for the development and execution of SBLEs. The researcher supports the simulation best practices of the Association for Medical Education in Europe (Motola *et al.*, 2013), which is of the opinion that protected time for the planning and development of the programme should be allocated to identified educators, to ensure mindful integration of simulation. Implementing all four phases proposed by Kolb for experiential learning would be challenging, as there is currently a notable lack of trained simulation facilitators in physiotherapy available to run the SBLEs optimally, especially considering time for allowing repetition of SBLEs. Strategic planning in the design of SBLEs is, therefore, required to optimise the available human resources, whilst still adhering to the guiding principles of the education theory employed. The researcher advises that institutional and departmental support is provided to assist identified educators to attend Train the Trainer programmes to fulfil their roles as framework facilitators. Department simulation workgroups, in the form of discussions on the use of and value of simulation, are also recommended by the researcher, to drive both the development and integration of simulation, with protected time for optimal planning and execution of SBLEs. Once the initial integration and programme reviews have been completed, the trained educators' facilitating framework integration may move into a supervisory role to ensure empowerment and development of all department personnel.

The majority of respondents in Swart *et al.*'s (2019) study reported either owning or having access to dedicated simulation space and equipment. Although Swart *et al.*'s (2019) study is limited in terms of generalisability, due to a low response rate, the results report that healthcare educators have access to simulation space and some equipment. A major barrier to simulation integration is national educational financial constraints (Swart *et al.*, 2019), however, the researcher is aware that, although access is available, the maintenance of current facilities and equipment and procurement of additional equipment requires prioritisation by training institutions.

The role of the competent facilitator and student-centred preparation is instrumental in the development and delivery of the curriculum, and will be discussed in the following section. The previously identified categories of training and educator role were merged into the all-encompassing category **competent facilitator,** as the

> *"educator is not limited to planning, it's almost like a foundational relationship across all of the domains." [2]*
> *"The facilitator must be competent to facilitate the development, integration and execution of this educational method to ensure all involved facilitators are able to deliver the strategy." [4]*

Regarding participation in simulation integration, the researcher proposes that educators trained in SBE are referred to according to their designated facilitative roles. For example, an educator responsible for SBLE development will be referred to as an SBLE development facilitator, to clearly indicate that educators engaging in simulation integration have stepped away from their traditional educator role, into a more facilitative role. Role clarification is, therefore, essential for ensuring that facilitators engage in the respective roles they have been trained for,

> *"to ensure that people that are involved have the capacity to deliver it" [4].*

Participants also advised that mandatory institutionally supported competency training should be provided to equip participating educators to fulfil the required facilitative roles needed to achieve optimal simulation integration and facilitate student learning (ASPiH Standards Project Team, 2016; INACSL Standards Committee, 2016e; Fey *et al.*, 2014).

Although many healthcare educators are aware of the value of simulation-based learning, few educators in sub-Saharan Africa currently have practical experience of incorporating SBLEs into their programmes (Welman & Spies, 2016). Educators who have implemented SBLEs are required to take on various roles and are actively involved throughout the planning, implementation, execution and evaluation processes. Two reasons exist for educators fulfilling various roles during simulation integration; one is the lack of human resources, as SBE is still evolving in sub-Saharan Africa healthcare education (Swart *et al.*, 2019; Welman & Spies, 2016), and simulation teams are not specifically appointed to facilitate SBLEs. The second and probably the most important reason is that learning occurs during the debriefing process, which is viewed as the essence of simulation (INACSL Standards Committee, 2016d), and South African educators still

"fear debriefing… that's why they're keen to say no" [5].

Even though best practice does not stipulate who should fulfil the role of the debriefing facilitator (ASPiH Standards Project Team, 2016; INACSL Standards committee, 2016d) experts participating in this study mentioned that, in their experience

"the educator MUST be there. That's when learning occurs, it's not in the action of doing the simulation, it's thereafter" [3].

The researcher, in accordance with literature, is of the opinion that a trained facilitator adds more value to student learning and reflection during the debriefing process than a content expert who is not proficient in facilitating SBLEs and debriefing would. Although educators may relinquish other, smaller roles related to the planning and organisation of SBLEs, educator involvement during the debriefing process (Dufrene & Young, 2014; Groom *et al.*, 2014) remains crucial, to ascertain if the learning outcomes have been achieved. The researcher, therefore, proposes that the educator, SBLE and debriefing facilitators engage in a facilitator debrief upon conclusion of the SBLE, and a student debrief to ensure that the learning outcomes were achieved and any required adjustment can be made. Bearing in mind both financial and resource restrictions, incorporating shorter SBLEs with a focus on only a few learning outcomes may reduce the anticipated time required for debriefing and, thereby, free up programme and SBLE facilitator time. Shorter, more directed SBLEs may also address the fast-paced learning needs, which is valued by the current student population, better (*cf.* Table 2.1).

Train the Trainer programmes that are registered with the national qualifications authority (SAQA) and that pertain to various aspects of SBLE use, design and implementation are viewed by the researcher as necessary for providing identified role players with a working knowledge of the SBLE process and procedures. The researcher proposes that consultation is required between simulation unit managers and department management to consider educators' aptitude for SBLE facilitation and debriefing. Educators should be strategically selected for further training, to equip them to optimally manage all SBLE facilitation and debriefing. This would encourage collaboration, resource sharing and accountability within the department, as educators responsible for the design of SBLEs will be required to do so in line with their simulation training, to ensure that the trained SBLE facilitators are able to facilitate and debrief accordingly.

Full or partial financial support for facilitators to attend Train the Trainer programmes will add an additional burden to already strained institutional budgets. However, according to the researcher, the possible gains in student and clinical supervisor satisfaction, and for fostering the development of reflective practitioners outweigh the financial implications. Student buy-in and satisfaction will bring about students who perceive SBLEs as meaningful, thereby resulting in active engagement in all the SBLE components. As with most teaching and learning developments, a gradual approach to training could alleviate some of the financial burden. The trained facilitators may assist in developing departments, by presenting workshops and discussions, and promoting the optimal integration of simulation within the programme. As complement to the mandatory standardised training, all facilitators involved in SBLEs should remain abreast of current research and trends in healthcare simulation, to ensure the implementation of current simulation best practice within the programme. Continuing professional development in the field could be maintained by attending workshops and lectures and engaging in active participation in special interest group forums. Proof of the SBLE design and integration process should be provided to departments and institutions annually, by means of written reports containing substantiating evidence, to ensure that the facilitators use their knowledge and skill to enhance the programme and utilise the new blended learning approach in South African undergraduate physiotherapy education.

In addition to providing training for clinical educators in teaching and learning methodology relevant to their role as clinical educators (Archer, 2011) (*cf.* Section 2.3.4), the researcher proposes, furthermore, investigation into the various student learning strategies, principles of debriefing and reflection, to optimise clinical teaching and learning. As simulation is increasingly integrated into the programme, clinical educators will be required to have knowledge and skills to continue encouraging reflection practice in the clinical setting.

As for the competent facilitator, student participation is <u>ongoing</u> and <u>flexible</u> throughout the <u>whole simulation process</u>, from providing input regarding curriculum needs (Khamis *et al.*, 2016), to preparing for and taking part in the developed scenarios with resulting evaluation (Jeffries *et al.*, 2015; Motola *et al.*, 2013; Zevin *et al.*, 2012; Binstadt *et al.*, 2007) to address SBLE shortfalls. **Student-centred preparation** illustrates the student-centredness of this educational methodology and dictates that students are involved in more than merely the SBLE, and should have input into what they deem to be curriculum shortfalls, and where simulation could assist to enhance learning. Student involvement could also include providing feedback about their experiences with the SBLEs. Student feedback should, however, be interpreted with caution, as there are many variables, including personal preferences and shortcomings regarding team adherence, which could influence the applicability of student comments and suggestions.

It is imperative that facilitators prepare students theoretically (Zevin *et al.*, 2012; Binstadt *et al.*, 2007), physically and psychologically (Guinez-Molinos *et al.*, 2017; Jeffries *et al.*, 2015; Binstadt *et al.*, 2007) prior to engaging in SBLEs; such preparation would contribute to the psychological safety of the students. Especially in an educational environment in which students might not be accustomed to technology use, or if they hail from cultures that dictate different team dynamics, it is critical to ensure that a learning space in which students are aware of precisely what is expected of the team regarding their roles within the SBLE, is created. Psychological safety is an all-encompassing concept and enables learners to fearlessly participate in and learn from the SBLE and their team members, and it fosters the development of both confidence and problem-solving skills, without judgement.

Theoretical preparation ensures students have a grasp on the SBLE content and are able to actively engage and subsequently reflect on the scenario to enhance learning without experiencing cognitive overload. Foundational activities, such as orientation, preparation and managing expectations, should form part of student <u>briefing</u>, and is vital (*cf.* Sections 3.5.4 & 4.8.2.1) for creating a safe learning environment, linking SBLE objectives to the post-simulation debriefing, clarifying environmental discrepancies and providing logistical arrangements for the session (Turner & Harder, 2018). Preparing students for the simulated environment and expectations will enhance psychological safety and prevent cognitive overload, as students will know where to focus their attention and learning during the SBLE, and will not be overwhelmed, even if their exposure to simulation was limited (*cf.* Sections 2.3.1 & 4.8.2.1). Facilitators have the duty to encourage students to view the SBLE as “real” by doing thorough preparation and aiming to create a physically accurate environment and scenario or, in the case of a resource paucity, to clarify the discrepancies encountered.

5.5.3 Content analysis: Implementation

After the adjustments mentioned, which resulted in the removal of student preparation, the theme of **IMPLEMENTATION** consisted of two categories, namely, **debriefing** and **assessment,** as illustrated in Figure 5.3 (*cf.* Section 5.5.1).

The previously identified categories of feedback, which were initially included in the **PLANNING** theme, and student goal setting, were both collapsed within the **debriefing** category, because providing constructive feedback and students identifying personal areas of improvement and individual goal setting are rightfully viewed as vital components of the debriefing process (Section 5.5.4).

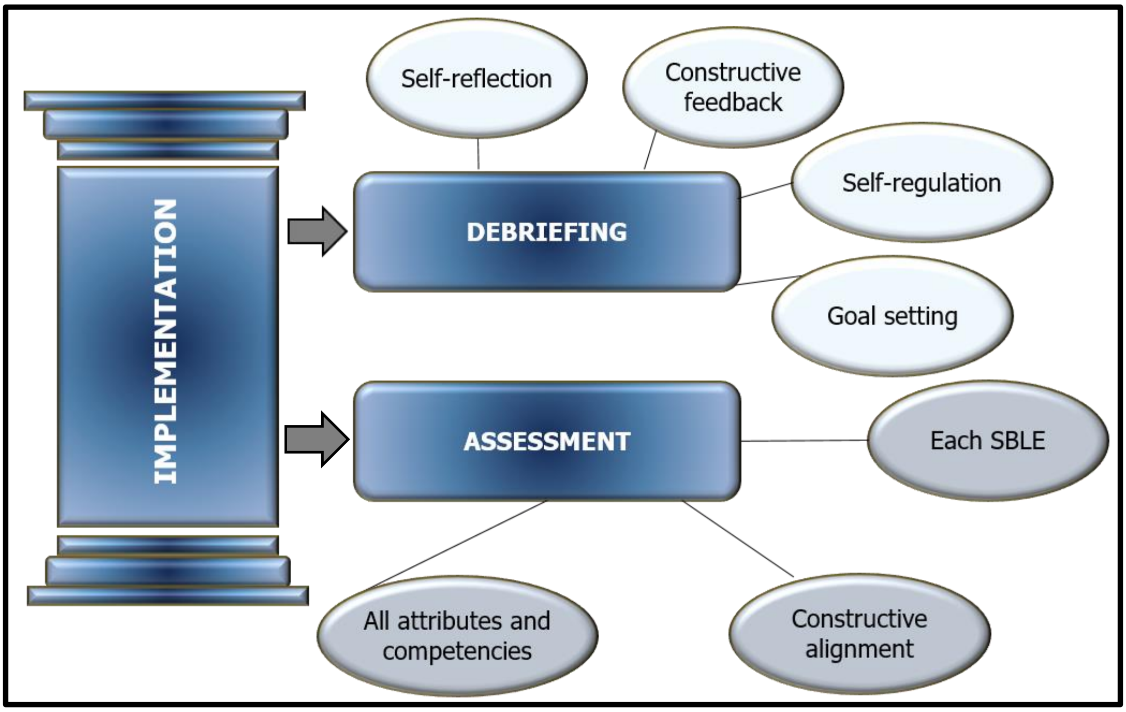

Figure 5.3: Theme 2: Implementation

5.5.4 Discussion: Implementation

One aspect that did not feature as an independent category or code was physical participation in the SBLE, depicted as Do in the framework illustrations (*cf.* Figures 5.7, 5.8 & 5.9). As the focus of the current research study was to describe the integration of simulation, detailed discussion regarding the participation in SBLEs is not warranted. The researcher, however, recommends using simulation best practice guidelines to ensure both facilitators and students optimally and meaningfully engage in the SBLEs. The manner of participation in each individual SBLE should, therefore, be guided by the simulation design, type of simulation modality utilised, and the individual learning outcomes of each SBLE.

The category of **debriefing** within the **IMPLEMENTATION** theme was expanded to unequivocally indicate the reflection component of this process, where the **assessment** category was collapsed, because the suitability of this category for the framework remained questionable. Participants echoed literature by emphasising the importance of **debriefing** for facilitating learning (Cheng *et al.*, 2018; INACSL Standards Committee, 2016d) and commented on facilitator fear hindering the process.

"Many of the educators, they fear debriefing. They're not skilled in debriefing, they don't like debriefing, that's why they're keen to say no. Because that's the most difficult skill of simulation" [5].

Fear of debriefing might contribute to facilitators hesitating to participate in the debriefing process, but a substandard debriefing technique is, according to the researcher, much more detrimental to the learning process than none at all. Student feedback and debriefing are increasingly enjoying focus in tertiary education, as these activities form part of newly employed educational methodologies (ASPiH Standards Project Team, 2016), are desired by the generational cohort at tertiary institutions (*cf.* Table 2.2), and the circumstances students are exposed to requires debriefing. Many educators and framework facilitators may be of the opinion that, as regular participants in various forms of feedback throughout the programme, they are competent in feedback and debriefing processes. However, an individual facilitating the debriefing process requires competency training (see concept clarification) and knowledge of debriefing models (ASPiH Standards Project Team, 2016). A comment that the researcher found concerning,

"if they are knowledgeable in the field then they can debrief" [4],

speaks to a misconception of what debriefing truly entails. As alluded to by participant 4, the researcher disagrees that debriefing facilitators are required to be subject experts, and do not necessarily need to be proficient at debriefing.

The researcher, thus, proposes that elements that should be covered during the debrief must be provided by the SBLE designer (content expert) during the facilitator briefing session. More important than content expertise is the facilitator's skill in limiting questions, statements and interjections. Skilled debriefing should allow students to grapple with their own thoughts and work towards reflecting on their actions and experiences, something that does not come naturally to most healthcare educators, as the majority of educators were trained in the provision of didactic lectures. Encouraging thinking aloud, as advocated by Thackray (2013), is a way to facilitate information processing by students, and would be optimised by a competent facilitator. Information processing is achieved through constructive feedback and debriefing, so that students both retrieve knowledge and facilitate the creation of new knowledge in their long-term memories. Although it is a challenge to provide evidence that supports the transfer of learning solely due to engagement in simulation (Asche *et al.*, 2018), this system of information processing may result in students transferring learning from the simulated environment to clinical practice (Thackray, 2013). Competency training (*cf.* Section 5.5.2) in the art of debriefing would equip educators with the necessary skill as debriefing facilitators to conduct meaningful debriefing sessions, even if they are not subject experts. Attending lectures on debriefing does not teach skills needed for this active educational approach, and debriefing facilitators should practise and receive feedback on their debriefing technique during the accredited training sessions, and beyond. Continued education opportunities in the field of debriefing are essential, and self-reflection, as well as peer and student feedback, by means of feedback tools, like the Debriefing Assessment for Simulation in Healthcare (Center for Medical Simulation, 2020), will assist facilitators to develop and maintain their debriefing skills further.

Equipping more facilitators with debriefing skills would go a long way to free up facilitators during the SBLE implementation process, and decrease the time needed for SBLE execution and subsequent debriefing. A spill-over effect may also be observed in other areas of teaching and learning, as the positive traits of debriefing may be utilised in other teaching and learning encounters, ensuring a constructive and active learning environment.

Participants discussed the category of

> *"debriefing as an overarching concept" [3],*

and expanded on the definition of debriefing to include the aspects of self-reflection, self-regulation, goal setting (McGaghie & Harris, 2018) and constructive feedback; debriefing refers to

> *"where students set their own goals, where they become self-directed learners, and lifelong learners." [3].*

Student-centred preparation, including orientation to the debriefing process (*cf.* Section 5.5.2) is essential for creating a trusting environment that is conducive to learning (INACSL Standards Committee, 2016d). Establishing clear student and facilitator expectations regarding the confidentiality of the debrief is vital, and students should collaborate to develop a debriefing code of conduct that focusses on providing constructive feedback and accepting the feedback. The researcher views the training of students in the art of giving and receiving feedback as being essential for optimising learning during and after SBLEs.

No universal distinction is made in the literature on whether feedback should be either included or excluded from the debriefing process (*cf.* Section 4.6.1.3). One participant mentioned that

> *"constructive feedback is embedded within debriefing" [5]* and another said that *"with constructive feedback we're already being encouraged to get students to think about what they did, to become reflective practitioners" [4],*

which addresses the primary goal of the debriefing process. The researcher, therefore, supports participants' opinion that constructive feedback should form part of the debriefing category. The conceptual definition of debriefing for this research study emphasises the development of reflective practitioners (see concept clarification) and, therefore, the researcher views constructive feedback as embedded within debriefing. As stated by the INACSL standards of best practice (INACSL Standards Committee, 2016b), feedback differs from debriefing – both are critical elements of SBLEs – and, therefore, the nature of the SBLE should determine if only constructive feedback, or a combination of constructive feedback and debriefing, should be utilised. As was evident in the Delphi survey, the concepts of ML/DP, again, proved to be challenging for participants, because of concerns regarding the practicality of ML/DP, and Delphi statements placing too much

> "*focus on assessment" [1].*

In line with Kolb's experiential learning theory, the core of ML/DP is the facilitation of self-reflection and development of self-regulation (McLeod, 2017).

> *"Repetition is your initial step into self-regulation, because if you don't get that opportunity – I think this is what I did wrong, corrected it, and I get affirmation, yes, you did it right – you're never going to develop confidence in correcting yourself." [4]*

ML/DP research has demonstrated that students can achieve success in acquiring clinical, procedural and communication skills, and developing attributes of professionalism (McGaghie & Harris, 2018). Frameworks included in the systematic review (Table 3.3) that cite ML/DP (Khamis *et al.*, 2016; Zevin *et al.*, 2012; McClusky & Smith, 2008) focussed only on attaining technical/procedural skill mastery. The current shift in healthcare education, however, places less emphasis on technical skill mastery, and emphasises the attainment of professional behaviours and attributes, in addition to technical skills (Dent *et al.*, 2017). Not all skills are required to be mastered, especially when considering immersive simulation experiences,

> "*there's more than one way to do things" [4]* and forcing mastery to a set benchmark in such an environment could result in an "*increased risk for perceiving it as negative experience" [4].*

The optimal application of Kolb's experiential learning theory requires the inclusion of all four of the theory elements – planning, performing, debriefing and thinking (Chmil *et al.*, 2015). The researcher advises, in appreciation of the following participant's comment,

> *"If you use Kolb's learning theory, then you should afford them the second opportunity on, not on exactly the same simulation, but something similar. Otherwise you haven't implemented Kolb's learning theory completely," [3]*

that critical skills mastered best by simulation are identified, and the SBLEs structured in such a way as to allow for this process. Bearing in mind that health professionals are required to display more interpersonal skills, ML/DP should focus on developing communication skills and demonstrating teamwork and collaborative care. Most importantly, these interpersonal skills should be displayed in challenging scenarios, such as the management of difficult patients. As physiotherapy often involves patient questioning and physical examinations, obtaining informed consent from the patient prior to evaluation and treatment should be mastered by healthcare students. According to the researcher, all invasive and potentially unsafe physiotherapy techniques should also be repeated until a predefined level of mastery has been demonstrated, to ensure patient safety. Invasive and potentially unsafe techniques include suctioning procedures (both nasopharyngeal and via an artificial airway), manual hyperinflation, the treatment of babies and infants, patient transfers and patient mobilisation.

Considering the practicality of ML/DP, peer assessment may be utilised to assess mastery of technical skills (Ryall *et al.*, 2016), thereby requiring less facilitator involvement. Effective feedback is classified as being prompt, clear and timely (Anderson & Neild, 2007). Even if educators were able to witness all SBLEs, they would not be able to provide the same detailed and timely feedback as peers would (Anderson & Neild, 2007). Educators cannot teach every situation that students may encounter in clinical practice and, therefore, the power should be transferred to students to engage in peer assessment. Clinical reasoning and overall skills mastery can be developed and facilitated during similar, repeated immersive simulations, with mastery demonstrated by the student's successful completion of the module's summative assessment opportunities. Participating in SBLEs with subsequent group or individual reflection assists students to identify areas in which they still require practise, and this should encourage self-directed practise to improve performance in future SBLEs.

The aspect of **assessment** was challenging for both the researcher and participants, especially assessment utilising simulation, due to assessments negatively impacting both learning and the psychological safety of the simulated environment (Turner & Harder, 2018). Evidence about the effectiveness of simulation-based assessments remains unclear, due to limited quality evidence supporting the choice of assessment format, and the isolated use of simulation-based assessments (ASPiH Standards Project Team, 2016; Ryall *et al.*, 2016).

Statements relating to assessment that informed the conceptual framework (*cf.* Figure 4.4) were not as explicit, which resulted in participants being unsure if immersive simulation or a combination of practical-skills-based and immersive simulation will be assessed. After participant discussion, it was decided that assessment in the context of this framework relates specifically to peer-assessment and summative practical-skills-based assessment. Self-assessment was deemed inappropriate for the study context, as the framework aims for self-reflection and not a standardised self-assessment procedure. Self-assessment was adjusted to self-reflection, which was included in the debriefing category (Eppich & Chen, 2015b). It is acknowledged that the process of debriefing is classified as formative assessment (Fey *et al.*, 2014) and is, therefore, not included here.

The <u>suitability</u> of the proposed framework for assessment is undefined. The researcher views the term simulation as encompassing both practical skills training and immersive simulation, and supports the use of practical skills training for both summative and formative assessment purposes (Ryall *et al.*, 2016; Kalaniti & Campbell, 2015). However, the researcher does not currently support the use of immersive simulation in South Africa for any assessment other than formative and peer assessment, due to a lack of trained SBE facilitators, and to maintain a psychologically safe environment (Turner & Harder, 2018). As the environment created and content required for practical-skills-based SBLEs might not be perceived as threatening as immersive SBLEs (Judd *et al.*, 2016), the researcher is of the opinion that, even if practical-skills-based simulations are used for summative purposes, the safe learning environment will not be jeopardised.

<u>Peer assessment</u> has been reported as aiding self-regulation and student learning for both the student and the peer (Duers, 2017), and it could be valuable for identifying where peer assessment may be incorporated in SBLEs.

> *"Peer assessment is totally underutilised. They don't do it very well, but it's our responsibility to facilitate that process, because it's so valuable in terms of eventually becoming a self-regulated person." [4]*

In light of current South African academic training platform disparities (*cf.* Section 2.2.4) and the current global state of affairs relating to the COVID-19 pandemic the use of immersive SBLEs as part of summative assessments might be required in the near future. It is the opinion of the researcher that assessment should not be removed from the framework, as the current healthcare education climate might necessitate summative simulation-based assessments in the future, due to a lack of patients or clinical platforms. Clarifying the terms of assessment are crucial for guiding both framework facilitators and students, to indicate what will be assessed during the SBLE, including the method, but only if the framework is used for assessment purposes. If the framework user decides to utilise assessment within identified SBLEs, the identification of a specific assessment tool is also essential (INACSL Standards Committee, 2016c; Khamis *et al.*, 2016) to ensure a standard and reliable assessment process that is

> *"aligned with the activity and the outcome" [4].*

Involving students in the development of peer assessment tools allows for an in-depth understanding of the assessment criteria and grading (Wride, 2017) and could increase student participation and appreciation of assessment procedures. The researcher advocates for peer assessments to be included in the framework to enhance self-regulation and collaborative learning with utilisation of the collaboratively developed assessment tools during the SBLEs. Well-structured SBLEs can also be used to assess communication and procedural skills in a summative manner in a "real" environment. Assessment tools that have been developed can, furthermore, assist facilitators to be prepared for the summative assessment process, should the need arise in the future.

5.5.5 Content analysis: Programme evaluation

The theme relating to **PROGRAMME EVALUATION** remained unchanged from the original framework, except for the addition of the word programme, to ensure the framework stipulates clearly that it is the programme's structure and content that should be evaluated (*cf.* Section 5.5.6). Figure 5.4 illustrates the categories and codes related to the theme **PROGRAMME EVALUATION**.

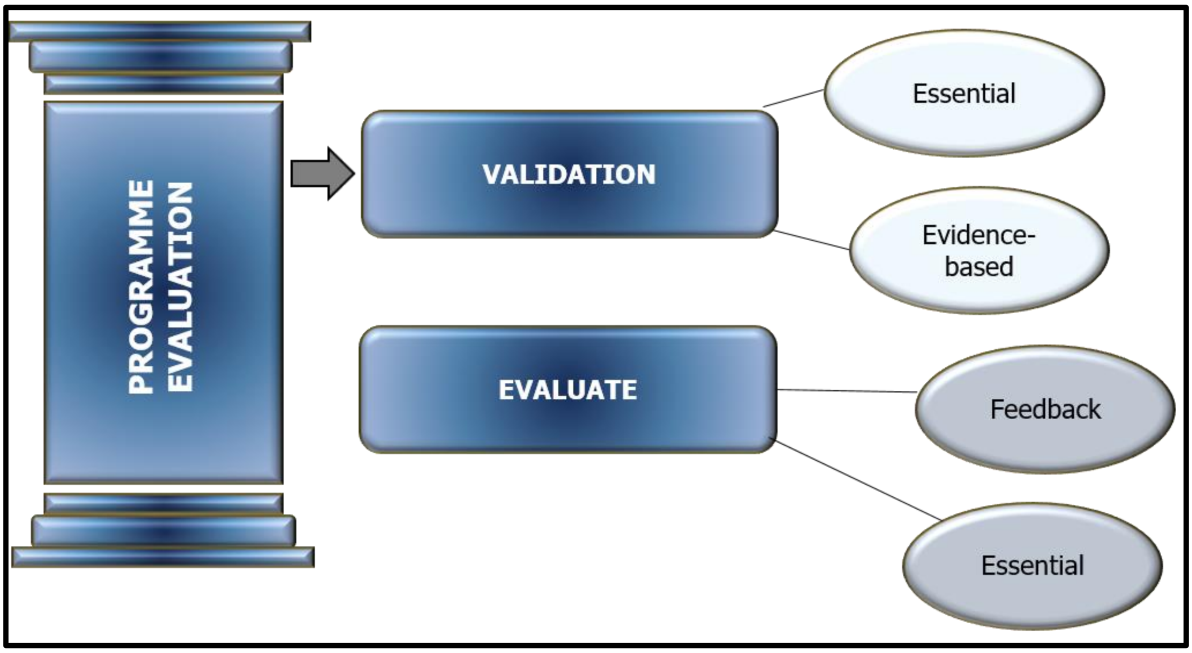

Figure 5.4: Theme 3: Programme evaluation

5.5.6 Discussion: Programme evaluation

After programme implementation, study results demonstrated agreement with published literature that programme **evaluation** and **validation** are vital (ASPiH Standards Project Team, 2016; Khamis *et al.*, 2016; Motola *et al.*, 2013).

Programme **evaluation** is essential after simulation integration (ASPiH Standards Project Team, 2016), to provide proof to all stakeholders of the viability of the programme. Feedback from the facilitators and students involved is essential for evaluating the perceived success of the programme and its acceptance (Khamis *et al.*, 2016; Jeffries *et al.*, 2015; Motola *et al.*, 2013; Zevin *et al.*, 2012). The Simulation Effectiveness Tool has proven to be valid and reliable in evaluating students' perceptions and satisfaction regarding their learning in the simulated environment (Leighton *et al.*, 2015) and the researcher recommends using the Simulation Effectiveness Tool when evaluating students' perceived benefit from the integrated SBLEs.

As this framework does not propose the development of a purely simulation-based programme, but merely offers guidance on how to integrate simulation to enhance an existing programme, student performance in summative and/or formative assessments does not constitute proof of programme success, as the variables influencing success or failure are exponential. As rightly mentioned by a participant:

"There are too many variables to control to say that simulation improved performance" [2].

The success of implemented SBLEs, measured in terms of formative and summative assessments, does not unequivocally confirm validity, as clinical placements and experience also influence the results obtained. In an environment where the integration of a time-consuming and potentially very expensive educational methodology might be met with apprehension, providing proof of programme success is vital. As described previously, using standardised frameworks measuring training effectiveness (*cf.* Sections 3.5.6 & 4.8.1.1) and value for money (*cf.* Section 3.5.6) should encourage SBLE facilitators to continue improving on the integrated SBLEs. Utilisation of the Kirkpatrick model of training effectiveness is advocated (*cf.* Sections 3.5.6 & 4.8.1.1), however, the measurement of behaviour and knowledge transfer to the clinical environment remains inconsistent (Aebersold, 2018) and more research in this respect is required.

There are limited quality measures to justify the continued use of simulation (Adamson, 2015; Beattie *et al.*, 2010). As mentioned, student satisfaction surveys are often utilised in SBE to evaluate the impact of simulation, but satisfaction with the educational methods does not necessarily translate to better prepared students. In instances where practical-skills-based simulations have been utilised to teach practical skills, using objective structured clinical examinations have been proven to provide evidence of simulation effectiveness (Alinier *et al.*, 2006). The SBLE itself is also a stressful learning environment for students (Judd *et al.*, 2016) and, as stress negatively impacts learning (Spies, 2016; Harvey *et al.*, 2012), the researcher proposes using validated questionnaires, including the Dundee Ready Education Environment Measure (DREEM) (Miles *et al.*, 2012; Umber *et al.*, 2011), to evaluate healthcare students' experience of their educational environments. As the aim of simulation integration is to prepare students with attributes to navigate the ever-changing clinical environment, the researcher advocates for using surveys to determine whether students perceive the simulation training preparing them better for clinical practice. Perceived simulation benefits should be measured during students' undergraduate training, and followed up with the same cohort as qualified practitioners, to assess lasting benefits. Simulation has been used during training of healthcare students to manage emotionally challenging and stressful situations (Jacques *et al.*, 2011), including as a strategy to decrease anxiety experienced during clinical encounters (Wright *et al.*, 2018). Measuring student anxiety may also provide tangible evidence in defence of the implementation of simulation. Measurement tools, including the Short Stress State Questionnaire (SSSQ) (Helton, 2004) or the clinical confidence measure utilised in previous physiotherapy simulation studies (Wright *et al.*, 2018; Blackstock *et al.*, 2013; Watson *et al.*, 2012), may be considered for measuring the change in the perceived stress and anxiety levels experienced by students in the clinical area after training in the simulated environment.

In resource-restricted environments, training institutions require substantiating evidence to assess the value of more expensive educational methodologies, including, but not limited to, simulation. The researcher advises that ROI is calculated (*cf.* Section 3.5.6) to monetise the effect of simulation training and provide motivation for continued simulation funding. It must be noted that the value of simulation does not only rest on the ROI (Harder & Chse, 2018), but also on the change brought about and the perceived benefits experienced by the population educated by means of this educational method. The researcher, therefore, advocates that further research should be considered to validate quantitative and qualitative measurement tools, to provide proof of the economic impact of physiotherapy-based simulation, thereby ensuring sustainability of simulation as an education model.

Providing funders with evidence of the value of simulation is essential. Programme evaluation should be prioritised to provide the required evidence to programme funders; evidence that could promote the acceptance and success of the newly integrated educational method should also be provided. As the programme continues, the various programme aspects may be evaluated on a biannual basis, to ensure thorough evaluation and allow time for implementing the changes suggested.

Validating the new programme is also essential (Khamis *et al.*, 2016; Zevin *et al.*, 2012), and is accomplished by demonstrating adherence to national regulating body requirements and utilising an evidence-based approach to the design and implementation of the programme.

> *"You need to provide evidence of, and good theory grounding as to why you did it, which is what's nice about this framework. It guides you." [4]*

By virtue of the execution of the validation meeting, the framework for the integration of simulation in the South African undergraduate physiotherapy programme was validated by using both up-to-date research and expert opinion.

5.5.7 Data analysis: Programme revision

As with programme evaluation (*cf.* Section 5.5.5), participants requested the addition of the word programme with reference to the theme of **PROGRAMME REVISION.** No further adjustments were made to the theme as it was presented to participants. The category and code related to the theme **PROGRAMME REVISION** are illustrated in Figure 5.5.

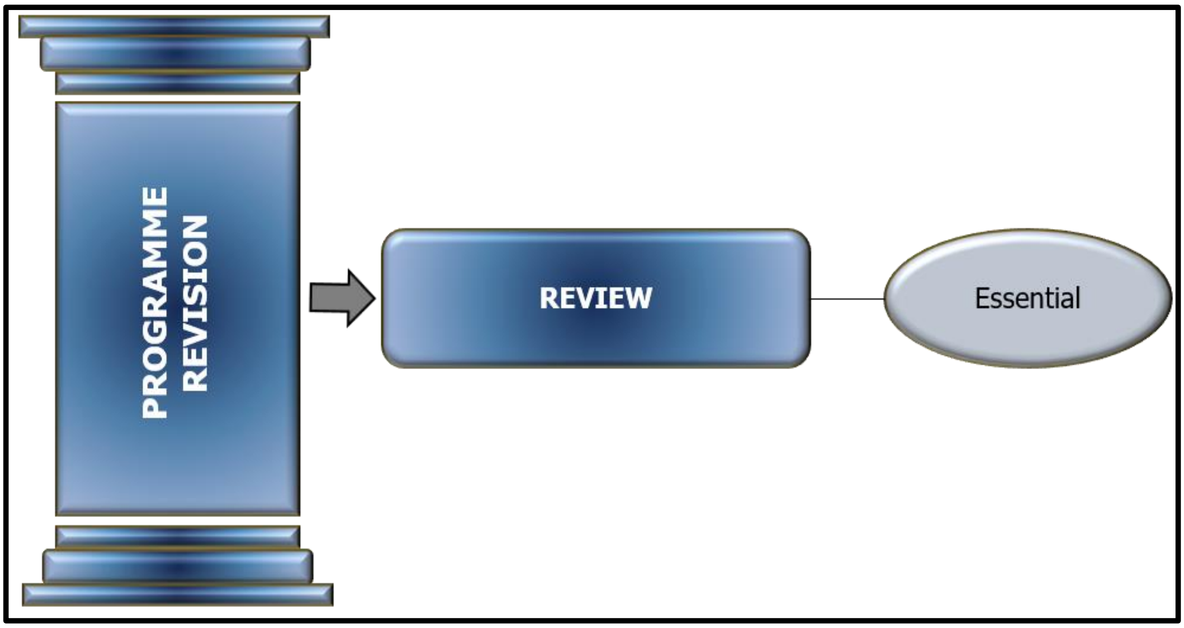

Figure 5.5: Theme 4: Programme revision

5.5.8 Discussion: Programme revision

The theme of **PROGRAMME REVISION** consists of only one category, namely, **review**. The **revision** cycle is a continuous process (Quirk & Harden, 2017), and is implied by the design of the framework (*cf.* Figure 5.9). A possible reason for only two (Motola *et al.*, 2013; Zevin *et al.*, 2012) of the articles included in the systematic review (*cf.* Table 3.3) including programme review could be that programme review and revision are implicit in a programme development process (Quirk & Harden, 2017). Framework users are cautioned to consider stakeholder feedback thoughtfully and to make informed adjustments, taking into account available technological advances and published best practices.

5.5.9 Content analysis: Framework

The final theme emerging from the data was the **FRAMEWORK**, which relates directly to the feasibility of the proposed framework. The theme did not form part of the Delphi section of the study, neither could it be collapsed with other identified themes and categories, as the categories emerging from this theme correlated with the developed framework, which was not available prior to the validation phase of the study.

Issues relating to framework **practicality, implementation** and **supplementation** of clinical hours by means of simulation were identified as categories, and are illustrated in Figure 5.6 under the **FRAMEWORK** theme.

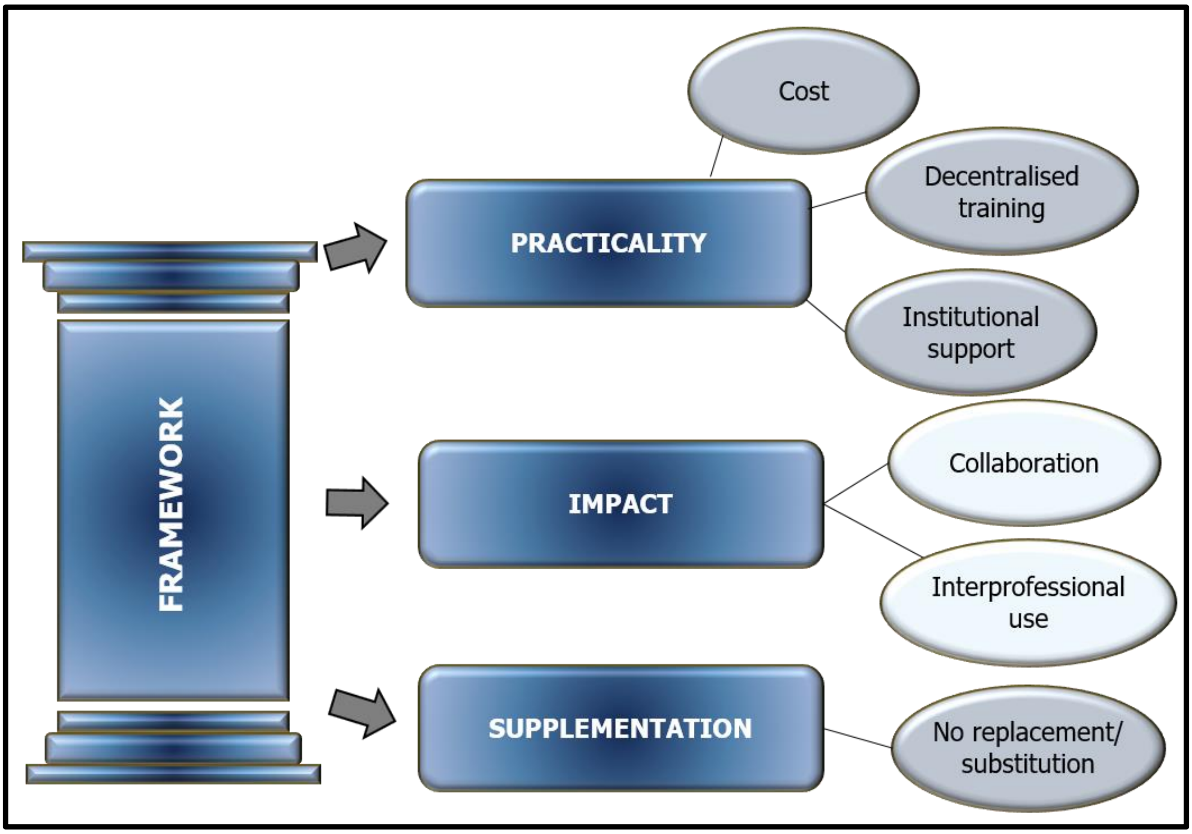

Figure 5.6: Theme 5: Framework

5.5.10 Discussion: Framework

The final theme, **FRAMEWORK,** details the implications and value of the proposed framework.

5.5.10.1 *Implication of the framework*

In a resource-restricted education environment, consideration of the **practicality** and feasibility of any new education delivery model is essential, especially when utilising a responsive curriculum with a focus on decolonisation, decentralised training and the impact of the 4IR (*cf.* Section 5.5.2). With SBE associated with increased costs, interinstitutional and interprofessional collaboration and resource sharing is crucial, especially for rehabilitation therapists and workers (see concept clarification), as certain equipment that is needed might not be as useful to other professions. If the institution deems the integration of SBE essential, a feasibility study, and a plan detailing simulation integration and institutional support is vital (Motola *et al.*, 2013) to ascertain how resources can be shared to allow access for all healthcare professions.

> *"Because, in a low-resource environment it doesn't have to happen all at once. So, in exercise therapy we have a principle of start low, go slow." [1]*

5.5.10.2 *Value of the framework*

A commitment to South African health needs, and understanding primary healthcare (*cf.* Appendix D) are graduate attributes that are easily achievable by simulation integration. The authentic integration of simulation within a programme

> *"should prepare students for more distributed sites with less supervision" [2]* where *"their competencies are expected much earlier than they used to" [2].*

Healthcare students in South Africa work at a large number of clinical sites (ASSAf, 218), from peri-urban and rural home visits, primary and community healthcare clinics to district hospitals (Chetty *et al.*, 2018) (Appendix A). The clinical site challenges include a lack of basic infrastructure, which results in limited space for service delivery, lack of equipment (Chetty *et al.*, 2018), unfavourable travelling conditions for healthcare workers and patients, and limited literacy and education levels of the patients the healthcare students serve (Gray & Vawda, 2017). Language barriers, due to South Africa's 11 official languages, and the multiracial and multicultural South African milieu ads to the call for adapting training (Griesel & Parker, 2009) for a diverse student population (*cf.* Section 2.2.2). Integrating the framework will assist to overcome the above-mentioned challenges through the integration of simulation.

The need for decolonised and decentralised training can also be addressed by integrating simulation, as mentioned by one participant:

> *"We have to train our students to be able to work with a different set of people that they are not used to working with. So, at least simulation, is a method to bridge that gap more effectively." [4]*

By integrating simulation, students are removed from their education silos (Kalaniti & Campbell, 2015), and interprofessional collaboration and insight into their professional roles within society are fostered. The environmental impact on an individual's health is undeniable, and healthcare professionals have the unique ability to directly address risk factors, which may result in changes in the individual's development or health (Júnior, 2016). Addressing risk factors and undesirable social behaviour, especially as part of disease prevention, is essential for the role of healthcare professionals in the formation of 21st century citizens (Júnior, 2016). It is, thus, imperative for training institutions to develop attributes related to citizenship in their healthcare students (Júnior, 2016), in order to bring about societal change. Integrating the framework could add to the programme by developing responsible citizenship in graduates. Engagement with authentic, context-specific scenarios, where students are able to problem solve and demonstrate appreciation of and respect for individuals of different social standings and cultures could be facilitated in the simulated environment.

The **impact** of the framework is far reaching and is not limited to use by one profession; instead, allows for interprofessional use, fosters collaboration and person-centred care and encourages exploration of this educational methodology in a developing country. Interprofessional education is no longer viewed as a programme add-on, instead, every effort is being made to embed IPE throughout South African healthcare curricula (ASSAf, 2018). If healthcare provision is to be underpinned by the philosophy of person-centred care (Health Innovation Network, 2013) it is imperative that all parties – healthcare professionals and patients – engage in establishing an equal partnership when planning, coordinating and overseeing patient care. In developing a collaborative healthcare workforce, person-centred care will be achieved (Manilall & Rowe, 2016; Kalaniti & Campbell, 2015). Collaboration among healthcare professionals has the potential to transform healthcare delivery by providing improved quality care and ensuring active involvement of patients in their personal care, thereby helping to reduce some of the pressure experienced by healthcare institutions. Collaboration is not only limited to participation in SBLEs as an interprofessional team and engaging in health dialogues with simulated patients; participants also advocated for institutional collaboration, as mentioned in Sections 5.5.2 and 5.5.10.

Australian education researchers have researched the **supplementation** of a portion of mandatory physiotherapy clinical hours with SBE extensively (Wright *et al.*, 2018; Keast, 2016), and the Occupational Therapy Board of Australia allows a maximum of 20% of the mandatory 1 000 clinical hours of their undergraduate students to be replaced by immersive simulation (Imms *et al.*, 2017). Although competition for clinical placements is increasing due to increasing student numbers, the SANC currently only supports the use of SBE as part of teaching, learning and assessment, with no mention of clinical hour replacement. Although South African physiotherapy students have the same number of mandatory clinical hours (1 000 hours) as the Australian physiotherapy programme, in which a portion of the hours may be supplemented by simulation (*cf.* Section 2.4.2), the feasibility of national clinical hour replacement is questioned. Limited financial resources (Swart *et al.*, 2019), educator availability (Jansen, 2018) and simulation-based competency (Welman & Spies, 2016) challenges clinical hour substitution, and substitution should only be considered once human and financial resources have been increased and secured, and can assist with the integration and implementation of SBLEs. By facilitating competency training of educators to ensure effective simulation delivery, more educators would be available to participate in SBLEs, thereby increasing the possibility of clinical hour supplementation being viable. In light of the current shortage of healthcare educators (ASSAf, 2018; Jansen, 2018) and lack of clarity regarding the availability of simulation teams to run planned simulations (Swart *et al.*, 2019), the researcher advises that no replacement/substitution of clinical hours by simulation is currently feasible in the South African physiotherapy context.

Even though participants were in consensus that simulation does not replace the clinical platform and

> *"does not compete with clinical science" [2],*

this does not mean that simulation is unable to contribute to the clinical training of students. As described by a participant:

> *"the idea of replacing real-time experiences, it's got to be complementary to those, otherwise you start separating yourself from real patients." [2]*

Universities find it increasingly difficult to identify quality clinical sites (Kalaniti & Campbell, 2015), and due to the diversification into primary and community healthcare (ASSAf, 2018; Imms *et al.*, 2017; Kent & De Villiers, 2007), innovative teaching and learning strategies are vital for ensuring quality education. The researcher, therefore, advocates for identifying physiotherapy educators who can complete Train the Trainer programmes to drive the integration of simulation in the undergraduate physiotherapy programme. When clinical sites experience patient shortages, or a limited patient case mix, or students are not allowed to access the clinical site, competent facilitators would be able to supplement clinical training by utilising SBLEs, making it possible for students to hone their skills, which would otherwise not have been possible. In addition, students can be prepared for varied disaster situations by means of simulation. The researcher appreciates participant views that simulation cannot replace a clinical experience, however, in an uncertain healthcare environment, where a limited patient case mix is common, students should still be provided with opportunities to demonstrate and practise clinical skills in an authentic and safe environment.

As all South African undergraduate physiotherapy programmes are required to have the same minimum required content, with the aim of producing graduates who demonstrate the attributes and skills expected by the HPCSA (*cf.* Appendices B & D), the developed framework may be implemented by any institution in an attempt to address the aforementioned South African healthcare educational crisis (*cf.* Section 2.2.4). The elements included in the framework are generic, and not limited by requiring expensive technology, and are, therefore, easily adapted to suit the identified needs of students, educators, institutions and the immediate society they serve.

Evidence demonstrates that the majority of South African universities do have access to simulation laboratories/units and/or equipment (Swart *et al.*, 2019), which provides a departure point for physiotherapy educators to equip themselves better to utilise simulation as an education strategy. Furthermore, attaining the desired graduate attributes is possible by implementing the framework presented in the current study, through careful curriculum development and SBLE design. The framework presented is based on a strong sense of partnership between all stakeholders involved in the design and delivery of the programme, based on promoting resource and knowledge sharing, and could culminate in person-centred care.

5.6 FRAMEWORK FINALISATION

During the validation meeting, the conceptual framework that was developed (*cf.* Figure 4.4) was presented to participants to contextualise and provide credibility for the framework content in order to finalise the framework for integration within the South African healthcare education context. The framework is, therefore, based on a conceptual framework that was, as part of the research process, reviewed by experts and finalised for possible implementation.

5.6.1 Shape

The shape of the conceptual framework was criticised for being unidirectional and not clearly illustrating the flow between the various integration phases and elements (*cf.* Figure 4.4). The conceptual framework representation may be due to the Delphi process, which does not allow enough interaction between the panel and the researcher, which prevents the latter from obtaining a clear view of the framework through the eyes of the Delphi panel. The fact that some elements were present in more than one integration phase lead the participants to discuss the iterative nature of the framework. A key shape was proposed and accepted by all validation meeting participants, as the framework should

> *"be the key for the way one looks at things" [2]*

when adjusting healthcare programmes to integrate simulation. A key may be regarded as a symbol for security, with only persons being in possession of the correct key for a lock being allowed access. The key depicts how framework facilitators could go about changing the way education is viewed, by finding the right key, and the right combination of educational methods, to develop graduates who are able to answer to the needs of society whilst continuously reflecting and engaging in lifelong learning, thereby opening the door to success.

Elements included in the framework were positioned within the key shape through continuous co-construction and member checking processes (*cf.* Section 5.6.2).

5.6.2 Member checking process

After data analysis relating to the validation meeting had been completed, the researcher critically reviewed the framework that had been adjusted and proposed by participants (*cf.* Figure 5.7). As this framework was designed to integrate both immersive and practical-skills-based SBLEs, the representation of the implementation section proved challenging to the researcher, specifically the representation of the debriefing component (*cf.* Figure 5.7).

When she reflected on the visual framework representation (*cf.* Figure 5.7), the researcher concluded that positioning debriefing as an overarching element of the framework may be misleading, as not all SBLEs necessarily require a specific debriefing component (INACSL Standards Committee, 2016b). Practical-skills-based SBLEs would probably only require a constructive feedback component, from either peers or a facilitator, with debriefing being an essential component of all immersive SBLEs. The researcher supports participant views that debriefing is crucial, as it facilitates student reflection on their performance in the SBLE, which is vital for constructing new knowledge for future implementation. Even though simulation best practice dictates the value of debriefing in SBE, representing it as an overarching element would imply that debriefing is required for all SBLEs, which is not necessarily the case.

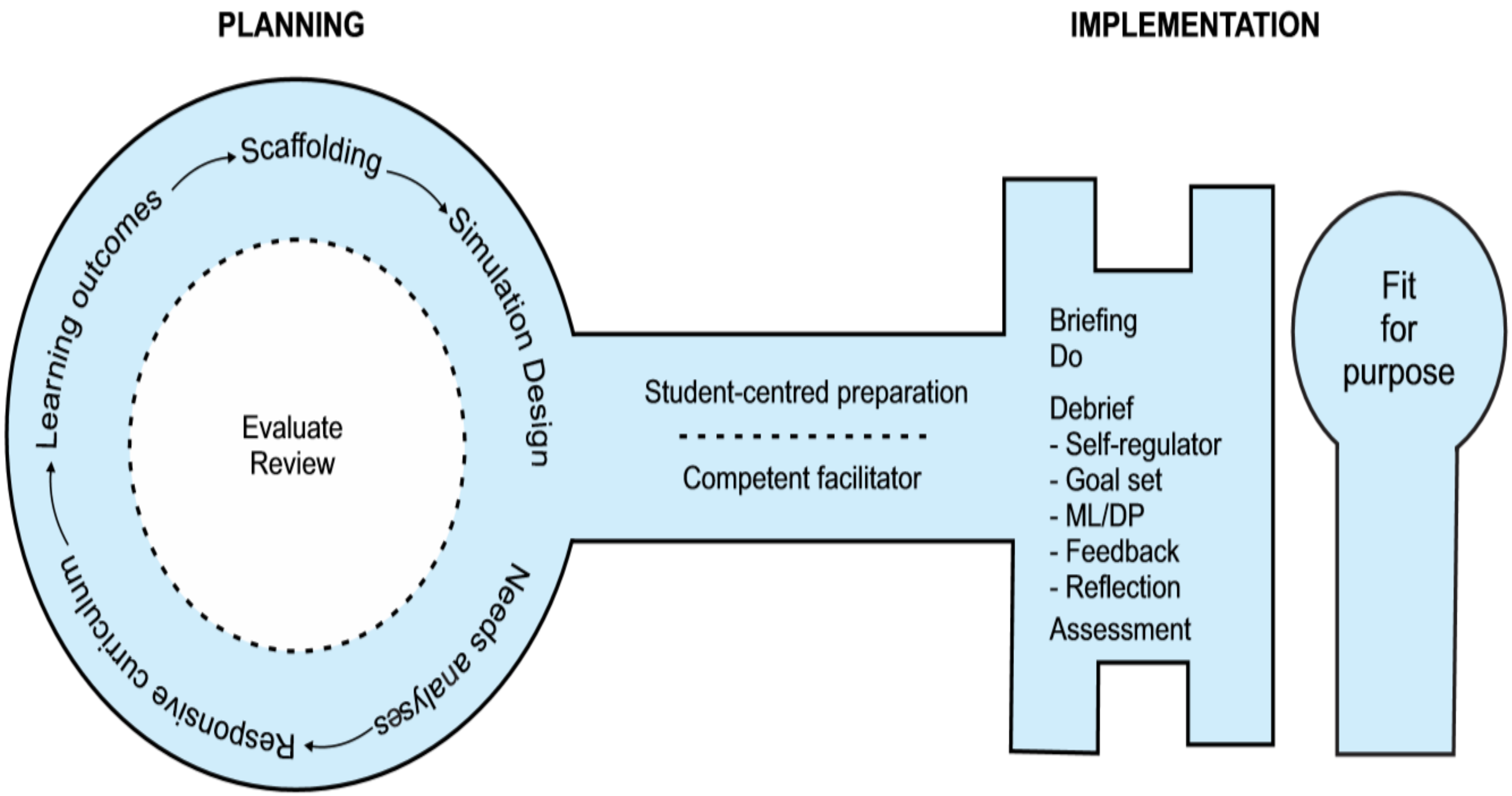

Figure 5.7: Framework prior to final member checking process

The researcher proposed an adjustment to the framework and engaged in a further electronically based member checking process with validation meeting participants. The researcher adjusted the framework by expanding the implementation phase into two parallel sections, to provide for the integration of both practical-skills-based and immersive SBLEs (*cf.* Figure 5.8). The framework user would, then, implement either of the two vertical sections, depending on the nature of the SBLE, with the first section relating to specifically practical-skills-based SBLEs, and the second section to immersive SBLEs.

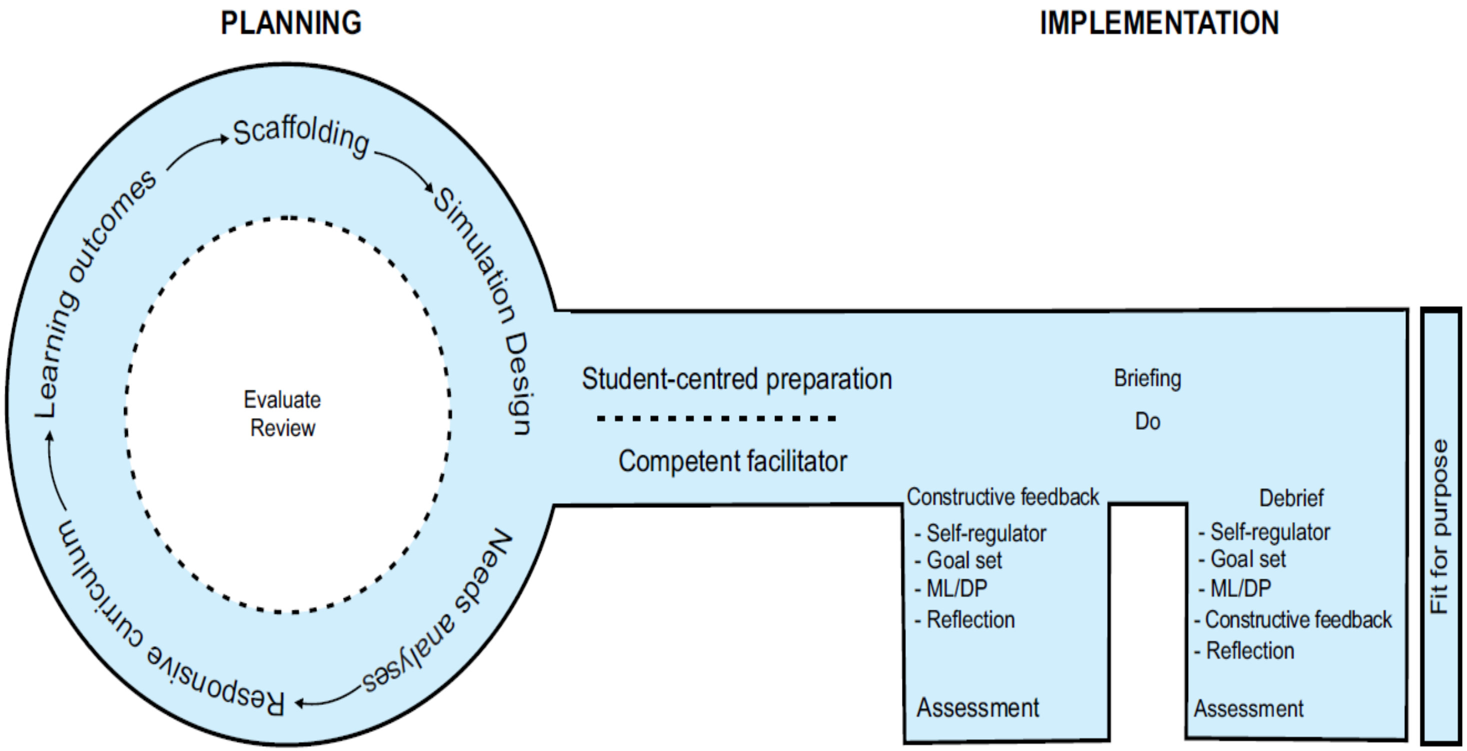

Figure 5.8: Researcher adjusted framework option prior to member checking process

A process of member checking, by means of email, was utilised to collect the opinions of the validation meeting participants on the two proposed framework option templates (*cf.* Figure 5.7 & Figure 5.8). All validation meeting participants received both framework options, accompanied by a detailed explanation of the researcher's reasoning for the proposed adjustment, and they were requested to provide comments and suggestions. Comments and suggestions were provided as replies, sent as carbon copies (cc), to all participants in the original recipient list. This manner of iteration ensured that participants were able to view all comments and suggestions. Three participants provided input regarding the two framework designs within the researcher's two-week deadline. The framework labelled as Figure 5.8 was rejected, as participants felt that the importance of debriefing and the cyclic nature of the experiential learning process was not clearly depicted. One participant suggested that arranging briefing, doing and debriefing in a closed circle within the implementation phase would provide the best display of the experiential learning cycle. This suggestion was supported by two other participants. The value of having a debriefing component in practical-skills-based SBLEs was also mentioned by one participant:

> *"debriefing, self-evaluation, self-regulation, goal setting and reflection are relevant for task training because they* [students] *need to correct and improve their skill if they are not yet competent." [3]*

After careful reconsideration, the researcher accepted the changes proposed by the participants and adjusted the framework according to the suggestions. Considering that South Africa's potentially emerging adult learners value and desire feedback and struggle with critical reasoning skills (NPEF, 2019) (*cf.* Table 2.1), the researcher acknowledges the value of reinstating debriefing as an overarching concept for both immersive and practical-skills-based SBLEs. The method and structure of debriefing employed between the two types of SBLEs will vary in an attempt to achieve the best individual SBLE outcomes, and the concept of facilitating reflection on the part of the learner is essential.

5.6.3 Final framework

The researcher made the final framework adjustments in accordance with participant suggestions, and the framework for simulation integration in the undergraduate physiotherapy programme was finalised (*cf.* Figure 5.9).

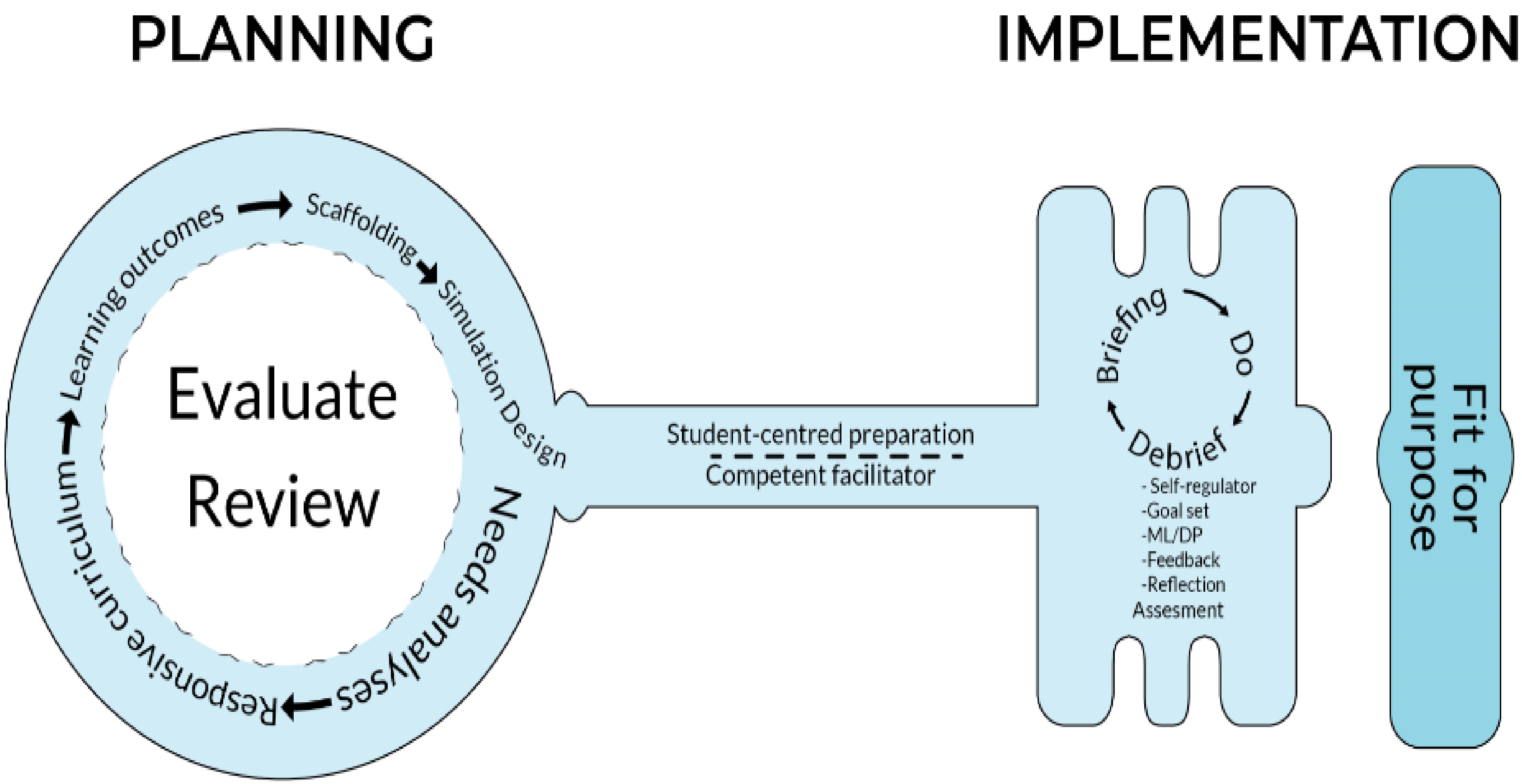

Figure 5.9: Framework for the integration of simulation in the South African undergraduate physiotherapy programme

In the framework (*cf.* Figure 5.9), arrows are used to indicate the cause and effect relationship between the sequential elements (Malamed, 2019); the absence of arrows depicts a fluidity between phases and elements. As the aim of the research study was to develop a framework for the initial integration of simulation within the physiotherapy programme, both font size and arrows within the planning phase guide the user's eyes to the starting point of planning simulation integration (Malamed, 2019). Dashed lines are symbolic of impermanence and change (Malamed, 2019) and, therefore, these lines depict the dynamic relationship between elements encompassed in the framework.

Although not planned at the outset of the study, the conceptual framework (*cf.* Figure 4.4) and the framework (*cf.* Figure 5.9) evolved during the study and both bear resemblance to Kern's framework for curriculum development and the ADDIE framework for instructional design in terms of elements included. The experts included in both the Delphi survey and validation meeting were well versed in programme development and instructional design by nature of their profession and areas of research expertise, and this may have resulted in the similarities observed.

One difference in the framework presented in this research study is the inclusion of developing a responsive curriculum in the framework (*cf.* Figure 5.9). When utilising Kern's framework, the overarching aim is to develop a curriculum. However, the current study's framework does not aim to develop a curriculum, but merely to guide the integration of simulation in an already existing curriculum and, therefore, mention should be made of curriculum development in the current study's framework.

Mention is also made of specific elements required for simulation integration, namely, scaffolding of SBLEs, simulation design, student-centred preparation, competent facilitators and the more detailed implementation phase (*cf.* Figure 5.9). Even though evaluation and review are situated in the planning phase of the framework, deficits identified during the simulation implementation phase will, by implication, result in framework facilitators returning to the planning phase to revise strategies. As with Kern's framework for curriculum development and the ADDIE framework, it is inferred by this framework that evaluation and revision of individual elements, or any combination of elements, should happen throughout the integration process. Continuous evaluation and review will ensure the constructive alignment of SBLEs founded in sound education theory and simulation best practice. The integration phases and individual elements of the presented framework inform each other in a sequential manner, therefore, the visual representation of the framework implies a constant evaluation and review of each individual aspect, to optimise simulation integration.

5.7 CONCLUSION

South African experts in healthcare simulation and/or physiotherapy education reviewed and provided input regarding the conceptual framework developed following the Delphi survey. The framework design was adjusted by participants to depict a continuous and fluid integration process that includes terminology suited to the South African education environment.

The need to amend healthcare curricula and programmes to facilitate a continuum in education, from the classroom to the diverse South African healthcare setting, is undeniable. Needs analyses during planning and incorporation of simulation are essential, and could ensure a responsive curriculum that informs an overall healthcare programme that speaks to the needs of all stakeholders involved.

Both facilitator and student preparation are paramount to ensure acceptance of and active engagement in the SBLEs. It is essential that educators with an aptitude for facilitation and debriefing are developed as SBLE facilitators with debriefing skills through accredited training opportunities. Debriefing is the cornerstone of SBE, and without skilled exploration of students' behaviours, skills and attitudes following the SBLE, students might not engage in optimal reflection, and valuable learning may fail to occur. Literature unequivocally describes the vital role a facilitator plays during the student debrief; relying on an untrained and unskilled facilitator has the potential to not only limit the learning in individual SBLEs, but negatively influence the entire programme outcome. Student preparation is also critical for encouraging meaningful and optimal learning, especially for safeguarding the psychological safety of the simulated environment. South African students have had limited simulation experience, and SBLEs will, no doubt, cause anxiety and stress which, if not managed appropriately, could negatively influence the learning transpiring in the SBLE.

To ensure sustainability in a resource-restricted environment, it is of the utmost importance to provide stakeholders and funders with proof of the value of simulation. However, challenges are encountered by frameworks and facilitators when student behaviours and attitudes have to be measured objectively. The researcher proposes that future research aims to develop valid and reliable tools that can provide proof of simulation effectiveness, which can be used to motivate sustained funding and, thereby, ensure long-term simulation integration. Institutional support is not only limited to financial support, but includes the willingness of all institutional stakeholders to collaborate and enter in constructive discussions to drive simulation integration.

Institutional support and interprofessional collaboration could facilitate a collaborative workforce, ensure person-centred care and address issues surrounding the high costs associated with simulation integration.

A key-shaped framework was developed through in-depth exploration of participant opinions, and through two independent member checking processes, which added to the credibility of the framework. The interconnectedness of all framework elements and integration phases, as well as the insinuated importance of competent facilitators and prepared students, are visually portrayed in the framework, and this representation highlights that careful consideration should be given to these aspects.

In Chapter 6, the final research product, the framework for the implementation of simulation in the South African undergraduate physiotherapy programme, will be discussed, including different integration phases and recommendations for use.

CHAPTER 6

FRAMEWORK FOR SIMULATION INTEGRATION IN THE SOUTH AFRICAN PHYSIOTHERAPY PROGRAMME

6.1 INTRODUCTION

The researcher consulted published healthcare literature and experts in the fields of healthcare simulation and healthcare education during four sequential study phases, namely, a narrative systematic review, a Delphi survey, a validation meeting and a framework finalisation phase, to conceptualise the content of a framework for the integration of simulation in the South African undergraduate physiotherapy programme.

A systematic review process of published healthcare frameworks, designed for curriculum integration of simulation, yielded elements for possible inclusion in a framework; these elements were subsequently included in a Delphi survey. The Delphi survey involved international and national experts in healthcare education and/or simulation, and panel member input enabled the researcher to develop a conceptual framework for curriculum integration of simulation in the South African physiotherapy programme. Due to the Delphi survey including both international and national panel members, the results obtained required contextualisation. A validation meeting constituted the third study phase, during which national experts in healthcare education and/or physiotherapy education met face to face, to critically review the conceptual framework developed by the researcher after the Delphi survey. The in-depth validation meeting process explored national expert opinion on the credibility and feasibility of the conceptual framework, and encouraged contextualisation of the framework. Using a trained facilitator, a meeting guide with open-ended questions, and the researcher being present, though not involved in the validation meeting, ensured the collection of rich and contextualised data. Finally, a co-construction process involving validation meeting participants was utilised to finalise the framework. By including various international and national data sources throughout the research process, the researcher was able to develop a comprehensive framework, with substantiating evidence, which adds value to each element included.

Both the constructivist and cognitive load educational theories (*cf.* Section 2.3.1) were utilised in the design of the framework. Actively engaging with curriculum content through SBLE participation and debriefing allows students to reflect and construct new knowledge for implementation in future SBLEs and clinical settings. Mindfulness in the scaffolding of SBLEs throughout the curriculum supported the framework's focus on student-centred preparation, and speaks to a framework that gives careful consideration to ensuring students are fully equipped to participate in the planned SBLEs.

The symbolic and practical framework shape, a lock and key, depicts the contextualised elements deemed essential for successful curriculum integration of simulation in the South African undergraduate physiotherapy programme. The framework presented previously (*cf.* Figure 5.9) will be discussed in this chapter, including the framework's content and recommendations for implementation and use.

6.2 FRAMEWORK COMPONENTS

Figure 6.1 serves as a reference for the anatomy of a key, and is presented for clarification purposes, as the framework, presented again as Figure 6.2 for reader convenience, will be discussed according to the three anatomical key components namely, the bow, shaft and bit.

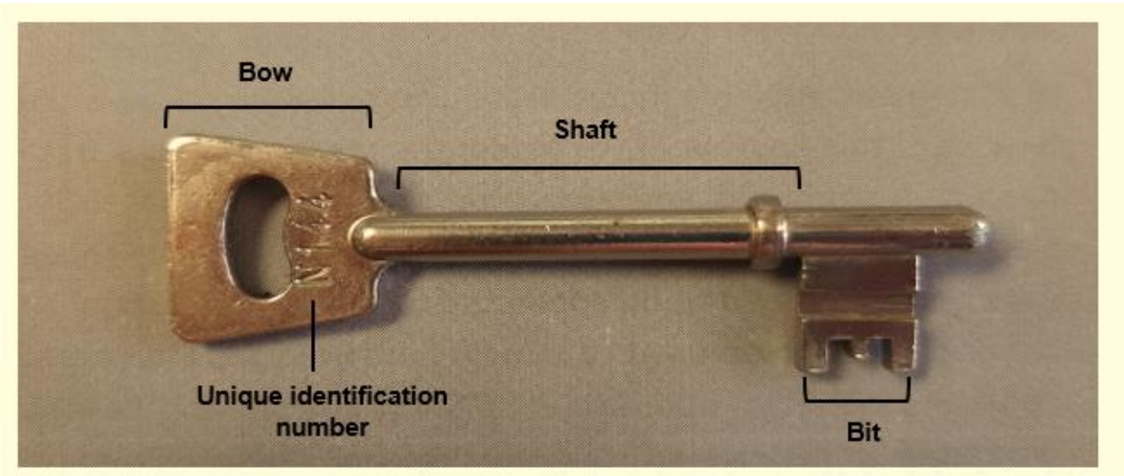

Figure 6.1: Anatomy of a key (Adapted by the researcher from www.bradleysmasterlocksmiths.co.uk [Accessed on 26 August 2019])

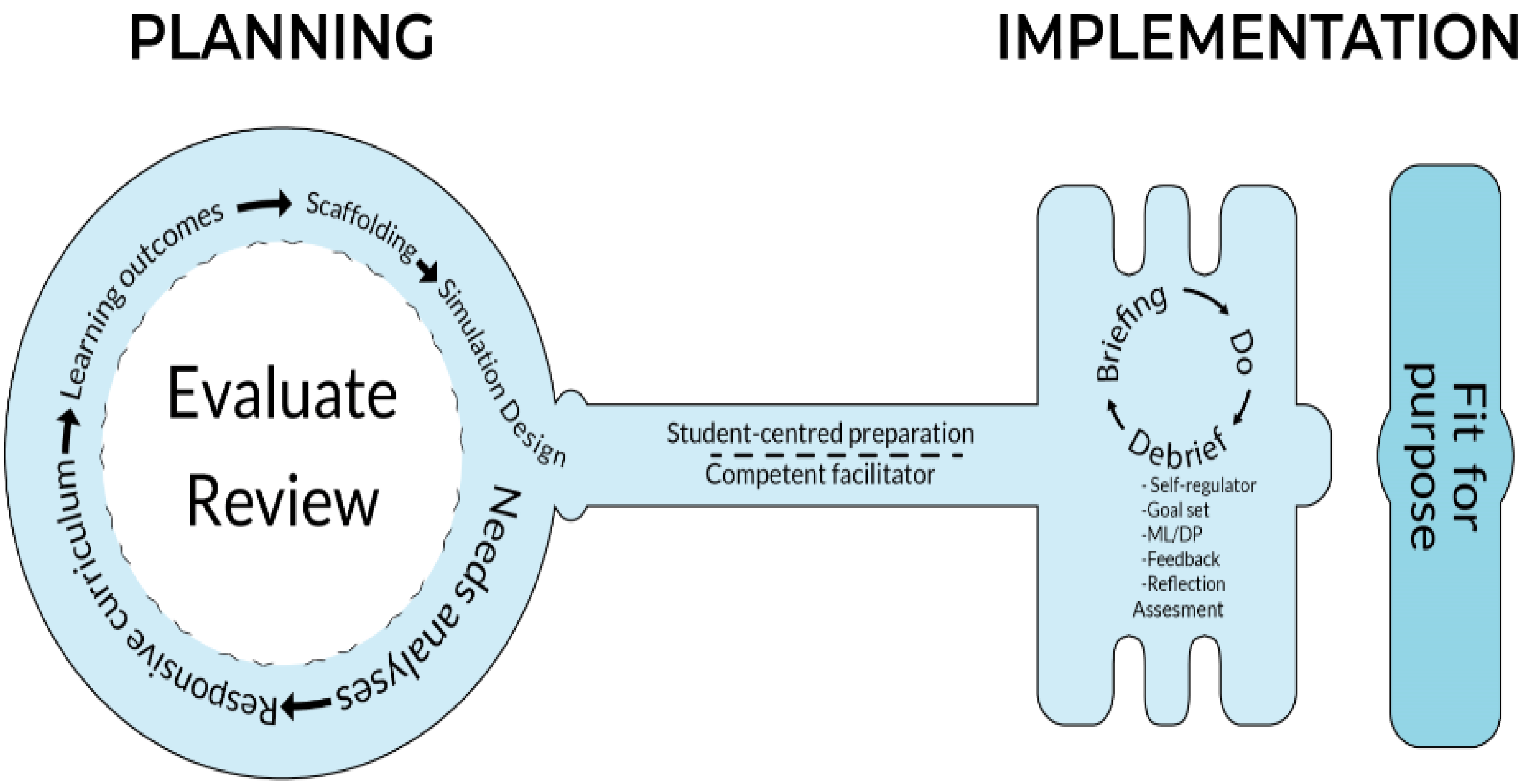

Figure 6.2: Framework for the integration of simulation in the South African undergraduate physiotherapy programme

When viewing the visual representation of the framework (*cf.* Figure 6.2), the bow of the key represents the planning phase, where the initial integration of simulation should commence. It is generally accepted that a reader starts reading at the upper left of an illustration (Malamed, 2019), however, as the simulation design element is intended to flow directly into the segment containing the elements of student-centred preparation and competent facilitator, the researcher was required to consider alternative visual element representation (*cf.* Figure 6.2). Enlarged font was selected by the researcher to increase the focus on and to guide (Malamed, 2019) the framework user to the point where the planning phase starts. As alluded to in the discussion of the framework shape (*cf.* Section 5.6.3), arrows were deemed necessary to direct the cause-effect relationship (Malamed, 2019) of the elements of the planning phase of integrating simulation. Both Kern's framework for curricular development and the ADDIE framework also include arrows to guide the user through the curriculum development and instructional design processes respectively. Due to constant framework evolution, the planning phase was consolidated and collapsed during the final research phase, to be presented as a concise framework section.

The needs analysis element, similar to Kern's framework for curricular development and the ADDIE framework, serves as the starting point for simulation integration. As discussed in previous chapters (*cf.* Sections 3.5.2, 4.8.1.1 & 5.5.2), needs analyses are essential for guiding curriculum integration of simulation, most notably at the start of the process, in accordance with institutional and discipline-specific needs (*cf.* Figure 5.2), which include consideration of resource availability. The development of a responsive curriculum emerges from the acceptance of and ability to integrate simulation into the existing curriculum, in response to identified societal and student needs, to ensure curriculum relevance to the context where the curriculum will be enacted. Learning outcomes detailing the behaviour, skills and attitudes students are expected to demonstrate in the revised curriculum, are essential. Detailed learning outcomes will ensure curriculum transparency and provide both educators and students with guidance regarding what is expected if students are to be deemed successful in the programme. Identifying how and where simulation will be implemented to best address the learning outcomes, in accordance with the students' experience level, would subsequently be incorporated in the simulation design phase. As the framework (*cf.* Figure 6.2) describes the integration of simulation into an already existing programme, and does not propose a purely simulation-based programme, as not all learning outcomes are expected to be met by the use of SBLEs. Educators are required to identify which outcomes will be achieved more effectively by simulation and, accordingly, identify appropriate simulation methods to achieve the selected outcomes. The "where" aspect of simulation integration is underpinned by the concept of scaffolding.

Even though scaffolding is conceptually part of the curriculum, it was deemed essential that it was visible in the framework (*cf.* Figure 6.2). Validation meeting participants deemed scaffolding to be a vital element, due to the risk of cognitive overload if SBLE content is above the cognitive and skill levels of the students involved in the simulated activity. Designing SBLEs according to not only the theoretical, but also the psychological level of the student, is essential for optimising learning. Students should, in addition to being theoretically prepared, also be psychologically prepared for the simulated environment they will encounter, especially if it is a complex immersive SBLE. Psychologically underprepared students might fail to mindfully engage in the SBLE, due to their focus being divided between various aspects, such as sounds, simulators and equipment, present in the simulated environment.

Most keys have a unique identification number at the centre (*cf.* Figure 6.1) to indicate the type of lock it opens and to enable a locksmith to replicate the key. Similarly, the strategic placement of simulation design in the framework (*cf.* Figure 6.2) indicates the main purpose of the framework. Simulation design was depicted as flowing into the section containing the elements of student-centred preparation and competent facilitator. A dashed line is used to depict that neither of these elements are concrete, and to imply change (Malamed, 2019), as facilitator and student roles change throughout the integration of the framework. Furthermore, the fluidity of this section, illustrated by a lack of guiding arrows, implies that SBLE designs are equally dependent on student and facilitator preparation, adjustments required according to changing needs, as well as stakeholder feedback obtained. Therefore, simulation design can be viewed as the centre of the key, which guides the implementation of simulation according to the information obtained from all other framework elements. All aspects relating to individual SBLE design were removed from the visual framework representation, to declutter the framework.

The section containing the elements of evaluate and review may be viewed as a separate circle, situated within the bow of the key. A dashed line is used to distinguish between the planning, programme evaluation and programme revision phases. Although the initial planning phase will not include recommendations obtained from programme evaluation and programme revision, all subsequent planning will include adjustments according to programme evaluation and review. The use of dashed lines, implying that something has not yet occurred (Malamed, 2019), depicts that both the evaluation and review processes may be implemented, throughout all framework sections, as required.

6.2.1 Shaft of the key

The shaft of the key is indicative of the bridge, which seamlessly connects elements related to planning with the implementation of the SBLEs (*cf.* Figure 6.2). Although the elements of student-centred preparation and competent facilitator conceptually form part of the planning phase, validation meeting participants emphasised the importance of these two elements for the whole framework, and not only for the planning phase. Its importance is visually portrayed by these two elements, which connect directly and move through the planning and implementation phases.

Both student and facilitator competence (*cf.* concept clarification) are essential for successful navigation through framework implementation and evaluation. Facilitators who are not competent in delivering the educational methodology are likely to revert back to education strategies that they are more familiar with. Overloading the SBLE to address numerous outcomes with the goal of saving programme time may also be caused by lack of facilitator competency in optimal SBLE design. Ensuring the competence of curriculum and SBLE designers, including the facilitators involved in SBLE facilitation and debriefing, will limit curriculum drift, as the programme that is designed will be enacted by facilitators who are capable of doing so.

The preparation required of students, and the roles of the facilitators involved, will continuously change throughout the implementation of the framework, and is, therefore, illustrated as being able to move to and from all aspects of the framework. The Healthcare Simulation Dictionary provides two descriptions of a facilitator, namely, an individual participating in any part of simulation implementation and/or delivery (*cf.* concept clarification), or an individual directly facilitating the achievement of a desired outcome in an SBLE (Lopreiato *et al.*, 2016). Due to the various roles fulfilled by South African educators in the simulated environment, careful consideration was given to labelling the element of competent facilitator. South African educators may be required to fulfil the roles of educators, programme developers and SBLE facilitators, and opting for the term, facilitator, implies that the educator is not necessarily required to participate in all framework phases. The national shortage of healthcare educators, especially educators trained in the use of simulation as educational methodology, and limited institutional financial resources, makes identification of facilitative roles (e.g., curriculum development, SBLE design, SBLE execution and debriefing) when integrating the framework essential. According to the researcher, not all educators are required to be involved, and competent, in all aspects of simulation integration and delivery. The researcher suggests that department and simulation unit management identify physiotherapy educators for the various facilitative roles required by the framework. By identifying and training educators to fulfil only certain roles in the simulation integration process, some of the financial burden of integrating the framework on institutions may be alleviated, and would ensure that facilitators are able to engage in their field of simulation expertise.

Students will be required to engage in both theoretical and psychological preparation prior to SBLE participation. Dedicated time for student preparation prior to engaging with the simulated environment is a necessity, as the current tertiary education student population yearns for frequent guidance and clear and transparent direction (*cf.* Table 2.1). The researcher, furthermore, advises that students are trained to ensure that they are able to provide detailed and constructive feedback, and are able to receive feedback after participation in SBLEs. Student feedback after participation in the programme that integrates simulation is another vital student role that assists with programme evaluation.

6.2.2 Bit of the key

The bit of the key represents the active participatory phase. The bit is the vital part that provides proof of programme validity – either fitting or not fitting the lock. Specific mention is made of student briefing prior to SBLE participation (Do), to orientate students to the SBLE's expectations, and the simulated environment they will encounter, and to situate the SBLE within the programme outcomes. The diverse South African student population might not be accustomed to the simulated learning environment and may require focused psychological preparation and attention to their role during the SBL, if they are to participate in the learning experience optimally. The role of briefing differs from the previously described student-centred preparation (*cf.* Section 6.2.2), in that it specifically relates to individual SBLE orientation and role clarification.

The importance of the sequential briefing, doing and debriefing cycle is depicted by solid line arrows (Malamed, 2019), which visually present the causal influence the elements have on each other. The element of debriefing is elaborated on further, in the form of a list below the word, to indicate the components comprising debriefing. The goal of the list is purely to indicate which essential components form part of and should be incorporated in the debriefing process, and elements are not given in any particular order. To foster the development of lifelong learners with critical reasoning abilities, engagement in reflection activities after SBLE participation (Eppich & Cheng, 2015b) is not only limited to certain types of SBLEs, but is essential for students after all simulated activities. When students are facilitated to reflect on their actions by participating in debriefing led by a trained facilitator, and if they receive constructive feedback and engage in ML/DP, students develop self-regulatory skills, particularly for identifying individual strengths and shortcomings. Gaps that are identified in demonstrated behaviour, skills and attitudes should be reflected on, and students encouraged to address these gaps to improve engagement with future SBLEs or clinical practice. The vision of the researcher is that, by identifying aspects requiring attention, students will set, in addition to the stipulated learning outcomes, individual goals that will guide their engagement in ML/DP, to improve their own skills.

Because the framework is situated within the constructivist paradigm, and relies heavily on Kolb's experiential learning theory, the inclusion of an opportunity for repetition is essential. Repetition of SBLEs will not only require additional time for SBLE design and execution within already full programmes, but will also necessitate increased financial and equipment resources. The researcher, therefore, advises careful consideration of programme outcomes and available resources, so that curriculum developers can identify the best ways to integrate simulation. Department and institutional support is essential for selecting educators to manage simulation integration and to facilitate SBLEs, with content experts taking responsibility for the design and setup of individual SBLEs – doing so will free up facilitator time to allow for SBLE repetition.

Essential practical skills to be mastered by means of ML/DP should be identified, and self-directed skills practice, including a component of peer assessment and self-reflection, is advised prior to the facilitator observing the practised skills. Practical skills may be either directly observed by facilitators, and followed by group debriefing, or recorded practical skills may be submitted in electronic format for facilitator feedback. Immersive SBLEs should address only a limited number of outcomes, and kept short, to allow for focussed learning and a quicker turnaround time when participating in SBLEs. Furthermore, ML/DP and constructive feedback is positioned within the overarching debriefing element, because it provides constructive feedback and aims to facilitate student reflection, to affect future practice. The researcher reiterates the need for including a reflection component, irrespective of the type of SBLE.

Assessment is positioned at the end of the implementation phase, and refers, specifically, to summative practical-skills-based assessment and/or peer assessment (*cf.* Section 5.5.4). To protect the safety of the simulated learning environment and manage the psychological safety and anxiety of students, students should be afforded the opportunity to engage in similar peer-assessment opportunities and practical-skills-based SBLEs prior to their assessment. A peer-assessment component is encouraged for both immersive and practical-skills-based SBLEs, as it actively engages all SBLE participants to engage in mindful participation. Currently, the researcher does not support the use of immersive SBLEs for summative assessment purposes, mainly, due to a lack of educators trained in the use of simulation as an educational methodology. As there is no evidence available indicating the current use of simulation in the South African undergraduate physiotherapy programme, the researcher deems it inappropriate to assess students in a summative manner in the immersive simulated environment.

6.2.3 Keyhole

A keyhole was added to the visual framework presentation to depict the contextual validation of the framework through curriculum integration and assessing if the framework is fit for purpose. The deeper the key is inserted in the lock, the further the integration process has progressed, with success being demonstrated by the lock opening.

6.3 RECOMMENDATIONS

After framework development, recommendations for the initiation of framework implementation, stakeholder engagement in the framework, and options for further research and policy considerations are put forward.

6.3.1 Implementation

The value of the framework lies therein that the programme it informs is based on the needs of students, institutions, the discipline and society, and is underpinned by a strong sense of stakeholder collaboration. Due to SBLEs being based on stakeholder needs, support to ensure the sustainability of framework integration will be encouraged, as stakeholders will be invested in and value the societal relevance of the programme. The framework also supports active participation by both facilitators and students in the learning environment and fosters the development of reflection skills in both parties – an essential action for professional success. In the current healthcare milieu, it is vital that physiotherapy facilitators and graduates continuously reflect on their practice and actively engage in steps to improve the delivery of their respective services; this will ensure they remain relevant in society, whether in providing education or in clinical practice.

The departure point for framework integration would be performing institutional and discipline-specific needs analyses. First and foremost, an investigation into discipline-specific needs is warranted to ascertain the effect of the 4IR on the discipline. The impact of the 4IR on healthcare is undeniable, and graduates need to develop skills in their undergraduate study years to incorporate technology in their professional practice, to ensure client satisfaction and client retention. Considering that increased need for a person-centred approach to healthcare is anticipated in the future, during the 5IR, graduate attributes developed in answer to the effect of the 4IR will remain vital, even in years to come. The high cost of healthcare, compounded by only a small number of the population being able to afford comprehensive healthcare plans, drives the exploration of alternative treatment and management techniques through technology use and prevention strategies. As information freely available via the internet and social media, physiotherapy graduates are required to engage in healthcare dialogues with patients to develop person-centred approaches to healthcare management that focus on prevention rather than treatment. It is the duty of healthcare training institutions to instil lifelong learning practices in their graduates, who should continuously update their knowledge and skills, and adjust their practice according to the information gained, thereby ensuring that they remain an integral part of the healthcare team. Discipline-based needs regarding the effect of the current generational cohort on teaching and learning strategies used by educators are also essential. The researcher advises investigation of the characteristics of the current student population, to identify student strengths and desires to utilise teaching and learning activities that are viewed as effective by both educators and students. Generational characteristics that may be regarded as negative characteristics should be addressed by educators and transformed into behaviour and attitudes that are more socially acceptable, to ensure graduate employability. The NPEF (2019) refers to the lack of demonstrated practical skills and clinical reasoning abilities, the inability to implement community-based care, and professional conduct deficits of newly qualified South African physiotherapists. These shortcomings warrant exploration of alternative educational methodologies, to optimise undergraduate training.

Parallel to identifying discipline-specific needs, institutional ability and the need to integrate the framework to enrich national undergraduate physiotherapy programmes should be investigated. An institutional needs analysis that explores the current status of simulation at the institutional level is recommended by the researcher. In order to develop a comprehensive simulation integration plan, the framework user must be familiar with institutionally available simulation space and equipment, the level of simulation training of the educators who will fulfil facilitative roles, programme time available for simulation development and integration and the human resources available to execute SBLEs. Resource deficits that have a direct financial impact on framework integration must, then, be identified, to ensure transparency regarding the true cost of framework integration, and to enable calculations of the feasibility and sustainability of the programme.

A feasibility study related to simulation integration should be presented to institution management, to obtain institutional support and funding for framework integration. Essentially, a full economic evaluation is the most acceptable way to effectively engage with administrators regarding the ROI and cost-effectiveness of healthcare simulation (Asche *et al.*, 2018). However, the limited knowledge and expertise of clinicians regarding economic analysis necessitates, according to the researcher, the inclusion of healthcare economists, who should assist healthcare educators to determine the true ROI of simulation. Resource costs should be calculated from the perspective of the institution (Asche *et al.*, 2018), as the integration of simulation will directly influence the functioning and resources of the institution itself. Direct and indirect resource costs that should be considered should include, expenditure related to equipment procurement and maintenance, use of simulation facilities, payment of simulated patients, consumables, facilitator time and a possible backlog in educator services and tasks related to their institutional job description. Cost avoidance outcomes (Asche *et al.*, 2018) are also essential for economic evaluation and, from an institutional perspective includes, but is not limited to, student throughput rates (including costs associated with accommodation, the programme and further educator expenditure), decreased adverse events resulting from safer student-patient interaction, increased third-stream revenue by using simulation for continuing professional development training opportunities, as well as simulation-based research.

Additionally, patient satisfaction ratings, decreased hospital readmissions due to complications related to poor rehabilitation outcomes, the decreased use of healthcare services for follow-up treatments, and providing more professionals who are able to work immediately with minimal supervision are also outcomes that could be measured to demonstrate the effectiveness of simulation. As noted by Asche *et al*. (2018), the majority of simulation-based outcomes in healthcare are difficult to measure objectively, and only limited research that describes some form of measured economic benefit is available. Expense justification might be challenged further if the benefits of simulation integration is not experienced in the short term, or proven to be favourable in the local setting. Therefore, a comprehensive economic evaluation is essential to facilitate negotiations with institutions, funders, industry and the private sector, to ensure the sustainability of simulation integration. The feasibility study should be accompanied by a detailed plan of how simulation will be integrated and stakeholders involved in the process must be identified. The plan must describe why simulation is the educational strategy chosen to address the identified discipline-specific needs, it must provide evidence of the effect of simulation as reported in literature, and must identify possible external funding sources.

Even though it is not conceptually part of discipline-related needs analyses, but rather encompassed in subsequent curriculum development and design (*cf*. Section 5.5.2), critical discussions to identify gaps in students' demonstrated behaviour, skills and attitudes may motivate framework integration further. These discussions should include educators, clinical supervisors and society at both institutional and national levels.

6.3.2 Stakeholder engagement

Stakeholders who are required to engage with institutional integration of the framework should include the immediate society, clinical supervisors, the institution, educators and students.

6.3.2.1 *Society and clinical supervisors*

As mentioned in Section 6.3.1, the immediate society in which students engage in clinical practice, as well as clinical supervisors, should provide feedback regarding the behaviour, skills and attitudes they observe as lacking in undergraduate and newly qualified physiotherapy students.

6.3.2.2 *Institution*

Institutional support is essential for the success of framework integration (*cf.* Section 6.3.1) in terms of both financial resources and for approaching potential external funders. Approaching external funders with the support of the institution will go a long way towards obtaining the much-needed additional external funding. Institutional support is not only vital for procuring funding, but also for allowing protection of facilitator time during the curriculum development process, simulation design, simulation execution and programme evaluation. Educators, as discussed previously (*cf.* Section 5.5.2), should be afforded time to develop and implement all aspects of the framework.

6.3.2.3 *Educators/Facilitators*

As SBE gains momentum in South Africa (Swart *et al.*, 2019), conversations between training institutions, healthcare educationalists and physiotherapy educators are necessary to ascertain the level of simulation training physiotherapy educators are currently engaged in. Accredited Train the Trainer programmes can be identified to develop national physiotherapy educators in the effective design and delivery of programmes that are responsive to societal change. If the results of Swart *et al.*'s (2019) and Thurling's (2017) studies are considered, the majority of current healthcare educators would be required to participate in Train the Trainer programmes, or other accredited simulation-based training, to ensure that they are able to fulfil their assigned roles in the optimal integration of simulation. Facilitators have a further responsibility to engage in continuing professional development, to maintain their simulation-based skills and continue to use an evidence-based approach to simulation integration. Evaluation by students and peers by means of validated evaluation measures, as well as personal reflection, is essential for ensuring that facilitators are fulfilling their role within the framework, and for identifying areas for improvement on the part of the facilitator. The researcher recommends that validated evaluation measures are identified and/or developed to assist with facilitator development.

The detrimental effects of students being underprepared for the simulated environment has been reported (Welman & Spies, 2016) and facilitators are expected to prepare students prior to SBLE participation. As described (see concept clarification), the researcher views the term facilitator as referring to an individual involved in the implementation and/or execution of simulation, and various facilitators will, therefore, be required to fulfil all designated roles in the framework. Facilitator roles related to student preparation would include, amongst others, preparation of students in relation to the required theory and designing individual SBLEs. Facilitators who are to be involved with the execution of the SBLEs will also be identified, including preparation for briefing directly prior to each SBLE, execution of the SBLEs and debriefing after completion of the SBLE. Theoretical preparation should be linked to both programme and individual SBLE learning outcomes, so that students understand the value of each SBLE. Standardised video content that contains SBLE information relating to role clarification, scenario content, learning outcomes, time frames and what to expect in the simulated environment prior to the SBLE should be recorded, to enable student preparation and to save facilitator time. Facilitators of the SBLE have the vital role of personally briefing students immediately prior to the SBLE, to reiterate role clarification and confirm the logistical arrangements of the SBLE. Students must be aware of the facilitator's role during and after the SBLE, so that they know if they may consult the facilitator during the SBLE. Immediately prior to the debriefing, the facilitator should outline the structure of the debrief and ensure the confidentiality and psychological safety of the debriefing environment.

It is imperative that SBE terminology in use in the South African simulated environment is standardised, to enable the accurate integration of simulation.

6.3.2.4 *Students*

It is essential that students who are enrolled in the programme take responsibility for their learning and actively engage with both the programme and individual SBLEs. Although the simulated environment is not real, students should immerse themselves in the SBLEs by means of suspension of disbelief (see concept clarification), to fully engage with and learn from the SBLE. Students are, therefore, required to prepare for their SBLEs in accordance with the information provided by the facilitators. After role clarification prior to the SBLE, students should remain in their allocated roles throughout the SBLE, to allow for a positive learning process for all students.

Active participation during the debriefing is a vital component for learning to occur. Honest and constructive discussion in the debriefing environment, without fear of punishment, is essential. Students are encouraged to critically reflect on their performance in the SBLE and identify aspects that went well and which require further practice. In line with Kolb's experiential learning theory, students should be afforded the opportunity to repeat similar SBLEs or aspects thereof. The responsibility lies with students to address their identified shortcomings and engage in additional education strategies (e.g., further practice or theoretical knowledge acquisition) prior to follow-up SBLEs, to ensure their performance improves.

Providing of feedback is another integral student role during SBLEs, and the researcher advises that students should receive practical training in receiving and providing constructive feedback. If an element of peer assessment is included in the SBLE, students are, furthermore, expected to familiarise themselves with the peer-assessment procedure and provide helpful feedback to their peers. When requested to provide feedback regarding the programme, SBLEs or facilitators, students are expected to provide honest feedback with practical recommendations, to ensure programme improvement.

6.3.3 Research

The educational impact of SBE on outcomes for patients, institutions and the system as a whole are classified on four levels (McGaghie *et al.* in Griswold *et al.,* 2012). These levels indicate the translational impact of simulation-based research on both patient and population outcomes, and are presented in Table 6.1.

Table 6.1: Level of simulated-based research evidence indicating skills transfer (McGaghie *et al.* in Griswold *et al*., 2012; compiled by the researcher, A. van der Merwe, 2020)

LEVEL OF EVIDENCE	EDUCATIONAL IMPACT	EXAMPLE
T_1	Evaluation of the educational outcome	Improved technique/skill measured in simulated environment.
T_2	Transfer of skill to clinical practice	Technique/skill practised in simulated environment is measured in student's clinical performance.
T_3	Improved population health	Improved clinical outcomes and patient safety.
T_{value}	ROI	Decreased complications and costs incurred by the institution/healthcare system after technique/skill practice within simulated environment.

The researcher's recommendations regarding future research endeavours will be structured according to Table 6.1.

6.3.3.1 *Level of evidence: T_1*

Peer assessment supports learning and the development of self-regulation; however, as alluded to by one validation meeting participant (*cf.* Section 5.5.4), it is underutilised in the South African physiotherapy programme. Therefore, the researcher proposes investigation into the use of peer assessment in SBLEs.

A standardised approach to peer assessment, including student preparation with regard to the process, expectations, and providing constructive feedback, is warranted to ensure a safe learning environment in which meaningful learning can occur.

6.3.3.2 *Level of evidence: T_2*

Levels 2 and 3 of the Kirkpatrick training evaluation model relating to demonstratable knowledge, skills, attitudes and behaviours gained from the SBLEs, should be utilised to evaluate the transfer of skills to the clinical environment. As this is an under-researched area in healthcare education, both in South Africa and abroad., The researcher advises that identification, if engagement in SBLEs results in skills transfer to clinical practice, be prioritised in order to further justify the implementation and sustainability of simulation in the undergraduate physiotherapy programme.

Programme evaluation measures that evaluate facilitator competence should be identified and/or developed for the programme that integrates the framework.

6.3.3.3 *Level of evidence: T_3 and T_{value}*

It is accepted by literature that simulation is an effective educational method for healthcare training (Welman & Spies, 2016). However, in light of dwindling resources, and as alluded to by Asche *et al.* (2018), proof of the cost-saving benefits of simulation integration for training institutions is of the utmost importance.

Future research should investigate the development and/or identification of validated outcome measures, to provide proof of simulation effectiveness, which can be used to perform a cost-benefit analysis and calculate the ROI for the institution integrating simulation. Due to the challenge of converting all healthcare simulation benefits to a monetary value, the researcher supports the proposal by Asche *et al.* (2018), that future research should identify types of qualitative research that could be used to calculate the monetary value of simulation integration. The researcher advises investigation into how inclusion of simulation accelerates the education process relating to preparing physiotherapy students for clinical practice. By obtaining proof that simulation accelerates student training, compared to traditional methods, and produces students who are better prepared for their clinical training, healthcare economists may be able to accurately calculate the monetary impact of simulation training.

6.3.4 Policy

Conversations with the HPCSA and NPEF are required to discuss the integration of the framework in all South African physiotherapy programmes. Although the HPCSA does not have the authority to prescribe how education material is to be delivered to undergraduate students, they do set minimum education standards that national physiotherapy providers are required to adhere to for programme accreditation. Regulatory bodies should advise the inclusion of simulation as part of their training requirements, to ensure comparative training by all national physiotherapy programmes. International undergraduate healthcare programmes have successfully integrated simulation, as have the majority of South African nursing programmes, therefore, the value of this educational method is evident and should be explored by physiotherapy educators.

6.4 CONCLUSION

Data obtained during all four study phases was used by the researcher to develop a framework for simulation integration in the South African undergraduate physiotherapy programme. The framework that was developed after the conclusion of the validation meeting (*cf.* Figure 5.9) illustrates a fluid and dynamic approach to simulation integration, with the framework shape used as a departure point to discuss the individual elements and their influence within the framework.

The importance of thorough planning is evident, due to the planning phase constituting the largest part of the framework. The inclusion of seven elements in the planning phase depicts the importance of developing a responsive curriculum in which authentic SBLEs are implemented. Facilitator and student engagement throughout the integration of simulation is essential for programme success. The image of student-centred preparation and a competent facilitator linking the planning phase and the implementation phase, indicates the importance of both students and facilitators being prepared for their roles and responsibilities throughout the integration of simulation. Supporting educators to attend Train the Trainer programmes is essential for educators to fulfil their respective facilitative roles during the integration process and, thereby, lead to the successful integration of simulation. Student preparation prior to engaging in SBLEs and subsequent debriefing is also vital, to create a safe learning environment, encourage active participation by the suspension of disbelief and ensure meaningful learning.

The framework shape depicts the need for constant reflection on the parts of both facilitators and students, who should strive to continuously improve their engagement with the programme integrating simulation.

The researcher advises that further research should explore ways to objectively measure the effect of simulation integration in the physiotherapy programme, to provide proof to the Department of Higher Education and Training, external funders, the HPCSA and institutions of the benefits of supporting the integration of this framework in a resource-restricted environment.

CHAPTER 7

CONCLUSION

7.1 INTRODUCTION

The aim of the study was to develop a credible and contextualised framework for the integration of simulation in South African undergraduate physiotherapy programmes. In order to achieve this aim, three study phases were undertaken to inform the framework development. In this final chapter, the researcher will discuss the extent to which each of the individual study phases achieved the stated objectives, contributed to the research process and influenced the researcher's decisions. Finally, the contribution of the thesis, study-specific limitations, and recommendations will be presented.

7.2 FRAMEWORK DEVELOPMENT

The first study phase aimed to achieve two related research objectives. The first was to perform an in-depth literature overview to conceptualise and contextualise the use of simulation in physiotherapy education. Secondly, the researcher aimed to identify key elements that should form part of simulation-based frameworks describing the curricular integration of simulation in the healthcare context by means of a systematic review. The systematic review identified 18 descriptive themes, grouped under four analytical themes, which were included in healthcare simulation frameworks for simulation integration at curricular level. Results of the systematic review indicated that thoughtful and detailed planning is paramount for the success of simulation integration. The inclusion of needs analyses to direct simulation integration was, however, lacking in the majority of articles included, and cause for concern for the researcher. The inclusion of ML/DP and the use of both practical-skills-based and immersive SBLEs for assessment purposes required further investigation in the South African context, due to limited human and physical resources. Considering that few South African healthcare educators have attended SBE Train the Trainer programmes, and integration of SBLEs in healthcare curricula is limited, the readiness of national healthcare educators to integrate simulation is questioned, especially if an assessment component is added to the SBLE.

The second study phase's defined objective was to identify the elements to be included in a conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme. The elements identified during the systematic review were used to develop a Delphi survey, which was distributed to experts in South Africa and abroad in the fields of healthcare simulation and healthcare education. The Delphi panel members reiterated the necessity of thoughtful curriculum development with thorough SBLE design. It was clear that panel members advised the consideration of both available resources and stipulated learning outcomes when designing SBLEs. Only identified institutional and student needs were deemed essential by the Delphi panel for inclusion in the conceptual framework. Educator training in utilising simulation as an educational method was also supported by panel members, as a way to encourage optimal student learning by means of SBLEs.

Although appropriate measures were taken to prevent misinterpretation of anticipated differences in using SBE terminology, the differences still posed a challenge during the execution of the Delphi survey. Due to the absence of uniform terminology in SBE, the varied roles South African educators are required to fulfil in terms of simulation use, and the marginalised national implementation of simulation, panel members found it challenging to respond to statements relating to student preparation, student assessment and ML/DP.

The conceptual framework developed by means of the Delphi survey (*cf.* Figure 4.4) depicted three framework themes that built on each other, with the fourth theme, revision, potentially influencing all themes. A possible back and forth movement between evaluation and revision was also indicated, as adjustments brought about by programme evaluation would, in essence, require programme revision to ensure an optimised programme for integrating simulation.

During the third study phase, the research objective was to discuss and critically review the content of the conceptual framework, in order to finalise the framework for simulation integration. South African experts in the fields of healthcare simulation and/or physiotherapy education were invited to participate in a face-to-face validation meeting to provide their opinions and recommendations regarding elements to be included in the framework.

The need to amend healthcare curricula to facilitate a continuum in education, from the classroom to the diverse South African healthcare setting, was undeniable, notably in addressing the needs of all stakeholders. Element adjustment regarding facilitator competency (see concept clarification) and student preparation were deemed critical for the success of simulation integration. A collaborative approach to framework implementation was highlighted, and aimed to foster a collaborative workforce that would go a long way to ensure the sustainability of simulation integration, in light of limited resources in South Africa. Elements included in the framework were renamed by validation meeting participants to resonate with South African healthcare education terminology.

7.3 FRAMEWORK FINALISATION

The final study phase aimed to finalise the framework and it commenced through a member checking process embedded within the validation meeting. The final study phase was concluded through an electronic member checking follow-up process, to obtain participant input for the final framework design.

Participants criticised the shape and design of the conceptual framework presented to them, as it illustrated a unidirectional approach to simulation integration. A further concern for participants was that elements were limited to individual integration phases, which might not be the case, as some elements may be required in more than one integration phase. A key-shaped framework was proposed by one participant, and accepted by fellow validation meeting participants.

The framework aimed to present a fluid and active approach to simulation integration in the undergraduate physiotherapy programme in South Africa. The necessity of designing authentic SBLEs within a responsive curriculum is unequivocally illustrated in the finalised framework (*cf.* Figure 6.2). With tertiary training institutions playing an integral role in ensuring economic growth and social justice – with consideration of social, racial and gender equality – in the quest for innovation and growth (Cloete, 2020), identifying the needs of all stakeholders are essential for institutional sustainability. Preparation and competence (see concept clarification) on the part of both the educator and students participating in the SBLEs are central points of aiming to integrate simulation in the South African context, and would require careful departmental and institutional planning. The need to encourage the development of reflective practitioners, on the part of both students and facilitators, was evident from the inclusion of a debriefing component for all SBLEs, with the framework clearly stating the concepts encompassed within the debriefing process.

The role of tertiary training institutions has shifted towards shaping civic values and adaptable graduates, with South African institutions not performing well in either the categories of citizen forming and producing new knowledge, as proven by recent protest movements calling for decolonising training. The proposed framework aims to

> "*train a person who is more confident in going into the environment where more is expected of them" [2].*

In changing South African and global healthcare settings, graduates are entering fast-paced and complex work environments that expect them to demonstrate reflection, reasoning and problem-solving abilities in the face of various challenges. The framework presents the aim to train skilled, adaptable and employable physiotherapy graduates. In addition, South African physiotherapy students demonstrate a lack of essential attributes required for clinical practice, namely, practical skills, clinical reasoning abilities, the ability to implement community-based care and professional conduct (*cf.* Section 2.3.2). The researcher is of the opinion that, by integrating simulation into the undergraduate physiotherapy programme, students will be facilitated to develop these valuable, lifelong learning and reflective abilities. Additionally, engaging in authentic and contextually relevant SBLEs will assist tertiary institutions to achieve their task of graduating responsible citizens by developing attributes related to the rights and duties of individuals living in society.

7.4 CONTRIBUTION

The study contributes primarily to the current body of knowledge, by presenting a framework to guide the full curriculum integration of simulation in the South African undergraduate physiotherapy programme. As the framework is generic in nature, all healthcare disciplines may benefit from framework implementation.

The framework is far reaching in its implications, as it moves beyond simulation integration, to the fundamental need to develop responsible and adaptable training institutions and, subsequently, citizens. As eloquently stated by Professor Manuel Castells:

> *"But universities cannot simply mobilise against destructive politics; they also have to protect their mission as beacons of innovation, ideas and equality, without surrendering everything to activism. Ultimately, the convergence between the shift to a new form of economic organisation, the acceleration of the technological revolution, and the relegitimation of political institutions, has a site in society: higher education"* (Castells, 2017 in Muller *et al.*, 2017).

The framework aims to engage government, governing organisations, society, institutions, educators and students in decreasing social fragmentation and implementing policies with the public interest at their heart. By encouraging the active development and participation of both educators and students, the researcher envisages continued training of healthcare students who are optimally prepared for independent practice and lifelong learning in a rapidly changing society.

7.5 RECOMMENDATIONS

Based on the results obtained during the research phases, the following recommendations for framework implementation, policy changes and areas requiring further research are put forward.

7.5.1 Implementation

A primary recommendation for framework implementation is the appointment of a dedicated simulation expert (see concept clarification) who is well versed in SBE, to drive framework implementation. This position is deemed essential by the researcher, as a great deal of planning is required for simulation integration. Although the appointment of an additional personnel member will place additional strain on the institutional budget, the researcher views this as the best available option to ensure the sustainability of the implemented framework.

The overarching role of the simulation expert will be to liaise with all stakeholders involved, to plan and navigate simulation integration, and to engage with institutions, industry and private funders to procure funding for simulation use, thereby alleviating institutional financial pressure caused by expenditure related to an additional personnel member. The simulation expert will also be required to manage the fair distribution of resources between healthcare departments involved, to maintain stakeholder buy-in and ensure that all departments are equally capable of utilising simulation in their programmes. Collaboration between all healthcare departments involved would decrease costs further, through responsible resource sharing and by encouraging interprofessional behaviour.

As healthcare professions have similar attributes and generic skills that require training, the simulation expert may involve all trained SBLE facilitators to assist in generic SBLE design and facilitation. By including SBLE facilitators from all healthcare professions, facilitator time will be effectively utilised in the design of SBLEs, and will enhance interprofessional collaboration in both the SBLE design and implementation processes.
Other, related recommendations are the following:

- The physiotherapy programme that integrates simulation could be established and offered to other African physiotherapy institutions for training their students by means of SBE. Dedicated time for international physiotherapy students to attend undergraduate training through simulation will not only enhance their students' undergraduate training, but generate additional third-stream income for simulation sustainability. Fostering international relations and expanding on the integration of simulation will allow African physiotherapy training institutions to compete internationally.

- Once the framework has been adopted for integration by an institution, identified educators should attend mandatory Train the Trainer programmes to enable them to fulfil their respective roles within the framework.
- Due to heavy reliance on clinical educators in the clinical training of South African physiotherapy students, specific teaching and learning methodology training for clinical educators should be implemented. In light of simulation integration with a focus on active student participation during the learning process, training specific to the role of the clinical educator is essential. To ensure a continuum in the education process of undergraduate students, clinical educators should have knowledge and skill regarding the facilitation of learning and knowing how to encourage student reflection.

7.5.2 Policy changes

A recommendation in relation to policy change is as follows:

- Consultation with the governing bodies regulating physiotherapy education, HPCSA and NPEF, is required to investigate the need for and feasibility of replacing physiotherapy clinical hours with simulation. If the need for clinical hour supplementation is identified, it is advised that regulating bodies and education institutions enter into a critical discussion regarding the best route for institutions aiming to utilise such a supplementation process.

7.5.3 Research

The following research-related recommendations are made.

7.5.3.1 *Level of evidence: T_1*

- Research investigating the practical use of SBLEs for ML/DP and assessment purposes should use mixed method research methodology. The use of mixed methodology will allow for more participant reflection and provide justification for opinions and recommendations. The depth of information obtained in relation to the challenging aspects of ML/DP and assessment implementation within the simulated environment will provide valuable data.

- Using simulation for practical-skills-based assessment in the undergraduate physiotherapy programme should be investigated to ensure the correct tools are used for what is to be assessed.
- Standardised assessment tools and procedures for the identified practical skills to be assessed by simulation should be developed and tested by means of a pilot study, to ensure the tools that are used are valid and reliable.

7.5.3.2 *Level of evidence: T_2*

- Due to limited financial resources, the effect of SBLEs with a lower cost should be investigated.

7.5.3.3 *Level of evidence: T_3 and T_{value}*

- Research investigating the economic impact of physiotherapy-based simulation integration is essential for motivating continued funding to institutions and other funders.

Further research-related recommendations are the following:

- The current use of simulation in the South African undergraduate physiotherapy programme needs to be explored.
- The validity of the framework needs to be established through programme evaluation after implementation.

7.6 LIMITATIONS

During the course of the study, the researcher identified challenges and limitations that should be considered when generalising the results obtained.

- Using a subjective appraisal tool during the systematic review appraisal process could have introduced bias when articles were appraised.
- Unstandardised SBE terminology and differences in simulation integration between South Africa and international institutions challenged Delphi panel members when they interpreted and responded to Delphi survey statements.
- Unnecessarily long and, at times, complex Delphi statements could have hindered Delphi panel members in their responses.

- In addition to the possible misinterpretation of data obtained from the Delphi survey, little justification was provided by panel members for their option choices and/or comments.
- As mentioned during the study, few South African physiotherapy educators are currently viewed as simulation experts according to the study's definition of simulation expert (see concept clarification). This resulted in data being obtained from various other healthcare professionals who are viewed as simulation experts, and although the data is extremely valuable, data obtained from educators directly involved with the South African physiotherapy programme would have been ideal.

7.7 CONCLUSION

A credible and contextualised framework was developed to guide and optimise simulation integration in the South African undergraduate physiotherapy programme. The researcher believes that implementation of this framework will result in simulation-based physiotherapy research in the future and, ultimately, the transformation of both physiotherapy teaching and learning and, consequently, the physiotherapy profession, to ensure a lasting and positive impact on future generations.

The researcher recommends the appointment of a dedicated simulation expert to guide framework implementation by addressing identified needs of stakeholders and ensuring the sustainability of the integrated framework. National regulating bodies are to be consulted, as advised by the researcher, to investigate the inclusion of simulation as part of the mandatory undergraduate physiotherapy training requirements. Research exploring the practical application of ML/DP and assessment in the South African simulated environment is required. Considering the multitude of national resource restrictions, the researcher recommends further research to investigate valid methods of calculating the economic impact of simulation integration on the undergraduate physiotherapy programme.

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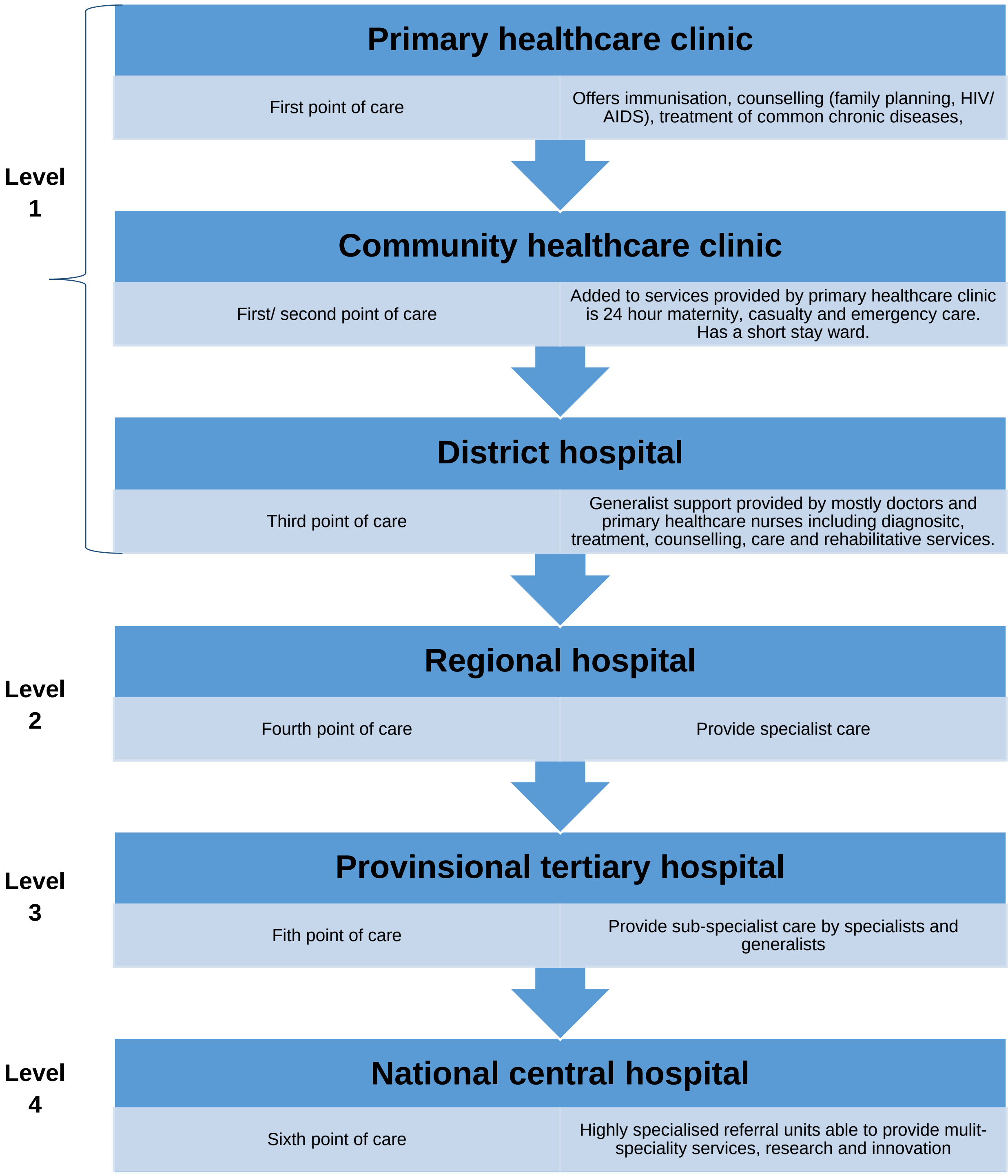
South African referral system illustrating levels of healthcare

APPENDIX A. South African referral system illustrating levels of healthcare (Department of Health, 2019. Compiled by the researcher A. van der Merwe, 2019).



APPENDIX B.

Minimum standards for Physiotherapy training

APPENDIX B. Minimum standards for physiotherapy training (HPCSA, 2019)

HPCSA

Professional Board for Physiotherapy, Podiatry and Biokinetics
Minimum standards for training: PHYSIOTHERAPY

1. **Rationale for the Profession**
   Physiotherapy is a healthcare profession that provides services to individuals and communities/ populations to develop, maintain and restore maximum movement and function throughout the lifespan. Physiotherapy is provided for individuals who have, or may develop impairments, activity limitations, and participation restrictions related to conditions of the musculoskeletal, neuromuscular, cardiovascular, pulmonary, and/or integumentary systems as they relate to human movement, or due to personal and environmental factors. Physiotherapy is concerned with identifying and maximising quality of life and movement potential within all the pillars of health care, namely promotion, prevention, treatment/ intervention, habilitation/ rehabilitation and referral[1]. Knowledge and application of the science of human movement is central to the profession of Physiotherapy.

2. **Purpose of training**
   The undergraduate programme must equip physiotherapists with the basic knowledge, skills and attitudes to function as reflective practitioners within the philosophy and values inherent to the physiotherapy profession within the South African healthcare context. The training aims to deliver professionals, who understand patient-centred care, have excellent communication and collaborative skills, high standards of ethical and professional behaviour, and have the ability to conduct research and apply evidence-based practice, taking into consideration the national and global burden of disease.

   The undergraduate programme trains physiotherapists to meet the minimum standards required for registration with the Board for Physiotherapy, Podiatry and Biokinetics of the Health Professions Council of South Africa.

3. **General**
   3.1. Minimum requirements for access to training
   National Senior Certificate with university admission endorsed by Umalusi (Quality Assurance Council), or an equivalent qualification. In addition, the accredited tertiary institutions may have specific entry requirements for their Physiotherapy programme.
   The following subjects are highly recommended:
   - Mathematics

[1] World Confederation for Physical Therapy. Policy statement: Regulation of the physical therapy profession. London, UK: WCPT; 2017. www.wcpt.org/policy/ps-regulation

- Physical Science
- Life Sciences / Biology

3.2. Length of the program

The program is a four-year Professional Bachelor degree with students exiting at HEQF level 8 (http://www.saqa.org.za/docs/misc/2012/level_descriptors.pdf). It is preferred that the program is situated in a Medical or Health Sciences Faculty to ensure outcomes related to inter-professional health education are met.

A graduate is entitled to apply for Post-Graduate Diploma, Master and PhD degree programs providing he/she meets the specific institutional entry requirements.

3.3. Mode of delivery

The four-year full-time program has theoretical, practical, clinical and workplace based components. A variety of learning and teaching methods may be utilised, including face-to-face or classroom-based, blended- and online learning methodologies. Problem-based, enquiry-based learning and similar methods are encouraged. Group work and inter-professional training are also part of the course. Incorporating technology to increase access, optimise teaching and learning and improve service delivery is also recommended.

3.4. Registration with the HPCSA

All undergraduate and postgraduate students must register as students with the HPCSA for the full duration of the program, from year one until they exit the program. After completion of Community Service, graduates are eligible to register with the HPCSA as independent practitioners.

4. Broad outcomes for the program

The successful Physiotherapy graduate must:

4.1. Be ethically accountable to the profession, client and community

4.2. Be able to execute safe, effective and professional practice

4.2.1. Demonstrate knowledge of the normal and abnormal functioning of the human body and psyche.

4.2.2. Perform a physiotherapy evaluation of the client(s)'s physical, functional and psychological status, analyse his/her/their needs, formulate a hypothesis and predict prognosis.

4.2.3. Identify risk, precautions and contraindications.

4.2.4. Develop and implement an evidence-based intervention plan.

4.2.5. Evaluate the effectiveness of this intervention using appropriate outcome measures and incorporate the findings in future practice.

4.3. Be able to communicate appropriately and effectively with clients, family and other members of the healthcare team.

4.4. Exhibit sensitivity towards the cultural environment on the outcomes of health care.

4.5. Be able to plan, implement and evaluate appropriate, cost-effective physiotherapy services within the South African health context.

4.6. Be able to identify, apply and/or develop appropriate technology to support physiotherapy practice.

4.7. Be able to interpret and conduct supervised research in physiotherapy practice.

4.8. Be able to advocate for patient/client groups with particular health needs (including the poor and marginalised members of society).

5. Program Fundamentals

The program must comply with the following Higher Education Qualifications Sub-Framework (HEQSF) minimum requirements for a professional degree in Health Sciences:

NQF Exit Level: 8
Minimum total credits: 480 (includes a minimum 30 credits for Research)
Minimum total credits at Level 8: 120

The PPB board strongly recommends programs do **not** exceed this by more than 5% (maximum 510 credits).

The table below defines content, exposures and/or activities with minimum credit load for each (1 credit = 10 notional hours). It also provides *guidance* concerning what the students' need to 'know' or 'know of' (knowledge) and what they need to be able to 'do' (practical or clinical skill(s)).
Please note that work integrated learning (WIL) should occur throughout the four years of the program (refer to the PPB guideline for WIL – Addendum 1).

It remains the prerogative of institutions to develop their curriculum to ensure graduates exit with the necessary knowledge, skills, attitudes and behaviours as outlined in the broad outcomes above (Section 4).

Content/ Exposure/ Activity	Knowledge level	Practical/ clinical skill(s) component	Minimum credits
5.1. Professional Behaviour & Practice Management			**20**
5.1.1 Professionalism	✓	✓	
5.1.2 Bioethics	✓		
5.1.3 Medical Law	✓		
5.1.4 Human rights	✓		
5.1.5 Cultural and socio-economic diversity	✓		
5.1.6 Healthcare systems	✓		
5.1.7 Health promotion & prevention	✓	✓	
5.1.8 Principles of rehabilitation	✓	✓	
5.1.9 Communication (includes effective interviewing, education, counselling)	✓	✓	
5.1.10 Documentation & report writing	✓	✓	
5.1.11 Practice management	✓	✓	
5.2. Research methods (including research ethics)			**35**
5.3. Body structure, organs & systems			**80**
5.3.1 Cellular & Molecular Biology	✓		
5.3.2 Histology	✓		
5.3.3 Chemistry (atomic structure and the nature of bonding in molecules, ionic substances and metals, electrochemistry, stoichiometry, gasses, chemistry of biomolecules, chemical kinetics, Krebs cycle)	✓		
5.3.4 Anatomy of the musculoskeletal-, cardio-vascular-, respiratory-, central and peripheral nervous systems, integumentary system, metabolism, endocrine- and immune systems	✓	✓	
5.3.5 Physiology of the muscle-; neurology; respiratory-; cardio-vascular-; digestive-; renal-; endocrine-; reproductive- and immune systems	✓	✓	
5.3.6 Applied physiology (exercise)	✓	✓	
5.3.7 Changes across the lifespan (from pre-birth to the older person)	✓	✓	
5.3.8 Behaviour and mental health	✓		

Content/ Exposure/ Activity	Knowledge level	Practical/ clinical skill(s) component	Minimum credits
5.4 Biomechanics and human movement			80
5.4.1 Physics (e.g. splinting and mechanics, mechanical energy, work and power, momentum, temperature and thermal energy, waves and radiation, electro-stimulation)	✓	✓	
5.4.2 Normal development (motor control) and changes across the lifespan	✓		
5.4.3 Biomechanics	✓	✓	
5.4.4 Movement analysis	✓	✓	
5.5.5 Ergonomics	✓	✓	
5.5.6 Muscle testing & function	✓	✓	
5.5.7 Joint testing & function	✓	✓	
5.5.8 Neural testing & function	✓	✓	
5.5.9 Cognitive, emotional & behavioural influence on human movement	✓		
5.5.10 Anthropological and sociological perspectives on health/ movement	✓		
5.5 Pathology (aligned with local burden of disease)			40
5.5.1 Anatomical pathology (inflammation, healing and repair; disease on cellular level)	✓		
5.5.2 Non-communicable diseases (including obesity, diabetes, cardio-vascular disease, cancer)	✓		
5.5.3 Communicable diseases (including HIV/AIDS, TB)	✓		
5.5.4 Pain	✓		
5.5.5 Risk factors for illness/movement disorders	✓		
5.5.6 Cognitive, emotional & behavioural functioning in illness and pain	✓		
5.5.7 Anthropological and sociological perspectives on illness	✓		
5.6 Pharmacology			5
5.7 Interpretation of special tests/ investigations			5
5.7.1 Imaging (e.g. X-rays, MRI, fMRI, PET scans, LODOX, ultrasound)	✓		
5.7.2 Pathology tests	✓		
5.7.3 Blood gasses	✓		

Content/ Exposure/ Activity	Knowledge level	Practical/ clinical skill(s) component	Minimum credits
5.7.4 EMG	✓		
5.7.5 EEG	✓		
5.7.6 Movement -function tests (e.g. 3-D motion analysis)	✓		
5.7.7 Doppler (Ultrasound)	✓		
5.7.8 Nerve conduction tests	✓		
5.8 Communication			12
5.8.1 Effective interviewing, education, counselling within the bio-psychosocial model (including verbal & non-verbal skills in communicating information, advice, instruction and professional opinion to service users, colleagues and others)	✓	✓	
5.8.2 Additional (local) language (optional)			
5.9 Functional assessment of the movement system (includes cardio –respiratory systems)			10
5.9.1 Functional outcome measures	✓	✓	
5.9.2 Field tests	✓	✓	
5.10 Manual techniques for assessment			20
5.10.1 Neuro-musculoskeletal assessment (including ROM & flexibility testing [e.g. goniometry, inclinometry, composite flexibility tests], strength, power, endurance [e.g. Oxford scale, dynamometry], neuro-dynamic testing [nerve conduction, sensation, proprioception] balance, and functional testing)	✓	✓	
5.10.2 Cardio-respiratory assessment (e.g. auscultation, chest expansion/ breathing pattern, peak expiratory flow)	✓	✓	
5.10.3 Cardio-vascular assessment (e.g. heart rate, blood pressure, peripheral pulses, perfusion, oedema)	✓	✓	
5.10.4 Neurological status (e.g. level of consciousness)	✓	✓	
5.10.5 Skin integrity (e.g. observation, palpation, wound/scar size measurement/ mapping)	✓	✓	
5.10.6 Fitness testing	✓	✓	
5.10.7 Pain	✓	✓	
5.10.8 'Special tests' / differential diagnostic tests of joint and soft tissue injuries	✓	✓	
5.10.9 Anthropometric measurements	✓	✓	

Content/ Exposure/ Activity	Knowledge level	Practical/ clinical skill(s) component	Minimum credits
5.11 Clinical reasoning process			15
5.11.1 Hypothesis generation and review/modification	✓	✓	
5.11.2 Goal setting	✓	✓	
5.11.3 Identification of personal and professional limitations	✓	✓	
5.11.4 Referral	✓	✓	
5,12 Manual techniques for treatment			20
5.12.1 Neuro musculoskeletal techniques (e.g. facilitation [including proprioceptive and exteroceptive facilitation techniques], strength, power and endurance re-education and training, spinal and peripheral joint mobilisation, soft-tissue mobilisation, neural mobilisation)	✓	✓	
5.12.2 Respiratory techniques for improving lung volume and function (e.g. postural drainage, chest manual techniques [percussion, shaking and vibration, exercise [including breathing exercises], nebulisation, suctioning	✓	✓	
5.12.3 Cardio-vascular techniques (e.g. positioning for pressure care, exercise, electro-physical modalities [thermal effects])	✓	✓	
5.12.4 Skin (e.g. scar and soft tissue mobilisation, electro-physical modalities [thermal and light therapy])	✓	✓	
5.13 Therapeutic exercise			20
5.13.1 Exercise for restoration / recovery	✓	✓	
5.13.2 Exercise for health promotion and prevention of injury and disease	✓	✓	
5.13.3 Behaviour change interventions	✓	✓	
5.14 Assistive and supportive devices			5
5.14.1 Mobility devices (e.g. wheelchairs, walking aides)	✓	✓	
5.14.2 Braces and splinting (e.g. back-slab, corsets, neck collars, knee- , ankle, foot- and elbow braces/splints)	✓	✓	
5.14.3 Bandaging and strapping	✓	✓	
5.14.4 Pressure garments	✓	✓	
5.14.5 Slings	✓	✓	
5.14.6 Other medical technologies (e.g. orthotics, tilt tables, prosthetics, robotics)	✓		

Content/ Exposure/ Activity	Knowledge level	Practical/ clinical skill(s) component	Minimum credits
5.15 Specialised equipment/techniques/therapies			10
5.15.1 Electro-physical modalities (e.g. hot packs, cryotherapy, ultrasound therapy, electrical stimulation [interferential therapy, transcutaneous electrical stimulation, electro-muscular stimulation])	✓	✓	
5.15.2 Other electrotherapy modalities (e.g. LASER, shockwave therapy, light/photo therapy, ultraviolet radiation, shortwave diathermy)	✓		
5.15.3 Aqua/hydrotherapy	✓		
5.15.7 Other technologies (e.g. vibration therapy, ultrasound imaging for musculoskeletal diagnostics and rehabilitation, virtual reality, mirror imaging, nanotechnology, genomics and robotics)	✓		
4.18.7 Dry needling	✓		
5.16 Clinical training*			100
5.16.1 Setting			
a. Primary (rural, community, homes)	✓	✓	
b. Secondary (-hospital)	✓	✓	
c. Tertiary (-hospital)	✓	✓	
d. Intensive care unit	✓	✓	
e. In-patient	✓	✓	
f. Out-patient	✓	✓	
g. Clinic (specialised)	✓	✓	
h. Private practice	✓	✓	
i. Sports practice/event (can include recovery massage)	✓	✓	
j. School (e.g. schools for children with special needs)	✓	✓	
k. Retirement homes	✓	✓	
5.16.2 Exposure/conditions			
Broad spectrum clinical conditions and/or patient presentations	✓	✓	
5.16.3 Activities			
a. Recordkeeping	✓	✓	

Content/ Exposure/ Activity	Knowledge level	Practical/ clinical skill(s) component	Minimum credits
b. Statistics (consultation, management and outcome statistics)	✓	✓	
c. Inter-professional education (e.g. ward rounds, case discussions)	✓	✓	
d. Writing reports and referral letters	✓	✓	
e. Group education and exercise classes	✓	✓	
f. Observe medical/nursing and/or surgical procedures	✓	✓	
g. Reflection	✓	✓	
TOTAL			**480**

5. Quality assurance

5.1 Quality assurance measures should be aligned with the institutional policy, and the program must be **accredited** by the PPB Board of the HPCSA, a process that occurs every 5 years.

5.2 Lecturers lecturing and assessing physiotherapy specific content and or involved in clinical training must be registered as a Physiotherapist with the HPCSA.

5.2.1 It is recommended that lecturers (including external lecturers and clinical supervisors) have a master's degree and/or at least 3 years of clinical experience; and

5.2.2 should demonstrate CPD and ongoing development in teaching and learning

5.3 **Comprehensive study guides** in which exit outcomes, the learning activities, tests and/or examination processes and promotion criteria are clearly indicated, must be available to all students before the start of any module/course.

5.4 **Student feedback** must be sought

5.4.1 Per module (at least every two years for existing modules and with new modules/ courses must be conducted within the first year)

5.4.2 Lecturer feedback (every 1 - 2 years)

5.4.3 Program feedback (this occurs at the end of the fourth/final year and if possible repeated 6-12 months after graduation)

5.5 Lecturer/educator peer assessment (voluntary but recommended especially for new lecturers/ educators)

5.6 **Performance appraisal** for all lecturers/educators (360° recommended)

5.7 Lecturers must comply with all requirements for annual registration with the HPCSA

5.8 **Lecturer to student ratio**:

5.8.1 Theory only - this will depend on mode/method of delivery, the resources and space available

5.8.2 Theory and practical demonstrations - a ratio of no more than 1:25 is recommended

5.8.3 Theory and group work (e.g. problem-based learning) - a ratio of 1:15 is recommended

5.8.4 Practical/tutorials - a ratio of 1:20 is recommended

5.8.5 Clinical setting (e.g. around a patient bedside) - a ratio of 1:5 is recommended (but this can vary based on the nature of pedagogy and clinical setting e.g. ICU vs gym/rehabilitation setting)

5.9 Students must work under **supervision** by a registered Physiotherapist. Refer to the guidelines for placements without a qualified physiotherapist (Addendum 2)

5.10 **Assessment:**

5.10.1 Internal moderation

All summative assessments must be moderated (i.e. checked for alignment with module outcomes and to ensure editorial quality) in line with the institutional policy.

5.10.2 External moderation

5.10.2.1 All exit level module outcomes (i.e. all NEQF 8 exit level modules) and all final year courses/modules must be externally moderated (i.e. checked for alignment with module and program outcomes; and that assessments validity and reliability)

5.10.2.2 All students should be seen (at least in part) by an external examiner [note that an external moderator should not be considered a "second examiner" although may fulfil dual roles]

5.11 **Facilities:**

These must be adequately equipped and maintained to deliver the program, i.e. meet the program and course/module outcomes and comply with basic health and safety regulation.

APPENDIX C.

Expectations from the undergraduate physiotherapy degree by the South African Qualifications Authority

APPENDIX C. Expectations from the undergraduate physiotherapy degree by the South African Qualifications Authority (SAQA, 2018).

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

REGISTERED QUALIFICATION:

Bachelor of Science in Physiotherapy

SAQA QUAL ID	**QUALIFICATION TITLE**			
16512	Bachelor of Science in Physiotherapy			
ORIGINATOR				
University of the Free State				
PRIMARY OR DELEGATED QUALITY ASSURANCE FUNCTIONARY			**NQF SUB-FRAMEWORK**	
CHE - Council on Higher Education			HEQSF - Higher Education Qualifications Sub-framework	
QUALIFICATION TYPE	**FIELD**		**SUBFIELD**	
National First Degree	Field 09 - Health Sciences and Social Services		Curative Health	
ABET BAND	**MINIMUM CREDITS**	**PRE-2009 NQF LEVEL**	**NQF LEVEL**	**QUAL CLASS**
Undefined	612	Level 7	NQF Level 08	Regular-Provider-ELOAC
REGISTRATION STATUS		**SAQA DECISION NUMBER**	**REGISTRATION START DATE**	**REGISTRATION END DATE**
Reregistered		SAQA 06120/18	2018-07-01	2021-06-30
LAST DATE FOR ENROLMENT		**LAST DATE FOR ACHIEVEMENT**		
2022-06-30		2027-06-30		

In all of the tables in this document, both the pre-2009 NQF Level and the NQF Level is shown. In the text (purpose statements, qualification rules, etc), any references to NQF Levels are to the pre-2009 levels unless specifically stated otherwise.

This qualification does not replace any other qualification and is not replaced by any other qualification.

PURPOSE AND RATIONALE OF THE QUALIFICATION

Apply educational knowledge, skills, principles and methods to render a professional service as physiotherapists who have the necessary knowledge, skills, professional thinking, behaviour and attitudes to pursue their profession as physiotherapists and managers of health care in all the ramifications of physiotherapy and health care.

- Responding to the needs of the community
- Responding to business and industry needs
- In life-long learning and the appreciation of the value of education and society.

Qualifiers will demonstrate knowledge, skills and applied competence in the field of study that provide opportunities for continued personal growth, gainful economic activity and rewarding contributions to society.

LEARNING ASSUMED TO BE IN PLACE AND RECOGNITION OF PRIOR LEARNING

Learners who register for this qualification can:

- Learn from predominantly written material;
- Communicate what they have learnt comprehensively in the medium of instruction;
- Learn and take responsibility for their own progress.

NQF Level 4 understanding of at least two of Mathematics, Biology, Physiology or Physical Science.

RECOGNITION OF PRIOR LEARNING:
The qualification recognizes formal and non-formal prior learning (incorporating experiential learning) at a Further Education and Training Certificate Level 4 or a functional equivalent.

RECOGNISE PREVIOUS LEARNING?

Y

EXIT LEVEL OUTCOMES

The planned combination of learning outcomes are integrated with critical cross-field outcomes for this qualification:

Practical Competency
The demonstrated ability/skill to achieve the major Skills/Applied Competency of the qualification.

Foundational Competency
The demonstrated understanding, by the Learner, of the embedded knowledge that underpins the end result/outcome.

Reflective competency
The demonstrated ability/skill to integrate or connect our performances and to reflect on, evaluate and adopt the above competencies.

To successfully complete the qualification the learner will have to demonstrate his/her learning via module specific learning outcomes as well as critical cross-field learning outcomes.

Module specific outcomes will include capabilities relating to module knowledge and the understanding thereof within a specific context, and capabilities relating to integrated knowledge and skills from a variety of disciplines within the field.

Critical cross-field outcomes will include those specified in the learning outcomes for approved modules in the certificate and as appropriate to the learner's field of practice.

1. Identifying, treating and managing patients with physiotherapeutic problems;
2. Educating people in health care as relevant in physiotherapy;
3. Being managers in health care;

The learner will be able to analyse and apply the basic principles relevant to the following:

1. Sound knowledge and understanding of health care, the promotion thereof, and the prevention, management and treatment of disease and injury relevant to physiotherapy;

2. Proficiency in basic clinical and physiotherapeutic skills;
3. Skills in applying manual therapeutic techniques, exercises and electro-physical modalities;
4. Skills in utilising diagnostic and treatment aids, as well as the services of other health professions.

ASSOCIATED ASSESSMENT CRITERIA

A learner should provide evidence of learning competency (knowledge, skills and attitude) by means of the following:

1. Continuing, formal evaluations
2. Continuing, informal evaluations
3. Formal end evaluations.

INTEGRATED ASSESSMENT:

Competence is achieved, through continuous assessment by demonstrating the ability to achieve the outcomes of the Qualification:

- written, oral and practical examinations in accordance with set standards;
- skills/clinical tests and examinations;
- consultations and treatment of patients provided in accordance with set professional standard;
- a research project conducted to comply with set research standards;

This will be supported by a module credit system, followed by a final exam on the modules for which credit was not obtained.

Assessment documents are moderated to ensure that:

- They conform to the scope and con text of the competency as stipulated in the qualification
- They are constructed in such a way that the Assessor assesses the critical outcomes applied, during the Learners activity performances, towards achieving an outcome.

Assessments are:
- To include confirmation of the Embedded Know ledge component to that the Foundational Competency is achieved.
- To be verified by Internal Verifiers to ensure valid, credible, true and fair results.

ARTICULATION OPTIONS

Vertical: Access to Postgraduate studies at Master's level, M. Sc. (Physiotherapy), Tertiary Education Diploma (Physiotherapy).

Horizontal: Other Bachelor's programmes or Tertiary Education Diploma in Physiotherapy.

MODERATION OPTIONS

- A system of external peer review and evaluation of departments including evaluation of the standards and assessment practices per Department.
- Qualifications: The minimum academic and workplace experience requirements at a level above the level of moderation.
- Appropriate professional criteria will be drafted in the case of workplace assessment.
- Mentorship: All junior and new members of staff are mentored by senior members as they work together in teams. All assessment done by external assessors is quality controlled by internal staff.
- Any moderation criteria as determined by the ETQA.
- South African Physiotherapy Board and Association of Physiotherapists.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

The academic staff of the University of the Free State complies with standards set by Senate and will exercise their assessment within the approved quality assurance system of the University. Assessors will also meet all criteria as stipulated by the relevant ETQA.

Assessors are:

- Subject matter specialists.
- Registered with the awarding body.
- Accredited by the awarding body after achieving competency against Unit Standards of competence for Assessors.
- To be administrated, advised and coached by an Internal Verifier.

REREGISTRATION HISTORY

As per the SAQA Board decision/s at that time, this qualification was Reregistered in 2006; 2009; 2012; 2015.

NOTES

N/A

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION:

NONE

PROVIDERS CURRENTLY ACCREDITED TO OFFER THIS QUALIFICATION:

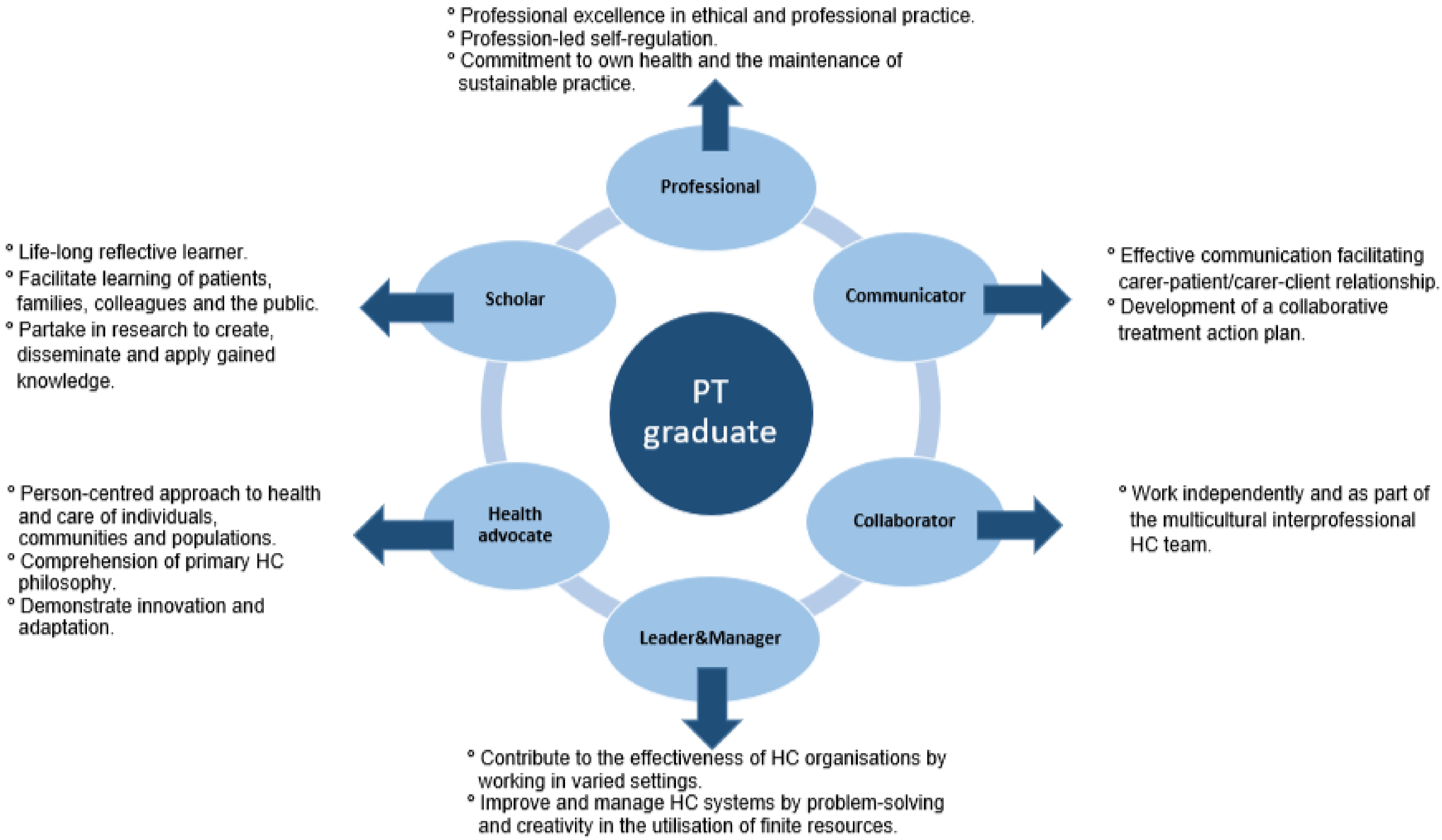
This information shows the current accreditations (i.e. those not past their accreditation end dates), and is the most complete record available to SAQA as of today. Some Primary or Delegated Quality Assurance Functionaries have a lag in their recording systems for provider accreditation, in turn leading to a lag in notifying SAQA of all the providers that they have accredited to offer qualifications and unit standards, as well as any extensions to accreditation end dates. The relevant Primary or Delegated Quality Assurance Functionary should be notified if a record appears to be missing from here.

1. University of the Free State

APPENDIX D.

Attributes expected of South African physiotherapy graduates

APPENDIX D. Attributes expected of South African physiotherapy graduates (Adapted from SAQA, 2018 and HPCSA, 2014; compiled by the researcher A. van der Merwe 2019).



SA: South Africa
HC: Healthcare
PT: Physiotherapy

APPENDIX E.

Approval letter from Health Sciences Research Ethics Committee (UFS)

APPENDIX E. Approval letter from Health Sciences Research Ethics Committee (UFS)

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA

UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

IRB nr 00006240
REC Reference nr 230408-011
IORG0005187
FWA00012784

30 August 2017

MRS ANKE VAN DER MERWE
DEPT OF PHYSIOTHERAPY
FACULTY OF HEALTH SCIENCES
UFS

Dear Mrs Anke Van Der Merwe

HSREC 108/2017 (UFS-HSD2017/1143)
PRINCIPAL INVESTIGATOR: MRS ANKE VAN DER MERWE
PROJECT TITLE: A FRAMEWORK FOR THE INTEGRATION OF SIMULATION IN UNDERGRADUATE PHYSIOTHERAPY: CONTEXTUALISED FOR SOUTH AFRICA

APPROVED

1. You are hereby kindly informed that the Health Sciences Research Ethics Committee (HSREC) approved this protocol at the meeting held on 29 August 2017.
2. The Committee must be informed of any serious adverse event and/or termination of the study.
3. Any amendment, extension or other modifications to the protocol must be submitted to the HSREC for approval.
4. A progress report should be submitted within one year of approval and annually for long term studies.
5. A final report should be submitted at the completion of the study.
6. Kindly use the **HSREC NR** as reference in correspondence to the HSREC Secretariat.
7. The HSREC functions in compliance with, but not limited to, the following documents and guidelines: The SA National Health Act. No. 61 of 2003; Ethics in Health Research: Principles, Structures and Processes (2015); SA GCP(2006); Declaration of Helsinki; The Belmont Report; The US Office of Human Research Protections 45 CFR 461 (for non-exempt research with human participants conducted or supported by the US Department of Health and Human Services- (HHS), 21 CFR 50, 21 CFR 56; CIOMS; ICH-GCP-E6 Sections 1-4; The International Conference on Harmonization and Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH Tripartite), Guidelines of the SA Medicines Control Council as well as Laws and Regulations with regard to the Control of Medicines, Constitution of the HSREC of the Faculty of Health Sciences.

Yours faithfully

....

DR SM LE GRANGE
CHAIR: HEALTH SCIENCES RESEARCH ETHICS COMMITTEE

Health Sciences Research Ethics Committee
Office of the Dean: Health Sciences
T: +27 (0)51 401 7795/7794 | E: ethicsfhs@ufs.ac.za
Block D, Dean's Division, Room D104 | P.O. Box/Posbus 339 (Internal Post Box G40) | Bloemfontein 9300 | South Africa
www.ufs.ac.za

APPENDIX F.

Information librarian involvement: Systematic review

APPENDIX F. Information librarian involvement: Systematic review

UNIVERSITY OF THE FREE STATE
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YUNIVESITHI YA FREISTATA
UFS UV

Frik Scott Medical Library
University of the Free State
PO Box 12327
Bloemfontein
9300
051 401 7786

11-10-2019

To whom it may concern

INFORMATION LIBRARIAN INVOLVEMENT: SYSTEMATIC REVIEWS

A systematic review as research methodology must demonstrate that sufficient effort has been made to identify as many methodologically sound studies as possible to answer a clinical question. As such, the information search is a critical step in the systematic review process.

In order to effectively conduct a systematic review the skills of an experienced information librarian are required. With regards to the study A FRAMEWORK FOR THE INTEGRATION OF SIMULATION IN UNDERGRADUATE PHYSIOTHERAPY: CONTEXTUALISED FOR SOUTH AFRICA by Anke van der Merwe, the information librarian will:

- Design the search strategy
- Run information searches on the following databases:
    - Academic Search
    - Africa-Wide
    - CINAHL
    - Cochrane Library
    - Medline
    - ProQuest Dissertations and Theses
    - Scopus (Elsevier)
    - SportDiscus
- Assist in obtaining the full text of references to articles
- Write the "sources and search methodology" section

The investigator will:
* Provide direction and feedback for the search
* Complete the screening and inclusion/exclusion analysis of articles

I hope you find this in order.

Yours sincerely,

Annamarie du Preez
Head: Frik Scott Medial Library

APPENDIX G.

Systematic review search results

APPENDIX G. Systematic review search results.

(clinical* n3 simulat*) and ("conceptual framework*" or model* or "instruction* design*")

And

Title (("health care*" or healthcare* or nurs* or physiotherap* or "physical therap*" or "occupational therap*" or medic* or "conceptual framework*" or model* or "instruction* design*") and simulat*)

Figure 1. Exact search strings used during systematic review process

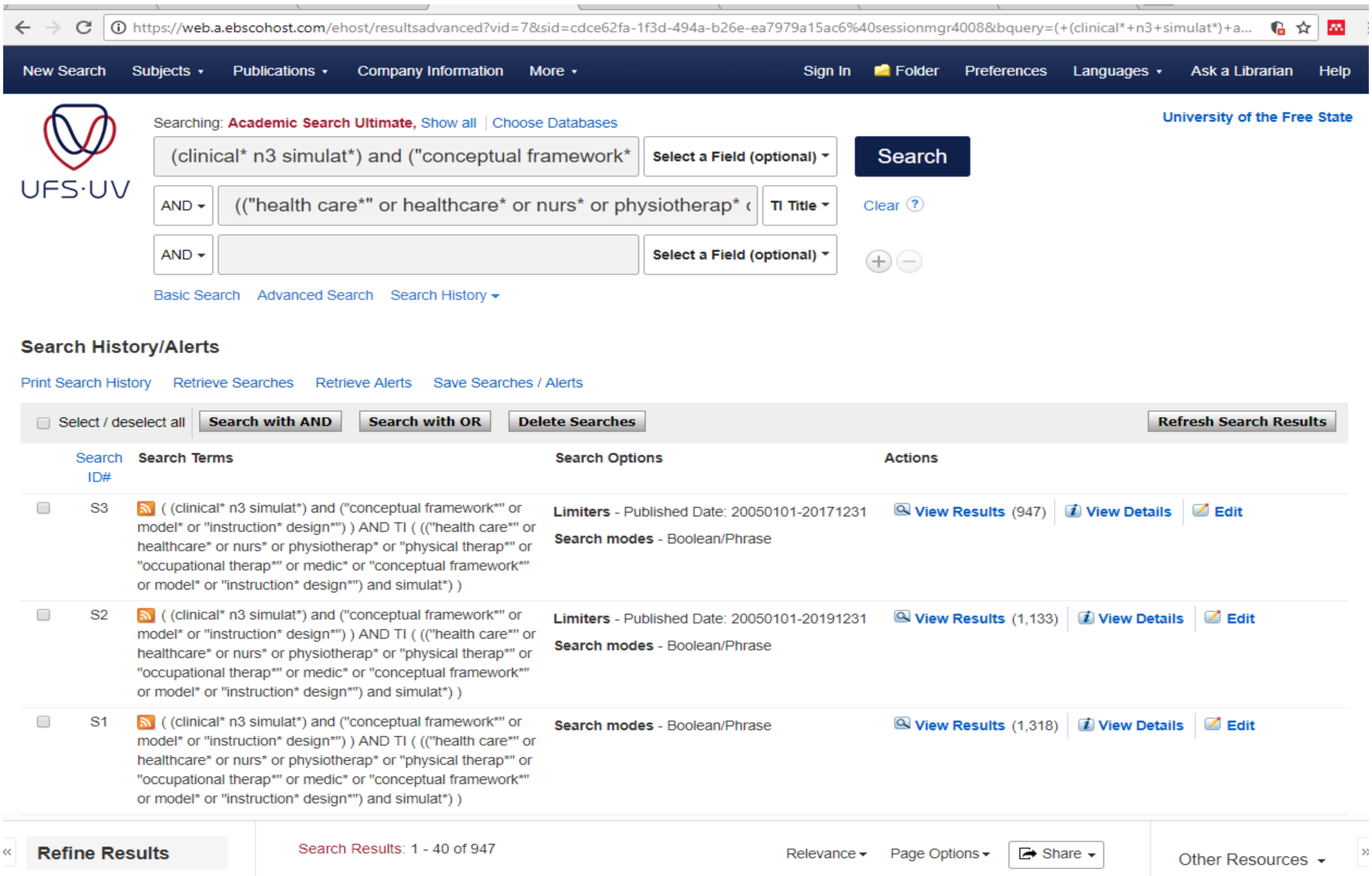

Figure 2. Results via EBSCOhost database, prior to deduplication

Table 1. Search results per database prior to application of inclusion criteria

Database	n
MEDLINE with Full Text	221
MEDLINE	220
CINAHL with Full Text	177
Academic Search Ultimate	141
Health Source: Nursing/Academic Edition	46
Education Source	45
PsycINFO	29
Applied Science & Technology Source Ultimate	15
OpenDissertations	10
ERIC	9
Africa-Wide Information	8
Business Source Ultimate	6
SPORTDiscus with Full Text	6
Library, Information Science & Technology Abstracts	3
Teacher Reference Center	3
Art & Architecture SourceSource	2
MasterFILE Premier	2
Communication & Mass Media Complete	1
Newspaper Source	1
Regional Business News	1
Humanities Source Ultimate	1
Total	**947**

** MEDLINE and MEDLINE with full text were indicated on the database search. The 220 articles included in the MEDLINE database are however exact duplicates of those available in the MEDLINE with full text database.*

APPENDIX H.

Permission for use of appraisal tool

APPENDIX H. Permission for use of appriasal tool.

1 of 2

RE: Checklist enquiry

Thomas, James <james.thomas@ucl.ac.uk>

Thu 2018-02-25 04:28 PM

Inbox

To:

Anke Van Der Merwe;

You replied on 2018-02-26 07:59 AM.

Dear Anke,

Thank you for your email and your interest in our work. We are currently writing a paper on this tool, but you can see the full version in several of our published reviews. E.g. if you download the 'technical report' from this page : http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=2466 you'll find the took in Appendix H and an account of how we used it on page 74-, and Appendices B and C.

The paper has been 'paused' for years, but is now moving forwards (at last!). Hopefully the above will help while we're waiting for the paper to be finalised.

Best wishes, James.

From: Anke Van Der Merwe <GonzalesA@ufs.ac.za>
Sent: 25 February 2018 14:55
To: j.thomas@ioe.ac.uk
Subject: Checklist enquiry
Importance: High

Good day

My name is Anke van der Merwe. I am a physiotherapy lecturer and PhD student at the University of the Free State, South Africa. I am currently busy with a systematic review of simulation framework literature, and really appreciated and enjoyed your article titled Methods for the thematic synthesis of qualitative research in systematic reviews. It really helped me a lot to formulate the way forward, as my studies included are not the typical studies used for "standard" systematic reviews.

I have a problem with quality assessment of the included studies and see you proposed "sensitivity analyses" in your article. If I understand correctly you formulated your own checklist to assess the study rigor. Have you published the formulated checklist somewhere? Or would it be possible for me to utilise and cite the checklist for my study?

I appreciate your time and assistance in this regard.

Kind regards

Anke

APPENDIX I.

Appraisal criteria

APPENDIX I. Appraisal criteria [adapted, with permission, by the researcher from Rees, Oliver, Woodman, & Thomas (2009)].

Criteria	Options	
1 Were steps taken to increase rigour in the sampling? _Consider whether:_ _*the sampling strategy was appropriate to the questions posed in the study (e.g. was the strategy well reasoned and justified?);_ _*attempts were made to obtain a diverse sample of the population in question (think about who might have been excluded; who may have had a different perspective to offer);_ _*characteristics of the sample critical to the understanding of the study context and findings were presented (i.e. do we know who the participants were in terms of, for example, basic socio-demographics, characteristics relevant to the context of the study, etc.)._		Yes, a fairly thorough attempt was made
		Yes, several steps were taken
		Yes, a few steps were taken
		Not stated/ Not at all
2 Were steps taken to increase rigour in the data collected? _Consider whether:_ _*data collection tools were piloted/(and if quantitative) validated;_ _*(if qualitative) data collection was comprehensive, flexible and/or sensitive enough to provide a complete and/or vivid and rich description of people's perspectives and experiences (e.g. did the researchers spend sufficient time at the site/with participants? Did they keep 'following up'? Was more than one method of data collection used?);_ _* steps were taken to ensure that all participants were able and willing to contribute._		Yes, a fairly thorough attempt was made
		Yes, several steps were taken
		Yes, a few steps were taken
		Not stated/ Not at all
3 Were steps taken to increase rigour in the analysis of the data? _Consider whether:_ _* data analysis methods were systematic (e.g. was a method described/can a method be discerned?); *diversity in perspective was explored;_ _* (if qualitative) the analysis was balanced in the extent to which it was guided by preconceptions or by the data);_ _*the analysis sought to rule out alternative explanations for findings (in qualitative research this could be done by, for example, searching for negative cases/exceptions, feeding back preliminary results to participants, asking a colleague to review the data, or reflexivity; in quantitative research this may be done by, for example, significance testing)._		Yes, a fairly thorough attempt was made
		Yes, several steps were taken
		Yes, a few steps were taken
		Not stated/ Not at all

Criteria	Options	
4 Were the findings of the study grounded in/ supported by the data? *Consider whether:* **enough data are presented to show how the authors arrived at their findings;* **the data presented fit the interpretation/support claims about patterns in data;* **the data presented illuminate/illustrate the findings; *(for qualitative studies) quotes are numbered or otherwise identified and the reader can see that they don't just come from one or two people.*		Good grounding/ support
		Fair grounding/ support
		Limited grounding/ support
		No grounding/ support
5 Please rate the findings of the study in terms of their breadth and depth. *Consider whether: (NB: it may be helpful to consider 'breadth' as the extent of description and 'depth' as the extent to which data has been transformed/analysed);* **a range of issues are covered;* ** the perspectives of participants are fully explored in terms of breadth (contrast of two or more perspectives) and depth (insight into a single perspective);* **richness and complexity has been portrayed (e.g. variation explained, meanings illuminated); *there has been theoretical/conceptual development.*		Limited breadth or depth
		Good/ fair breadth but limited depth
		Good/ fair depth but limited breadth
		Good breadth and depth
6 To what extent does the study privilege the perspectives and experiences of experts in the field of healthcare simulation and healthcare education? *Consider:* ** whether there was a balance between open-ended and fixed response options (where applicale);* ** were various credible data sources used;* ** whether there was a balance between the use of an a priori coding framework and induction in the analysis;* **the position of the researchers (did they consider it important to collect a wide variety of perspectives?);* ** whether steps were taken to assure confidentiality (where applicable)?.*		Not at all
		A little
		Somewhat
		A lot
7 Overall, what weight would you assign to this study in terms of the reliability/trustworthiness of its findings? *Guidance: Think (mainly) about the answers you have given to questions 1 to 4 above.*		Low
		Medium
		High
8 What weight would you assign to this study in terms of the usefulness of its findings for this review? *Guidance: Think (mainly) about the answers you have given to questions 5 and 6 above and consider:* **the match between the study aims and findings and the aims and purpose of the synthesis; *its conceptual depth/explanatory power.*		Low
		Medium
		High

APPENDIX J.

Systematic review data extraction sheet

APPENDIX J. Systematic review data extraction sheet (compiled by the researcher)

Author	Year	Location	Target population	Study design	Simulation modalities	Themes identified	Elements included in framework
Guinez-Molinos *et al.*	2017	Chile	Medicine	Literature review	All in combination with Computor support collaborative learning	Educational design, Students design, Running simulation scenario, Participants and workspace	Design, Outcomes, Resources, Educator role, Assessment (individual, peer, tool), Needs analysis, Debriefing, Student orientation
Jeffries *et al.*	2015	United States of America	Nursing	Literature review/ adjustment of	All	Facilitator (teacher)*; Participant (student); Educational strategies (practices); Design characteristics and simulation; Background;	Design, Outcomes, Resources, Educator role, Feedback, Scaffolding, Training, Debriefing, Student orientation, Student goal setting, Programme evaluation
Khamis *et al.*	2015	Saudi Arabia	Medicine (surgery)	Literature review; Delphi method	All	Problem identification and general needs assessment, Targeted needs assessment, Goals and objectives, Educational strategies, Individual assessment and feedback, Programme evaluation, Implementation	Design, Outcomes, Resources, Instructional method, Scaffolding, Assessment (individual), Training, ML/DP, Needs analysis, Debriefing, Student pre-test, Programme evaluation, Validation
Chiniara *et al.*	2013	Canada	Healthcare	Literature review	All	Medium, Simulation modality, Instructional method, Presentation	Design, Outcomes, Resources, Educator role, Feedback, Instructional method, Assessment (self), Debriefing
Motola *et al.*	2013	United Kingdom	Healthcare	Literature review	All	Plan, Implement, Evaluate, Revise	Design, Outcomes, Resources, Feedback, Instructional method, Assessment (individual, self), Curriculum development, Training, Debriefing, Programme evaluation, Adjustments
Zevin *et al.*	2012	United States of America	Medicine (surgery)	Literature review, Delphi method	All	Predevelopment analysis, Curriculum development, Curriculum validation, evaluation and improvement	Desing, Outcomes, Resources, Educator role, Feedback, Scaffolding, Assessment (individual,tool), Curriculum development, ML/DP, Debriefing, Theoretcal preparation, Student pre-test, Programme evaluation, Validation, Adjustments
McClusky & Smith	2008	United States of America	Medicine (surgery)	Literature review	All	Knowledge acquisition, Psychomotor assessment and initial acquisition, Integration of knowledge and Psychomotor skills, Supervised real-world application, Mastery	Desing, Outcomes, Resources, Educator role, Feedback, Instructional method, Scaffolding, Assessment (individual,tool), ML/DP, Needs analysis, Debriefing, Theoretcal preparation
Binstadt *et al.*	2007	United States of America	Medicine (emergency medicine)	Literature review	All	None stipulated	Desing, Outcomes, Resources, Educator role, Instructional method, Scaffolding, Curriculum development, Debriefing, Student orientation, Theoretical preparation, Programme evaluation

All simulation modalities refer to the consideration of computor-based simulation, simulated patients, simulated clinical immersion, procedural simulation.

** Bracketed words indicate the terminology used in the original framework (Jeffries, 2005).*

APPENDIX K.

Quality of studies meeting each appraisal tool criterion.

APPENDIX K. Quality of studies meeting each appraisal tool criterion.

I= Interpretive, A= Aggregative

Key: 1. Guinez-Molinos et al. (2017); 2. Khamis et al. (2016); 3. Jeffries et al. (2015); 4. Chiniara et al. (2013); 5. Motola et al. (2013); 6. Zevin et al. (2012); 7. McClusky&Smith (2008); 8. Binstadt et al. (2007).

Quality appraisal question	**Study type**	**Answer options**			
		A thorough attempt	**Several steps**	**A few steps**	**Not stated/ Not at all**
1.Were steps taken to increase rigour in the sampling?	I	N=1 2	-	N=1 1	N=5 3, 4,5,7,8
	A	N=1 6	-	-	-
2.Were steps taken to increase rigour in the data collected?	I	-	N=1 2	N=2 3, 5	N=4 1,4,7,8
	A	N=1 6	-	-	-
3.Were steps taken to increase rigour in the analysis of the data?	I	N=1 2, 3	-	N=2 5,8	N=4 1,4,7,8
	A	N=1 6	-	-	-
		Good grounding/ support	**Fair grounding/ support**	**Limited grounding/ support**	**No grounding/ support**
4.Were findings of the study grounded in/ supported by data?	I	N=5 2, 3,4,5,7	N=1 1	N=1 8	-
	A	N=1 6	-	-	-

Quality appraisal question	Study type	Answer options			
		Good breadth and depth	**Good/ fair depth, limited breadth**	**Good/ fair breadth, limited depth**	**Limited breadth/ depth**
5.Breadth and depth of findings?	I	N=3 2,3,5	N=2 1,7	N=1 4	N=1 8
	A	N=1 6	-	-	-
		A lot	**Somewhat**	**A little**	**Not at all**
6.To what extent does the study privilege the perspectives and experiences of experts in the field of healthcare simulation and healthcare education?	I	N=3 2,3,5	-	N=3 1,4,7	N=1 8
	A	-	N=1 6	-	-

APPENDIX L.

Consensus discussion regarding identified themes and codes following systematic review

APPENDIX L. Consensus discussion regarding identified themes and codes following systematic review.

Researcher	**Research assistant**	**Discussion**
The code Resources included all available simulation modalities, financial resources, human and facility resources as well as time for planning and implementation	Time for planning and integration as well as financial resources were each coded separately from human, facility and simulation modality resources	Discussion between the researcher and research assistant achieved consensus that both educator time and financial resources are essentially classified as resources and were subsequently collapsed in the Resources code
No programme validation component identified in Binstadt *et al* (2007) as part of the theme Programme evaluation	Identified a programme validation component identified in Binstadt *et al* (2007) as part of the theme Programme evaluation	Binstadt *et al* (2007) was reviewed again and it was ascertained that the aim of the simulation centre was to validate simulation as an educational method and validation was not specifically mentioned as part of the curriculum and was therefore deselected in Table 3.1
Mastery learning and Deliberate practice were grouped as one code in the Planning theme	Mastery learning and Deliberate practice were identified as separate codes in the Planning theme	In line with the concept clarification regarding Mastery learning and Deliberate practice, the two codes were collapsed as one code.
Non-technical training was grouped as part of the code Outcomes	Non-technical training was identified as a separate code in the Planning theme	Following re-examination of the research study's provided definition, consensus was reached that non-technical skills training refers to certain graduate attributes which forms part of programme outcomes and it was subsequently grouped with Outcomes
Student goal setting was coded as part of the Implementation theme	Student goal setting was not coded	The article of Jeffries (2005) was reviewed again and clear mention was made in the article regarding students being required to set individual goals. This code was subsequently grouped in the Implementation theme as it had direct influence on the execution of the SBLE's

APPENDIX M.

Information document (Delphi survey)

APPENDIX M. Information document (Delphi survey).

A FRAMEWORK FOR THE INTEGRATION OF SIMULATION IN UNDERGRADUATE PHYSIOTHERAPY: CONTEXTUALISED FOR SOUTH AFRICA (DELPHI SURVEY)

Dear Participant

My name is Anke van der Merwe and I am currently enrolled for my PhD degree at the Department of Physiotherapy in the Faculty of Health Sciences at the University of the Free State (South Africa). To fulfil my qualification, I am undertaking to do research to develop a proposed framework for the integration of simulation in the South African undergraduate physiotherapy programme.

Research is defined as the process to learn the answer to a question. In this study the researcher wants to learn how a variety of simulation activities can be integrated into the South African undergraduate physiotherapy programme.

Simulation is widely used within the healthcare setting to enhance and develop skills which are deemed essential for patient evaluation and treatment within a safe and non-threatening environment (Labuschagne 2012). Various research studies have indicated the advantageous use of simulation in enhancing clinical confidence, the acquirement of psychomotor skills, facilitating effective communication and teamwork (Bednarek *et al.* 2014; Jones & Sheppard 2007; Ohtake *et* al.2013). Simulation-based education has received a great deal of attention over the past decade and subsequently shifted to the centre stage in healthcare education (Kneebone *et al.* 2006; Good 2003; Berragan 2011; Bland *et al.* 2011).

Although simulation has been increasingly utilised for undergraduate training of healthcare professionals worldwide, very little information regarding the integration of simulation within the undergraduate physiotherapy curriculum could be found (Blackstock *et al.* 2013;Jones & Sheppard 2008; Ladyshewsky *et al*. 2000). South Africa also boasts with a very diverse student profile and experiences unique challenges when it comes to undergraduate healthcare education, therefore highlighting the need for a context specific educational research to be executed. No mention in both national and international literature was made regarding a specific framework detailing the integration of simulation within the South African undergraduate physiotherapy programme.

I am hereby inviting you to participate in this research study research study to enable me to collect the required data to compile a proposed framework for the integration of simulation within the South African undergraduate physiotherapy programme.

What is involved in the study? A multi method research study will be conducted by means of firstly, a systematic document review of all published simulation-based frameworks in healthcare education, with a focus on curricular integration of simulation. Secondly a Delphi survey will be executed amongst approximately eight to twelve national and international experts within the physiotherapy and/ or healthcare simulation-based education fields. Elements for possible inclusion in the conceptual framework will be sent to the expert review panel in the form of a Delphi survey for deliberation and discussion. The third and final study phase will be to subject the conceptual framework to a validation meeting to further deliberate and contextualise it for the South African undergraduate physiotherapy context.

If you agree to participate in the Delphi survey, you will be asked to complete and return the signed consent form. Following the receipt of the signed consent form, you will receive an e-mail with an electronic link to the questionnaire, which you answer electronically and then click “submit” to send the completed questionnaire. All panel member answers will be analysed by the researcher and only statements not achieving consensus between reviewers (consensus is defined as 70% or more panelists agreeing on a statement), or any additional comments or statements made by panel members, will be included in the second survey round. Panel members will receive a short report detailing all consensus achieving statements were which will be removed from subsequent rounds. Relevant detailed comments or justifications provided by panel members describing their reasoning which resulted in statement content and/ or context being altered will also be provided in the report. This iterative process will continue until no more content or context changing suggestions are put forward by panel members and data saturation is achieved. You will have two weeks to complete each survey round. Each new round of the survey will be sent out no later than two weeks following the submission deadline for the preceding survey round. It is foreseen that each questionnaire should take no more than 30 minutes to complete.

As no physical interventions are being tested, and no questions of a sensitive nature are being asked, the researcher foresees no risk for participation in this study. Participants will receive no remuneration for study participation, and no “out of pocket” expenses are foreseen for participants. By participating in this study reviewers will provide the researcher with invaluable feedback and opinion regarding the elements required for a proposed conceptual framework for the effective integration of simulation in the South African undergraduate physiotherapy programme. It is the vision of the researcher that by compiling this framework for simulation integration, all South African physiotherapy educators will be guided in the effective and quality integration of simulation within their undergraduate programme to address the unique needs of our South African student population.

Participation in this research study is voluntary, and refusal to participate will involve no penalty or loss of benefits. You may discontinue participation at any time without penalty or loss of benefits. Efforts will be made to keep all personal information confidential. All reviewers will remain anonymous to each other, but only confidential to the researcher. Absolute confidentiality cannot be guaranteed. If research results are published or presented at conferences, the researcher will ensure that no identifying information of participants is included. Personal information may however be disclosed if required by law.

If you have any questions or queries regarding the research study or participation in this study, feel free to contact the researcher at gonzelaesa@ufs.ac.za or alternatively on +27 824464923. Permission has been obtained from the Health Sciences Research Ethics Committee of the University of the Free State. You may contact the secretariat of the committee if you have any queries regarding your rights as research participant. Contact number: +2751-401 7795.

Your time and valuable input is greatly appreciated.

Regards

Anke van der Merwe

APPENDIX N.

Amendments to Delphi survey following the pilot study.

APPENDIX N. Amendments to Delphi survey following the pilot study.

**The requested terminology clarification was adjusted in all statements by replacing “simulated activity/ scenario” with the more accepted term “simulated-based learning experience”.*
***Italic sections were added for clarification.*

Original statement	Added/ Adjusted statement	Reason for addition/ adjustment
Simulated scenarios can be designed by students, with educator facilitation, and according to the stipulated learning outcomes.	Simulated-based learning experiences can be designed by students, with educator facilitation.	Statement expanded as it contained two sections which could make commenting difficult.
	Simulated-based learning experiences must be designed according to the stipulated learning outcomes.	
The logistics for each simulated activity/ scenario must be planned carefully regarding the activity/ scenario timeframe.	The logistics for each simulated-based learning experience must be planned carefully regarding the time frame of each simulated-based learning experience.	No change.
	The simulated-based learning experience time frame should include planning, preparation, setup, training of standardised patients (if used), actual simulation and dismantling.* *Feedback/ debriefing is addressed under separate headings.****Mastery learning is addressed under a separate heading.*	Clarity required regarding what should be considered when planning the SBLE time frame.
New statement.	Personnel (educators and support staff) must be identified who will be able to assist with recruitment, training and general administrative support of simulated patients (SPs) for each of the planned simulated activities/ scenarios.	Simulated patient recruitment and training is timeous and should be considered and planned for.
All available simulation modalities and available equipment must be identified and considered for use.	All available simulation modalities (e.g. standardised patients, virtual reality, part-task trainers) must be identified and considered for use.	Clarity required regarding what simulation modalities and equipment entails.
New statement.	Facilities equipped for hosting simulated-based learning experiences may be shared between disciplines (e.g. medical and rehabilitative therapy students).	Required from the view point of minimising costs and fostering collaboration.

Original statement	New/ Adjusted statements	Reason for addition or adjustment
New statement.	The educator must fulfil the role of an assessor following the completion of the simulated-based learning experience. **Further options regarding assessment is explored in Theme 3 (Assessment).*	Statement requested to clarify the role of the educator relating assessment.
New statements relating to the instructional methods utilised.	When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to the theoretical work and detailed outcomes for the learning experience.	Detailed statements required to ascertain which instructional methods are to be utilised and what the role of the educator entails for each.
	When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator must provide student training prior to the learning experience with regards to the resources (e.g. equipment) which will be utilised.	
	When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to all the resources required to complete the learning experience (venue, equipment, consumables etc).	
	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to the theoretical work and detailed outcomes prior to the learning experience	
	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide training of all involved stakeholders (educators, facilitators, simulated patients, students) prior to the learning experience with regards to the specific expectations and outcomes of the learning experience.	

Original statement	New/ Adjusted statements	
New statements relating to the instructional methods utilised.	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide training of all involved stakeholders (educators, facilitators, students) prior to the learning experience with regards to the resources (e.g. equipment) which will be utilised	Detailed statements required to ascertain which instructional methods are to be utilised and what the role of the educator entails for each.
	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to a trained facilitator and debriefer during and after the learning experience	
New statements relating to scaffolding	Simulated-based learning experiences for novice students may be more focussed on technical skills training	Detailed statements required to illustrate how scaffolding is to be implemented.
	Simulated-based learning experiences for more advanced students may be more focussed on more complex patient scenarios	
All stakeholders (educators, simulation experts, educationalists etc.) involved in the development of simulated activities/ scenarios are required to receive adequate training on how to integrate and develop these simulated activities/ scenarios	All stakeholders (educators, simulation experts, educationalists etc.) involved in the development of simulated-based learning experiences are required to receive training on how to integrate and develop these learning experiences	Amendment related to suggested terminology clarification.
New statements relating to debriefing	All educators involved in the facilitation of simulated-based learning experiences are required to receive training in debriefing	The participant was of the opinion that due to the importance of debriefing in SBE, clear and concise statements relating to debriefing was required.
	When debriefing of each simulated-based learning experience will take place must be decided upon during the planning phase (immediately following completion of the learning experience, or at a later stage)	
	The specific debriefing method and tool used for each simulated-based learning experience must be decided upon during the simulation planning phase	

APPENDIX O.

Delphi survey round 1

APPENDIX O. Delphi survey round 1.

Q1 A needs analysis identifying societal needs, which could be addressed by the integration of simulation into the programme, must be performed during the planning phase.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q2 A needs analysis identifying institutional needs, which could be addressed by the integration of simulation into the programme, must be performed during the planning phase.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q3 A needs analysis identifying discipline specific needs, which could be addressed by the integration of simulation into the programme, must be performed during the planning phase.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q4 Specific learning outcomes for each simulated-based learning experience must be carefully developed prior to the learning experience.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not Applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q5 The content of each simulated-based learning experience must be carefully developed prior to the learning experience.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

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Q6 Simulated-based learning experiences can be designed by students, with educator facilitation.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q7 Simulated-based learning experiences must be designed according to the stipulated learning outcomes.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q8 Educators must identify the team/ group composition for each simulated-based learning experience.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q9 The level of fidelity required for each simulated-based learning experience must be considered by educators and planned accordingly.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q10 The logistics regarding which simulation modality/ modalities are to be used to achieve the required learning outcomes must be planned carefully for all simulated-based learning experiences.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q11 The logistics for each simulated-based learning experience must be planned carefully regarding the time frame of each simulated-based learning experience.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q12 The simulated-based learning experience time frame should include planning, preparation, setup, training of standardised patients (if used), actual simulation and dismantling.* Feedback/ debriefing is addressed under separate headings.**Mastery of learning is addressed under a separate heading.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	STNEMMOC	DATE
	There are no responses.	

Q13 All available simulation modalities (e.g. standardised patients, virtual reality, part-task trainers) must be identified and considered for use.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q14 Available financial resources must be identified to assist with the implementation of simulation within the programme.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q15 Simulation experts (including experts from other disciplines) must be identified and included in the initial planning process.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q16 Time must be allocated specifically for simulation planning and scenario development for all involved educators.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q17 Personnel (educators and support staff) as well as participants must be identified who will be able to assist with each of the planned simulated-based learning experiences.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q18 Personnel (educators and support staff) must be identified who will be able to assist with recruitment, training and general administrative support of simulated patients (SPs) for each of the planned simulated activities/ scenarios

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q19 Facilities equipped for hosting simulated-based learning experiences may be shared between disciplines (e.g. medical and allied health science students).

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q20 Educators must identify which of their intended subject/ module/ programme outcomes could be better achieved by the use of simulation-based activities, and plan such learning experiences accordingly.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q21 Educators must identify the specific available simulation modalities, which could best achieve each of the individual learning outcomes..

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q22 Educators must ensure constructive alignment between each simulated-based learning experience outcomes and the subject/ module outcomes.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q23 Detailed learning outcomes for each simulated-based learning experience must be constructed.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

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Q24 Including aspects of non-technical training in all simulated-based learning experiences is required.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q25 Uni-professional simulated-based learning experiences must include a non-technical training component.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q26 Inter-professional simulated-based learning experiences must include a non-technical training component.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q27 The role of the educator must be clearly defined prior to the simulated-based learning experience.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q28 The educator must fulfil the role of a facilitator during the simulated-based learning experience and be available for questions during the simulated-based learning experience.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q29 The educator must fulfil the role of a facilitator only after the completion of the simulated-based learning experience.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q30 The educator must fulfil the role of an assessor following the completion of the simulated-based learning experience.* Further options regarding assessment is explored in Theme 3 (Assessment).

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q31 The instructional method to be utilised during each simulated-based learning experience must be identified during the planning phase of the programme.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q32 When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to the theoretical work and detailed outcomes for the learning experience.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
Comments	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q33 When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator must provide student training prior to the learning experience with regards to the resources (e.g. equipment) which will be utilised.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

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Q34 When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to all the resources required to complete the learning experience (venue, equipment, consumables etc)

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q35 When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to the theoretical work and detailed outcomes prior to the learning experience.

Answered: 0 Skipped: 1

No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q36 When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide training of all involved stakeholders (educators, facilitators, simulated patients, students) prior to the learning experience with regards to the specific expectations and outcomes of the learning experience..

Answered: 0 Skipped: 1

No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q37 When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide training of all involved stakeholders (educators, facilitators, students) prior to the learning experience with regards to the resources (e.g. equipment) which will be utilised.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q38 When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to a trained facilitator and debriefer during and after the learning experience.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q39 Simulated-based learning experiences must be incorporated and structured according to the level of the student. The complexity of the simulated-based learning experiences must therefore increase from novice to expert as the student progresses in the programme.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q40 Simulated-based learning experiences for novice students may be more focussed on technical skills training.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q41 Simulated-based learning experiences for more advanced students may be more focussed on more complex patient scenarios.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q42 All involved stakeholders (educators, simulation experts, educationalists etc.) must collaborate in the process of developing a curriculum, which integrates simulation.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q43 All involved stakeholders (educators, simulation experts, educationalists etc.) must collaborate to ensure curricular integration of simulation.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q44 All involved stakeholders (educators, simulation experts, educationalists etc.) must assess where simulation will be used best, as opposed to other teaching strategies, to ensure optimal learning.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q45 All stakeholders (educators, simulation experts, educationalists etc.) involved in the development of simulated-based learning experiences are required to receive training on how to integrate and develop these learning experiences.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

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Q46 All personnel involved in the development of simulated-based learning experiences are required to undergo training regarding the available faculty/ institutional resources and the functioning of these resources.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q47 All educators involved in the facilitation of simulated-based learning experiences are required to receive training prior to facilitating these learning experiences.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

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Q48 All educators involved in the facilitation of simulated-based learning experiences are required to receive training in debriefing.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q49 All educators involved in providing feedback following simulated-based learning experiences are required to receive training prior to prepare them in the art of providing meaningful feedback.

Answered: 0 Skipped: 1

No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q50 How simulated-based learning experience feedback will be provided must be decided upon during the simulation planning phase (simulator/ facilitator/ peer/ self).

Answered: 0 Skipped: 1

No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q51 When simulated-based learning experience feedback will be provided must be decided upon during the planning phase (during or following completion of the learning experience).

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q52 A specific assessment tool (formative/ summative) for each simulated-based learning experience must be developed during the planning phase.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essentail	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q53 A specific assessment tool (formative/ summative) for only simulated-based learning experiences involving skills/ technical training must be developed during the planning phase.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q54 A specific assessment tool (formative/ summative) for only simulated-based learning experiences involving non-technical training must be developed during the planning phase.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q55 Students must be orientated at the beginning of the module regarding the logistical arrangements for all the planned simulated-based learning experiences (equipment used, venue and timeframe for each session, group allocation etc.).

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q56 Students must be orientated a few days prior to every simulated-based learning experience as to the logistical arrangements regarding the planned learning experience (equipment used, venue and timeframe for the session, group allocation etc.).

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q57 Students must be orientated at the beginning of the module as to the specific learning outcomes for all of the planned simulated-based learning experiences.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

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Q58 Students must be orientated a few days prior to every planned simulated-based learning experience as to the specific learning outcomes pertaining to that particular learning experience

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q59 Students must be orientated at the beginning of the module regarding the method of feedback, which will be used as well as when feedback will occur, for all the planned simulated-based learning experiences.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q60 Students must be orientated a few days prior to every simulated-based learning experience regarding the method of feedback, which will be used as well as when feedback will occur for that specific learning experience.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q61 Most theory pertaining to the simulated-based learning experience must be completed prior to the students partaking in the simulated-based learning experience (either in class or self-study).

Answered: 0 Skipped: 1

No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q62 Students must repeat all simulated-based learning experiences (aimed at both technical skills training and non-technical skills training) until an educator set benchmark is achieved.

Answered: 0 Skipped: 1

No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q63 Students must only repeat simulated-based learning experiences aimed at technical skills training (deliberate practice) until an educator set benchmark is achieved.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q64 Students must only repeat simulated-based learning experiences aimed at non-technical skills training until an educator set benchmark is achieved.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q65 Attainment of the educator set benchmark must be assessed by the educator at all times.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

A FRAMEWORK FOR THE INTEGRATION OF SIMULATION IN UNDERGRADUATE PHYSIOTHERAPY: CONTEXTUALISED FOR SOUTH AFRICA
SurveyMonkey

Q66 Attainment of the educator set benchmark must be assessed by the educator during the student’s first attempt, but subsequent attempts could be peer-assessed.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q67 Students must have the opportunity to redo all simulated-based learning experiences (aimed at both technical skills training and non-technical skills training), even if the educator set benchmark was achieved.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q68 Students must have the opportunity to redo only the simulated-based learning experiences aimed at technical skills training), even if the educator set benchmark was achieved.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q69 Students are required to set individual goals applicable to each of the planned simulated-based learning experiences at the beginning of the module.

Answered: 0   Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q70 Students are required to set individual goals applicable to each of the planned simulated activity/ scenario only a few days prior to the simulated-based learning experience.

Answered: 0   Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q71 Students are not required to set individual goals for simulated-based learning experiences as the educator specified learning outcomes would suffice.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q72 Students are required to complete an assessment of theoretical knowledge before partaking in any simulated-based learning experience.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q73 Students are required to complete an assessment of theoretical knowledge before partaking in a simulated-based learning experience relating to technical skills training.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q74 Students must be debriefed by a trained facilitator, following the completion of each simulated-based learning experience.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q75 When debriefing of each simulated-based learning experience will take place must be decided upon during the planning phase (immediately following completion of the learning experience, or at a later stage).

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q76 The specific debriefing method and tool used for each simulated-based learning experience must be decided upon during the simulation planning phase.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q77 Individual assessor-based student assessments are required for all simulated-based learning experiences.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q78 Individual assessor-based student assessments are to be done at the discretion of the educator for educator identified simulated-based learning experiences.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q79 A peer-assessment element is required for all simulated-based learning experiences.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q80 A peer-assessment element, at the discretion of the educator, is required for only educator identified simulated-based learning experiences.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q81 A self-assessment element is required for all simulated-based learning experiences.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q82 A self-assessment element, at the discretion of the educator, is required for only educator identified simulated-based learning experiences.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q83 A form of programme evaluation is required once simulation has been integrated into the programme.

Answered: 0 Skipped: 1

No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q84 Formative assessments, using standardised assessment tools, are required for programme evaluation following simulation integration.

Answered: 0 Skipped: 1

No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q85 Summative assessments, using standardised assessment tools, are required for programme evaluation following simulation integration.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q86 Informal checklists/ rating scales are required for programme evaluation following simulation integration.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q87 Feedback from educators involved in the simulated-based learning experiences is required for programme evaluation following simulation integration.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q88 Feedback from students partaking in the simulated-based learning experiences is required for programme evaluation following simulation integration.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENT	DATE
	There are no responses.	

Q89 When utilising standardised patients in a simulated-based learning experience, feedback from these participants are required for individual simulation activity evaluation.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not aplicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q90 A standardised educational model must be used when designing a simulation programme to validate the programme.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q91 Existing national requirements and standards, as proposed by the national regulating body (Health Professional Council of South Africa), must be used when designing a simulation programme to validate the programme.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q92 Expert consensus and literature reviews must be used when designing an integrated simulation programme in order to validate such a programme.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q93 Adjustments to the programme following simulation integration must be made according to the feedback received form all stakeholders and participants.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

Q94 Adjustments to the programme following simulation integration must be made according to the new technological advances or educational best practices identified.

Answered: 0 Skipped: 1

⚠ No matching responses.

ANSWER CHOICES	RESPONSES	
Essential	0.00%	0
Useful	0.00%	0
Not applicable	0.00%	0
TOTAL		0

#	COMMENTS	DATE
	There are no responses.	

APPENDIX P.

Informed consent form (Delphi survey and Validation meeting)

APPENDIX P. Informed consent form (Delphi survey and Validation meeting).

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CONSENT TO PARTICIPATE IN RESEARCH

You have been asked to participate in a research study.

You have been informed about the study by the researcher, Anke van der Merwe.

You may contact Mrs van der Merwe at gonzalesa@ufs.ac.za any time if you have questions about the research or research procedures.

You may contact the Secretariat of the Health Sciences Research Ethics Committee of the Faculty of Health Sciences (University of the Free State) at telephone number (+27 51) 405 7795 if you have questions about your rights as a research participant.

Your participation in this research is completely voluntary, and you will not be penalised or lose benefits if you refuse to participate or decide to terminate participation at any time during the research study.

If you agree to participate, you will receive the participant information sheet, which is a written summary of the research.

The research study, including the above information has been described to me. I understand what my involvement in the study means and I voluntarily agree to participate.

________________________ ____________________

Signature of Participant Date

________________________ ____________________

Signature of Researcher Date

APPENDIX Q.

South African physiotherapy and healthcare context description for Delphi panel members

APPENDIX Q. South African physiotherapy and healthcare context description for Delphi panel members.

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A FRAMEWORK FOR THE INTEGRATION OF SIMULATION IN UNDERGRADUATE PHYSIOTHERAPY: CONTEXTUALISED FOR SOUTH AFRICA (DELPHI SURVEY)

Dear Delphi reviewer

I want to thank you again for your willingness to participate in the abovementioned research study. Your valuable input is greatly appreciated.

As you are going to review the proposed framework for the integration of simulation within the South African undergraduate physiotherapy programme. For your perusal I have compiled a document to describe the South African physiotherapy and healthcare context. I am attaching the information document to provide clarity regarding the South African physiotherapy programme as well as the healthcare context in which the programme is situated.

HEALTHCARE EDUCATION CHALLENGES

South African students are rich in their racial, cultural and religious diversity. As South Africa boasts a total of 11 official languages, language does pose an area for concern. The majority of universities in South Africa use English as their primary teaching language, whereas English is not always the students' home language. In most instances English is only the students' third language.

The basic education system in South Africa does not prepare students sufficiently for tertiary education, resulting in underprepared students who struggle with basic language and comprehension when commencing their studies. Especially with healthcare education requiring sufficient literacy in mathematics with the aim of accepting students who can apply gained knowledge and demonstrate critical thinking. A small number of South African high school students obtain university exemption which limits the pool for possible healthcare professionals. South African university curricula have been adapted to allow students a preparatory year or to exit the curriculum to engage in a year of intensive literacy and language development.

Challenges regarding the accessibility and use of technologies by students and educators in teaching and learning institutions are also experienced. These challenges include the ineffective use of the modest amount of available technology, limited accessibility of internet services to students, lack of funding for regular upgrades as well as the technologically challenged lecturer within educational institutions.

As the driving force for South African healthcare currently is towards primary care, resources are redistributed away from tertiary care institution. This results in established tertiary complexes used for healthcare training being faced with major staff and budget cutbacks and a lack of patients. Governmental and institutional pressure in the healthcare education sector to increase student numbers, in order to address the healthcare skills shortages, places further pressure on tertiary training institutions already struggling with dwindling patient availability. Retention of healthcare practitioners and skilled academics is further jeopardised by financially attractive posts within the private sector and abroad as well as poor working conditions in the public healthcare sector. A priority of South African healthcare education therefore is to train professionals who are prepared to serve in rural and often remote areas. This requires a wide range of administrative, cultural, clinical and interprofessional training.

Another aspect to consider is South Africa's battle against the raging HIV/ AIDS and Tuberculosis epidemic which is affecting both the nation and medical professions. A change in the mix of cases available for teaching and training purposes is currently a problem in South African training hospitals due to the abovementioned factors. But not only is it at an emotional burden on young healthcare practitioners to work with patients who have a poor prognosis, but the reality of needle prick injuries can pose a risk to students working in the clinical environment.

See the Table 1 on the following page with an overview of the South African physiotherapy programme structure.

Table 1. South African physiotherapy programme structure

<table>
<tr><td colspan="4">Duration: 4 years (BSc degree)</td></tr>
<tr><td colspan="4">General modules: Anatomy, chemistry, physics, psychology, pharmacology, physiology and
Clinical sciences for physiotherapy (lectures in various medical conditions, surgical disciplines, microbiology and family medicine specifically related to physiotherapy).
These modules are dispersed between the first three years of study.</td></tr>
<tr><td colspan="4">Physiotherapy specific education and training</td></tr>
<tr><td>First year of study:
Mandatory clinical hours: Students have no direct patient contact, they only visit teaching hospitals and shadow third and fourth year students on one occasion.

Physiotherapy modules are based on basic principles (range of motion measurement, muscle testing and passive limb movements). Electrotherapy and massage techniques are also taught during the first year. In addition students have a few introductory cardiopulmonary, paediatric, community service learning and neurology lectures.</td><td>Second year of study:
Mandatory clinical hours: Students have no direct patient contact, they only visit teaching hospitals and shadow third and fourth year students on one occasion.

Physiotherapy modules include electrotherapy, ethics, cardiopulmonary therapy, paediatrics, neurology, community service learning, neuro-musculoskeletal and sport conditions and orthopaedics. These modules are built on in complexity and practical application during the following years of study.</td><td>Third year of study:
Mandatory clinical hours: 400 hours. All clinical hours are currently obtained with in-hospital/ clinic rotations. Students commence with clinical rotations in secondary and tertiary academic hospitals, as well as primary health care clinics. Students also rotate at a school for children with disabilities.

Research: Students are also divided into small groups to write a research proposal for evaluation.</td><td>Fourth year of study:
Mandatory clinical hours: 600 hours. All clinical hours are currently obtained with in-hospital rotations. Students continue with clinical rotations with increasing complexity, which includes intensive care units, paediatrics, neuro-musculoskeletal conditions and sport injuries.

Research: Conduction and presentation of the research project, as per protocol presented in the third year of study.</td></tr>
</table>

APPENDIX R.

Delphi report following round

APPENDIX R. Delphi report following round 1.

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Consensus report: Round 1

A framework for the integration of simulation in undergraduate physiotherapy: Contextualised for South Africa.

The review panel consisted of five international and nine South African panel members.

Panel members were in agreement that an institutional and discipline specific needs analysis would be essential when planning simulation integration.

Panel members deemed it essential that specific learning outcomes, scenario content, team identification, equipment which can be utilised, available financial resources, the level of fidelity required as well as the timeframe and logistical arrangements for each simulated-based learning experience would require attention prior to simulation integration. It was reported that it may be useful for simulated-based learning experiences to be designed by students, with educator facilitation. Increasing the complexity of the learning outcomes according to the student level was also indicated to be essential.

It was evident that panel members were of the opinion that time for planning and development of simulated-based learning experiences are essential, as well as the identification of personnel to assist with the execution of the learning experiences.

The identification of learning outcomes which could be achieved with simulated-based learning experiences, together with the available modalities which could assist in this, is also essential when planning simulation integration. It is also essential that there is constructive alignment between the course content and simulated-based learning experience outcomes.

Panellists also indicated that it is essential to include non-technical training components in all inter-professional simulation sessions.

The role of the educator should be identified prior to the learning experience, but remaining educator role clarification statements were reworded and presented for further deliberation during round two.

The choice of instructional method to be used should be made prior to the simulated-based learning experience. Further deliberation regarding the expectations of both self-directed learning and instructor-based learning will occur during round two.

Collaboration between all stakeholders to ensure simulation-based curriculum development and integration thereof is essential. Training of the identified stakeholders in the facilitation and debriefing process was also reported to be of the utmost importance. How and when feedback will be provided following simulated-based learning experiences should also be identified during the planning phase.

Questions relating to mastery of learning/ deliberate practice and individual student goal setting were restructured according to received comments and recirculated during round two.

Debriefing by a trained facilitator, and the timing thereof, is also an essential component of simulated-based learning experiences. Panel members were of the opinion that a specific (formative/ summative) assessment tool for each simulated-based learning experience should be developed during the planning phase. Further opinions regarding educator-, peer- and self-assessments were reconstructed and form part of round two of the questionnaire.

Panel members unanimously agreed that programme evaluation, validation and adjustment is essential following simulation integration, with feedback from educators and students, expert consensus and literature reviews, new technological advances, educational best practice as well as existing national requirements forming an essential part of this process.

Thank you again for your participation, your opinion is greatly appreciated and valued.

Kind regards,

Anke van der Merwe

APPENDIX S.

Adjustments following Delphi round 1

APPENDIX S. Adjustments following Delphi round 1.
S= Statement number in survey
**Numerics indicates the participant number of the panel member suggesting the adjustment.*

S	Original statement	Statement round 2	Reason for change
1	A needs analysis identifying societal needs, which could be addressed by the integration of simulation into the programme, must be performed during the planning phase.	Identified societal needs should form the background context of simulated-based learning experiences, depending on the desired learning objectives for each planned learning experience.	Rephrased following comments (2,4,5) due to panel members stating that an understanding of the societal needs, the social impact responsibility of a university programme and the stipulated learning outcomes should guide the implementation of a needs analysis identifying societal needs when integrating simulation.
13	All available simulation modalities (e.g. standardised patients, virtual reality, part-task trainers) must be identified and considered for use.	All available institutional simulation modalities should be considered for use, as is deemed appropriate to achieve the set learning outcomes for each individual simulated-based learning experience.	Rephrased and clarified as panellists did not view it as all available institutional resources, but as all modalities on the market (1,4). The need for contextual applicability and choice of modality to facilitate learning outcome achievement was suggested (1,2,3,5,6)
15	Simulation experts (including experts from other disciplines) must be identified and included in the initial planning process.	Simulation experts (including experts from other disciplines) should be identified and included in the initial planning process.	No relevant comments or suggestions.
18	Personnel (educators and support staff) must be identified who will be able to assist with recruitment, training and general administrative support of simulated patients (SPs) for each of the planned simulated activities/ scenarios	A simulation team or committee should be established to assist with the general administrative duties (e.g. recruitment and training) when utilising simulated patients for identified simulated-based learning experiences. *This question focuses on only those learning experiences utilising simulated patients.	Clarified that the statement pertains only to those learning experiences utilising SP's due to comment (3) mentioning that the use of SP's will be dependent on the learning objectives. It was suggested to replace" Personnel" with "a simulation team or committee" (1).

S	Original statement	Statement round 2	Reason for change
19	Facilities equipped for hosting simulated-based learning experiences may be shared between disciplines (e.g. medical and allied health science students).	Facilities equipped for hosting simulated-based learning experiences may be shared between healthcare disciplines (e.g. medical and allied health science students). *These facilities should be designed in such a way as to be able to accommodate the needs of various healthcare disciplines (e.g. hospital ward setting, consultation room, skills training areas).	Clarified following comment (1) indicating that context is essential as nursing and medical hospital simulations might not be applicable to other health disciplines.
24	Including aspects of non-technical training in all simulated-based learning experiences is required.	Non-technical training aspects, according to the stated learning outcomes, should increasingly be embedded in simulated-based learning experiences (from simple to complex) as the outcomes for the learning experiences become more complex. *Non-technical training refers to aspects such as communication, leadership, professionalism, collaboration, health advocacy and scholarship. It can also include problem solving skills and clinical reasoning.	S24 and S25 collapsed following consensus meeting indicating that statement contents are identical. Rephrased following comments (1,2,4) indicating the importance of non-technical training in all simulated-based experiences. Addition of adherence to learning outcomes added as requested by comments (2,3) Definition of non-technical training moved from front of survey to the specific question for ease of reading.
25	Uni-professional simulated-based learning experiences must include a non-technical training component.		

<table>
<tr><th>S</th><th>Original statement</th><th>Statement round 2</th><th>Reason for change</th></tr>
<tr><td>28</td><td>The educator must fulfil the role of a facilitator during the simulated-based learning experience and be available for questions during the simulated-based learning experience.</td><td rowspan="2">The educator’s role in formative simulated-based learning experiences is that of facilitator.</td><td rowspan="3">S28, S29 and S30 collapsed and rephrased following consensus meeting and comments (7,8) for ease of reading and clarity.

Between the three statements (28,29,39) 10 comments related to the educator role being dependent on the learning objectives for the session and if the SBLE is formative/ summative.</td></tr>
<tr><td>29</td><td>The educator must fulfil the role of a facilitator only after the completion of the simulated-based learning experience.</td></tr>
<tr><td>30</td><td>The educator must fulfil the role of an assessor following the completion of the simulated-based learning experience.* Further options regarding assessment is explored in Theme 3 (Assessment).</td><td>The educator’s role in summative simulated-based learning experiences is that of post-simulation critique and discussion.
*Further options regarding assessment will be explored in Theme 3.</td></tr>
<tr><td>32</td><td>When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to the theoretical work and detailed outcomes for the learning experience.</td><td rowspan="2">When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator should provide the student with access to the course content, required resources and detailed outcomes for the learning experience.</td><td rowspan="2">S 32 and S34 were collapsed due to comment (3) stating there is no need for separate questions when making mention of the various resources.

Question set-up corrected in survey tool as comments were calculated as percentage values.

Changed “theoretical work” to “course content” (1). No other relevant comments.</td></tr>
<tr><td>34</td><td>When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to all the resources required to complete the learning experience (venue, equipment, consumables)</td></tr>
</table>

S	Original statement	Statement round 2	Reason for change
35	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to the theoretical work and detailed outcomes prior to the learning experience.	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator should provide the student with access to the course content, required resources and detailed outcomes for the learning experience.	Following consensus meeting the statement was rephrased to read exactly as S 32, but for instructor-based learning, for ease of reading.
37	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide training of all involved stakeholders (educators, facilitators, students) prior to the learning experience with regards to the resources (e.g. equipment) which will be utilised.	The educator is required to provide orientation to all involved stakeholders (educators, students, facilitators), with regards to the course content, outcomes and required resources which will be addressed/ utilised during the simulated learning experience. *Instructional methods refer to the specific techniques utilised for learning and can be self-directed learning or instructor-based learning (Chiniara *et al.* 2013:e1384).	No relevant comments or suggestions. Rephrased for clarity following consensus meeting as "orientation" was deemed a more appropriate word choice than "training". Question erroneously stated that stakeholder orientation is only to be done when utilising instructor-based learning the typo was corrected as the statement pertains to both self-directed and instructor-based learning. Definition of instructional methods moved from front of survey to the specific question for ease of reading.

S	Original statement	Statement round 2	Reason for change
40	Simulated-based learning experiences for novice students may be more focussed on technical skills training.	Simulated-based learning experiences would tend to move from basic cognitive, non-technical and technical skills training for novice students, towards more complex patient scenarios in which the mentioned skills should be integrated as well.	Collapsed and rephrased following comments indicating that no skill is trained in isolation, but the complexity of the training will differ (1,2,3)
41	Simulated-based learning experiences for more advanced students may be more focussed on more complex patient scenarios.		
46	All personnel involved in the development of simulated-based learning experiences are required to undergo training regarding the available faculty/ institutional resources and the functioning of these resources.	All personnel involved in the development of simulated-based learning experiences are required to receive orientation regarding the available faculty/ institutional resources which could be applicable to their field.	Rephrased following comments indicating that equipment orientation rather than training is a better term to use and as is applicable to their field (1,2, 4)
53	A specific assessment tool (formative/ summative) for only simulated-based learning experiences involving skills/ technical training must be developed during the planning phase.	A specific assessment tool for each summative simulated-based learning experience should be developed, according to the desired learning outcomes, during the planning phase. * A specific assessment tool refers to, for example, a detailed checklist of what the student should demonstrate during the simulated activity/ scenario.	Collapsed and rephrased following comments mentioning the statements should focus on summative assessment and identified learning outcomes not distinguish between skills assessed (S53: 1,2 and S54: 1,3). Definition of specific assessment tool moved from front of survey to the specific question for ease of reading.
54	A specific assessment tool (formative/ summative) for only simulated-based learning experiences involving non-technical training must be developed during the planning phase.		

S	Original statement	Statement round 2	Reason for change
55	Students must be orientated at the beginning of the module regarding the logistical arrangements for all the planned simulated-based learning experiences (equipment used, venue and timeframe for each session, group allocation etc.).	Students should receive simulation related orientation (logistics of the session, timing of feedback/ debriefing, outcomes) only at the beginning of the module and at no further time.	Collapsed and rephrased following consensus meeting and comment (2) indicating repetition as both statements focus on pre-briefing and logistical aspects.
57	Students must be orientated at the beginning of the module as to the specific learning outcomes for all of the planned simulated-based learning experiences.		
56	Students must be orientated a few days prior to every simulated-based learning experience as to the logistical arrangements regarding the planned learning experience (equipment used, venue and timeframe for the session, group allocation etc.).	Students should receive simulation related orientation (logistics of the session, timing of feedback/ debriefing, outcomes) at the beginning of the module and again prior to each simulated-based learning experience.	Collapsed and rephrased following consensus meeting and comments indicating repetition as both statements focus on logistical and pre-briefing aspects (2,3). Statement clarified to read easier.
58	Students must be orientated a few days prior to every planned simulated-based learning experience as to the specific learning outcomes pertaining to that particular learning experience		

S	Original statement	Statement round 2	Reason for change
59	Students must be orientated at the beginning of the module regarding the method of feedback, which will be used as well as when feedback will occur, for all the planned simulated-based learning experiences.	Students should be orientated at the beginning of the debriefing/ feedback session regarding the method of feedback to be used for the simulated-based learning experience.	Collapsed and rephrased following comments (S59: 1 and S:60: 1) stating that orientation as to the debriefing/ feedback method should occur directly before the session.
60	Students must be orientated a few days prior to every simulated-based learning experience regarding the method of feedback, which will be used as well as when feedback will occur for that specific learning experience.		
61	Most theory pertaining to the simulated-based learning experience must be completed prior to the students partaking in the simulated-based learning experience (either in class or self-study).	Relevant theory pertaining to each individual simulated-based learning experience must be completed prior to the students participating in the learning experience.	Word change indicating only the relevant theory relating to the specified learning outcomes and instructional method is required (1) Comment (2) mentioned allocating time for students to complete the theory portion, this however is encompassed throughout the simulation planning phase. Following consensus meeting, the method of theory provision was removed as it has no relevance in the statement.

<table>
<tr><th>S</th><th>Original statement</th><th>Statement round 2</th><th>Reason for change</th></tr>
<tr><td>62</td><td>Students must repeat all simulated-based learning experiences (aimed at both technical skills training and non-technical skills training) until an educator set benchmark is achieved.</td><td rowspan="3">Educators should identify which formative simulation-based learning experiences, according to the set learning outcomes, should be repeated until an educator's set benchmark is achieved.</td><td rowspan="3">Collapsed and rephrased following comments indicating time and logistical constraints accompanying such a practice (S62:1,2; S63:3; S64: 2).

Panel members indicated that the educator should identify which skills they require the student to master as all skills are to be seen as equal (S62:1 and S63: 1,2 and S64: 1).</td></tr>
<tr><td>63</td><td>Students must only repeat simulated-based learning experiences aimed at technical skills training (deliberate practice) until an educator set benchmark is achieved.</td></tr>
<tr><td>64</td><td>Students must only repeat simulated-based learning experiences aimed at non-technical skills training until an educator set benchmark is achieved.</td></tr>
<tr><td rowspan="2">65</td><td rowspan="2">Attainment of the educator set benchmark must be assessed by the educator at all times.</td><td>Attainment of the educator's set benchmark, for identified summative simulated-based learning experiences, should be assessed by the educator at all times. *Options for peer- and/ or self-assessment are provided for in follow-up questions.</td><td rowspan="2">Clarified that peer- and self-assessment is provided for in follow-up statements (1,3).

Statement expanded clarifying if assessments are formative or summative (2).</td></tr>
<tr><td>Attainment of the educator's set benchmark, for identified formative simulated-based learning experiences, should be assessed by the educator at all times. *Options for peer- and/ or self-assessment are provided for in follow-up questions.</td></tr>
</table>

S	Original statement	Statement round 2	Reason for change
66	Attainment of the educator set benchmark must be assessed by the educator during the student's first attempt, but subsequent attempts could be peer-assessed.	Attainment of an educator's set benchmark during formative assessments could be peer-assessed, while the educator is only responsible for assessing benchmark achievement during summative assessments.	Suggestion, with no explanation, was made that summative assessments should always be seen by the educator (4). Panel members indicated that educator assessment should only occur following peer-assessment (2,3). Clarity provided regarding assessments being formative or summative (4).
67	Students must have the opportunity to redo all simulated-based learning experiences (aimed at both technical skills training and non-technical skills training), even if the educator set benchmark was achieved.	Students should be allowed to redo all formative simulated-based learning experiences until they have reached their individual level of satisfaction.	Following consensus meeting the statements were collapsed and rephrased as panel members indicated the statements were too broad (S67: and S68:1,4).
68	Students must have the opportunity to redo only the simulated-based learning experiences aimed at technical skills training), even if the educator set benchmark was achieved.		
69	Students are required to set individual goals applicable to each of the planned simulated-based learning experiences at the beginning of the module.	Students are required to revisit the specific simulated-based learning experience outcomes, as well as their individual goals, as they progress through the module/ programme/ academic year.	Collapsed and rephrased following comments mentioning revision of goals are required (S69: 1) and doing so at the start of the academic year is advised (S69:2). Other comments not relevant for this statement.
70	Students are required to set individual goals applicable to each of the planned simulated activity/ scenario only a few days prior to the simulated-based learning experience.		

S	Original statement	Statement round 2	Reason for change
71	Students are not required to set individual goals for simulated-based learning experiences as the educator specified learning outcomes would suffice.	It is necessary for students, in addition to the set learning outcomes, to set individual goals applicable to each of the planned simulated-based learning experiences.	Following consensus meeting S71 was moved to before statements 69 and 70 for logical flow. Rephrased as comments stated that the statement was unclear and difficult to answer (1,4), with no detailed clarification provided.
72	Students are required to complete an assessment of theoretical knowledge before partaking in any simulated-based learning experience.	Students are required to complete an informal formative assessment (e.g. online multiple choice questionnaire) of theoretical knowledge before participating in specific educator identified simulated-based learning experiences.	Following consensus meeting the statement was rephrased for clarity. Comments 1 and 2 were not relevant for affecting change and were covered in previous statements.
		Students are required to complete an informal pre- and post-formative assessment (e.g. online multiple choice questions) when participating in specific educator identified simulated-based learning experience (technical and non-technical training).	Added new statement following comment (3) indicating a post-test is also required.
73	Students are required to complete an assessment of theoretical knowledge before partaking in a simulated-based learning experience relating to technical skills training.	Students are only required to complete an informal formative assessment (e.g. online multiple choice questionnaire) of theoretical knowledge before participating in simulated-based learning experiences relating to technical skills training.	No relevant comments or suggestions. Following consensus meeting the statement was rephrased for clarity and better sentence structure.

76	The specific debriefing method and tool used for each simulated-based learning experience must be decided upon during the simulation planning phase,	The specific debriefing method and tool used for each simulated-based learning experience should be flexible and can be modified during/ after a learning experience to better suit the identified student needs. *Debriefing is defined as the facilitator led reflective session following a simulated-based learning experience where the learning experience is re-examined with regards to performance aspects and emotions experienced (Lopreiato et al 2016). **Debriefing methods fall beyond the scope of this research study.	Rephrased to indicate the allowance for flexibility (2,3). Definition of debriefing moved from front of survey to the specific question for ease of reading. Sentence added indicating that debriefing methods does not fall within the scope of this study.
77	Individual assessor-based student assessments are required for all simulated-based learning experiences.	Educators should identify which simulated-based learning experiences are to be used for formative assessment. Only these identified assessments should be performed on a one-to-one student-educator basis.	Rephrased and expanded to indicate if assessments are formative or summative (S77: 2,3) and provide statement clarity (S78: 1,3,4).
78	Individual assessor-based student assessments are to be done at the discretion of the educator for educator identified simulated-based learning experiences.	Educators should identify which simulated-based learning experiences are to be used for summative assessment. Only these identified assessments should be performed on a one-to-one student-educator basis.	

S	Original statement	Statement round 2	Reason for change
79	A peer-assessment element is required for all simulated-based learning experiences.	Educators should identify which simulated-based learning experiences could accommodate a peer-assessment element, and it should be implemented as such.	Collapsed and rephrased statements following consensus meeting and in accordance to comments indicating the statement is too vague (S79: 3 and S80:1).
80	A peer-assessment element, at the discretion of the educator, is required for only educator identified simulated-based learning experiences.		
81	A self-assessment element is required for all simulated-based learning experiences.	All simulated-based learning experiences should have an element of self-assessment.	No relevant comments or suggestions. Rephrased sentence for grammatical accuracy.
82	A self-assessment element, at the discretion of the educator, is required for only educator identified simulated-based learning experiences.	A self-assessment element should only be included in simulated-based learning experiences identified by the educator. Therefore, not every learning experience should have an element of self-assessment embedded.	No relevant comments or suggestions. Rephrased sentence structure following consensus meeting for grammatical accuracy.
84	Formative assessments, using standardised assessment tools, are required for programme evaluation following simulation integration.	Formative assessments, using standardised assessment tools, should be used for programme evaluation following simulation integration.	Rephrased following comment stating it is not always required (1). No clarification provided.
85	Summative assessments, using standardised assessment tools, are required for programme evaluation following simulation integration.	Summative assessments, using standardised assessment tools, should be used for programme evaluation following simulation integration.	Rephrased following comment stating uncertainty if summative assessments are essential to be used for programme evaluation (1).

<table>
<tr><th>S</th><th>Original statement</th><th>Statement round 2</th><th>Reason for change</th></tr>
<tr><td>86</td><td>Informal checklists/ rating scales are required for programme evaluation following simulation integration.</td><td rowspan="2">Informal evaluations (e.g. checklists/ rating scales) completed by all educators, participants (e.g. simulated patients) and students involved in the simulated-based learning experiences, could be used for programme evaluation following simulation integration.</td><td rowspan="2">Following consensus meeting S86 and S89 were collapsed as feedback and informal evaluations are similar concepts. No other comments or suggestions requiring adjustments.</td></tr>
<tr><td>89</td><td>When utilising standardised patients in a simulated-based learning experience, feedback from these participants are required for individual simulation activity evaluation.</td></tr>
<tr><td>90</td><td>A standardised educational model must be used when designing a simulation programme to validate the programme.</td><td>A standardised educational model should be useful when designing a simulation programme, but must allow for contextual flexibility.</td><td>Rephrased following comments (1,2) stating that it is not essential and added “contextual flexibility” following comment (1).</td></tr>
</table>

APPENDIX T.

Adjustments following Delphi round 2

APPENDIX T. Adjustments following Delphi round 2.
S= Statement number in survey
**Word changes and/ or additions are bolded.*
***Numerics indicated the number of the panel member suggesting the adjustment.*

S	Statement round 2	Statement round 3	Reason for change
1	Identified societal needs should form the background context of simulated-based learning experiences, depending on the desired learning objectives for each planned learning experience.	Unchanged	No relevant comments or suggestions.
2	All available institutional simulation modalities should be identified and considered for use, as is deemed appropriate to achieve the set learning outcomes for each individual simulated-based learning experience.	Unchanged	No relevant comments or suggestions.
3	Simulation experts (including experts from other disciplines) should be identified and included in the initial planning process.	Simulation experts, **which could** include experts from other disciplines **where deemed necessary,** should be identified and included in the initial planning process.	Rephrased following comment indicating that input from other disciplines is not a necessity (3).
4	A simulation team or committee should be established to assist with the general administrative duties (e.g. recruitment and training) when utilising simulated patients for identified simulated-based learning experiences. *This question focuses on only those learning experiences utilising simulated patients.	Unchanged	No relevant comments or suggestions.
7	The educator's role in formative simulated-based learning experiences is that of facilitator.	The educator's role in formative simulated-based learning experiences, **not used for formal assessment**, would be that of facilitator **and providing feedback.**	Rephrased following comments mentioning that the provision of feedback is an essential component of being a facilitator (1, 2, 4).

S	Statement round 2	Statement round 3	Reason for change
8	The educator's role in summative simulated-based learning experiences is that of post-simulation critique and discussion. * Further options regarding assessment will be explored in Theme 3.	The educator's role in summative simulated-based learning experiences is that of post-simulation **feedback/ debriefing** and discussion. * Further options regarding assessment will be explored in Theme 3.	Rephrased due to all comments questioning the use of the word critique as it implies a negative action.
13	All personnel involved in the development of simulated-based learning experiences are required to receive orientation regarding the available faculty/ institutional resources which could be applicable to their field.	Unchanged	No relevant comments or suggestions.
16	Students should receive simulation related orientation (logistics of the session, timing of feedback/ debriefing, outcomes) at the beginning of the module and again prior to each simulated-based learning experience.	Unchanged	No relevant comments or suggestions.
17	Students should be orientated at the beginning of the debriefing/ feedback session regarding the method of feedback which will be used for the simulated-based learning experience.	Students should be orientated at the beginning of the debriefing/ feedback session regarding **what will be evaluated/ discussed** as well as the method of feedback to be used for the simulated-based learning experience.	Rephrased following comment indicating that the detail of what is to be discussed should be mentioned in the statement (2).
18	Relevant theory pertaining to each individual simulated-based learning experience must be completed prior to the students participating in the learning experience.	Question unchanged, but added: ***The simulated-based learning experience may be used to identify theoretical gaps and needs.**	Added extra clarification following comment mentioning that simulated learning experiences may identify theoretical requirements as well (2).

S	Statement round 2	Statement round 3	Reason for change
19	Students should be allowed to redo all formative simulated-based learning experiences until they have reached their individual level of satisfaction.	Question unchanged, but added: ***This would be dependent on the course structure, available time and resources.**	Added extra clarification following comments mentioning the labour intensiveness of such a practice and varied uses of simulation (2,3,4,5).
20	Educators should identify which formative simulation-based learning experiences, according to the set learning outcomes, should be repeated until an educator set benchmark is achieved.	Question unchanged, but added: ***This would be dependent on the course structure, available time and resources.**	Added extra clarification following comment making mention of resource availability (1).
22	Attainment of the educator set benchmark for identified formative simulated-based learning experiences, should be assessed by the educator at all times. *Options for peer- and/ or self-assessment are provided for in follow-up questions.	Unchanged.	No relevant comments or suggestions. Swopped to be before question 21 due to comment mentioning that the change would result in a more logical statement flow (2).
21	Attainment of the educator set benchmark for identified summative simulated-based learning experiences, should be assessed by the educator at all times. *Options for peer- and/ or self-assessment are provided for in follow-up questions.	Unchanged.	No relevant comments or suggestions.
23	Attainment of an educator set benchmark during formative assessments could be peer-assessed, while the educator is only responsible for assessing benchmark achievement during summative assessments.	Unchanged.	No relevant comments or suggestions.

S	Statement round 2	Statement round 3	Reason for change
25	Students are required to revisit the specific simulated-based learning experience outcomes, as well as their individual goals, as they progress through the module/ programme/ academic year.	Students are **encouraged** to revisit the specific simulated-based learning experience outcomes, as well as their individual goals, as they progress through the module/ programme/ academic year.	Rephrased following comment stating that this is not a compulsory practice, but is advised (1).
26	Students are required to complete an informal formative assessment (e.g. online multiple choice questionnaire) of theoretical knowledge before participating in specific educator identified simulated-based learning experiences.	Students **should** complete an informal formative assessment (e.g. online multiple choice questionnaire) of theoretical knowledge before participating in specific educator identified simulated-based learning experiences.	Rephrased following comment stating that this is not a compulsory practice, but is advised (4).
27	Students are required to complete an informal pre- and post-formative assessment (e.g. online multiple choice questions) when participating in specific educator identified simulated-based learning experience (technical and non-technical training).	Question unchanged, but added: ***Debriefing could be utilised as a post-formative assessment.**	Added clarification following comment (1)
29	The specific debriefing method and tool used for each simulated-based learning experience should be flexible and can be modified during/ after a learning experience to better suit the identified student needs.	The specific debriefing method and tool used for each simulated-based learning experience should be **decided upon prior** *to* the simulated-based learning experience **to ensure facilitators are trained in the method utilised**.	Rephrased following comment which mentioned adequate training of facilitators is a necessity therefore the debriefing method should be decided on prior to debriefing to ensure adequate facilitator preparation (1).
30	Educators should identify which simulated-based learning experiences are to be used for **formative** assessment. Only these identified assessments should be performed on a one-to-one student-educator basis.	Question unchanged, but added: ***An element of peer assessment could be added if deemed appropriate by the educator.**	Added extra clarification following comment stating the value of peer assessment (4).

S	Statement round 2	Statement round 3	Reason for change
31	Educators should identify which simulated-based learning experiences are to be used for summative assessment. Only these identified assessments should be performed on a one-to-one student-educator basis.	Unchanged.	No relevant comments or suggestions.
32	Educators should identify which simulated-based learning experiences could accommodate a peer-assessment element, and it should be implemented as such.	Unchanged.	No relevant comments or suggestions.
33	All simulated-based learning experiences should have an element of self-assessment.	All simulated-based learning experiences should have an element of **self-reflection.**	Rephrased following comments indicating that self-assessment and self-reflection are different concepts (1,3).
35	Formative assessments, using standardised assessment tools, should be used for programme evaluation following simulation integration.	Formative **student** assessments, using standardised assessment tools, should be used for programme evaluation following simulation integration. ***Questions pertaining to further programme evaluation methods are provided in the following questions.**	Added extra clarification following comments (1,2).
37	Informal evaluations (e.g. checklists/ rating scales) completed by all educators, participants (e.g. simulated patients) and students involved in the simulated-based learning experiences, could be used for programme evaluation following simulation integration.	Informal evaluations (e.g. **satisfaction surveys in the format of** checklists/ rating scales) completed by all educators, participants (e.g. simulated patients) and students involved in the simulated-based learning experiences, could be used for programme evaluation following simulation integration.	Rephrased following comment requesting clarification regarding the checklists and rating scales (1).

APPENDIX U.

Delphi report following round 2

APPENDIX U. Delphi report following round 2.

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YUNIVESITHI YA FREISTATA
UFS UV

<u>**Consensus report: Round 2**</u>

A framework for the integration of simulation in undergraduate physiotherapy: Contextualised for South Africa.

The review panel consisted of five international and seven South African panel members.

Panel members were in agreement that simulation facilities should be shared between health care disciplines. Panel members also indicated that it would be useful utilising a standardised educational model when designing a simulation programme, but it should allow for contextual flexibility.

It was reported that no matter which instructional method is used, the educator should provide students with access to the course content, resources and learning outcomes for each simulated-based learning experience. When students are to receive simulation related orientation is still open for deliberation, but being orientated only at the beginning of the module is not deemed sufficient. The educator is also required, according to reviewer opinion, to provide orientation to all involved stakeholders regarding the aforementioned mentioned aspects.

Panel members deemed it essential that non-technical training aspects be increasingly embedded in simulated-based learning experiences, from novice to expert. It was evident that panel members were of the opinion that simulated-based learning experiences should increase in complexity as the student masters the basic skills.

The development of an assessment tool for each summative simulated-based learning experience was also deemed essential. Panel members indicated that these tools could be utilised during both summative and formative assessments, and it would be encouraged that students complete an informal formative assessment prior to all simulated-based learning experiences.

Panellists also indicated that it could be useful for students to, in addition to the learning outcomes, set their own individual goals applicable to each planned simulated-based learning experience.

Panel members were in agreement that summative assessments, amongst other tools, could be useful when evaluating the programme following simulation integration.

Thank you again for your participation, your opinion is greatly appreciated and valued.

Kind regards,

Anke van der Merwe

APPENDIX V.

Delphi report following round 3

APPENDIX V. Delphi report following round 3.

UNIVERSITY OF THE FREE STATE
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UFS UV

<u>Consensus report: Round 3</u>

A framework for the integration of simulation in undergraduate physiotherapy: Contextualised for South Africa.

The review panel consisted of four international and seven South African reviewers.

Panellists were in agreement that simulation experts should be identified and included in the initial planning process with a simulation team or committee assisting with the general administrative duties (e.g. recruitment and training) when utilising simulated patients. The identification of all institutionally available simulation modalities should considered for use, as is deemed appropriate to achieve the set learning outcomes for each individual simulated-based learning experience.

Panel members were of the opinion that the attainment of an educator's set benchmark during formative assessments may be peer-assessed, while the educator is only responsible for assessing benchmark achievement during summative assessments.

It was reported that students should be orientated at the beginning of the debriefing/ feedback session regarding what will be evaluated/ discussed as well as receive simulation related orientation (logistics of the session, timing of feedback/ debriefing, outcomes) at the beginning of the module and again prior to each simulated-based learning experience. Educator training with regards to the debriefing method and tool used for each simulated-based learning experience is essential.

This survey round was deemed the final survey round as no content or contextual changes were suggested for any of the non-consensus achieving statements.

Thank you again for your participation, your opinion is greatly appreciated and valued.

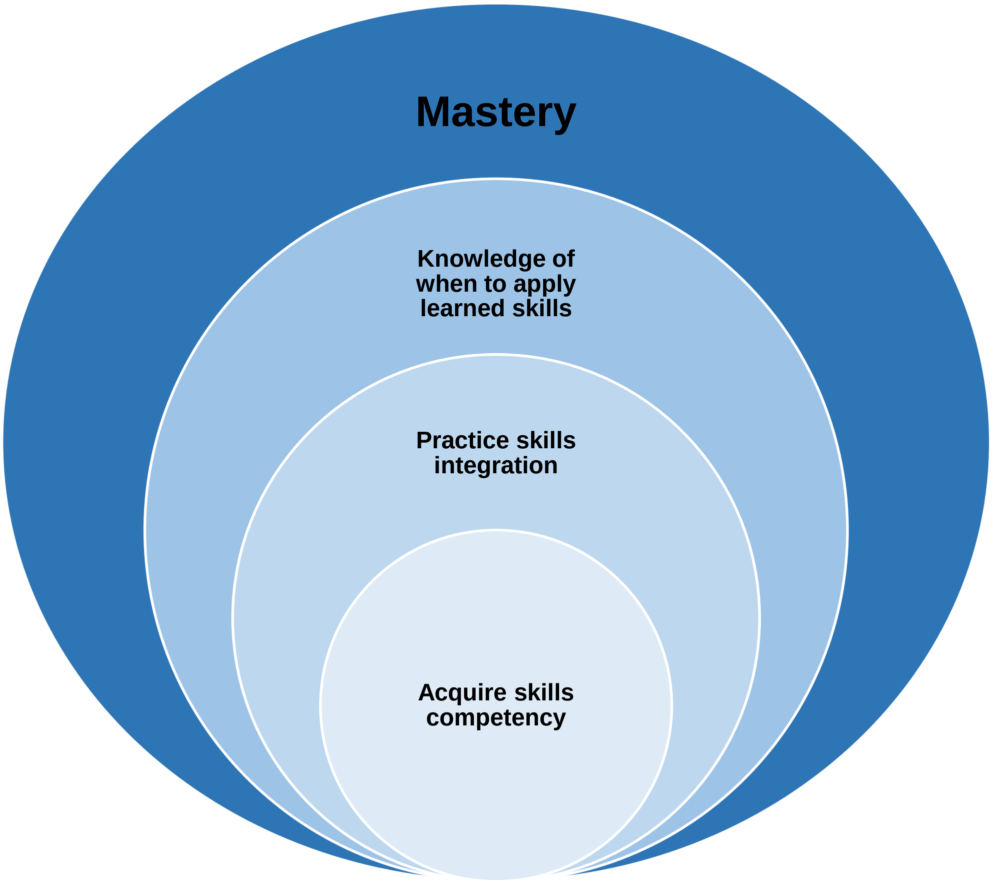
Kind regards,

Anke van der Merwe

APPENDIX W.

Elements of mastery

APPENDIX W. Elements of mastery [adapted by researcher from Ambrose *et al.* (2010) in Ambrose, Waechter and Hunt, 2017)].



APPENDIX X.

Validation meeting guide prior to exploratory discussions

APPENDIX X. Validation meeting guide prior to exploratory discussions.

Pre-interview:

Testing of equipment and area set-up (6 chairs and table for audio-recorders)

Interview administration:

Time:___________________________________

Date:___________________________________

Participant details:

Participant number	Area of expertise	Years' experience in field

Answering of any questions pertaining to provided information leaflet, clarifying of simulation glossary, signing of informed consent form.

Validation meeting procedure:

Presentation by researcher detailing meeting procedure- discussion will be facilitated regarding the proposed conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme. Participants should please state their participant number before providing their views during the meeting. All relevant comments, concerns and recommendations raised will be explored during the meeting and you are encouraged to answer questions freely as all data will be treated confidentially.

Validation meeting commences following switching on of audio-recorder.

Time for interview completion- estimated at four hours.

[Ensure that each participant signed consent before commencement of the session]

[Switch on audio-recorder and commence interview]

QUESTIONS

Participants should please not that, even though not stipulated in each question, all questions relate to the South African undergraduate physiotherapy context and should please be considered and answered as such.

Courtesy break for refreshments 10:30.

1. Do you perceive the framework as being supportive in the development of graduate attributes, as stipulated by the Health Professions Council of South Africa (HPCSA), and please indicate which aspects of the framework supports the development of these attributes?

2. Which elements of the framework do you view as being essential in achieving a competent physiotherapy graduate? Please provide your reasoning for the provided answer.

3. Please indicate the framework elements that you consider as being useful in producing a competent physiotherapy graduate, with possible omittance of these elements not compromising the framework and the final outcome. Please provide clarification of your answer.

4. Identify framework elements which you perceive as not applicable for inclusion in the framework, and that you feel would not compromise the framework and the final outcome if they are to be excluded? Please provide clarification as to why you are of the opinion these elements are to be excluded.

5. What would the impact of the proposed framework be on the various stakeholders involved in the South African undergraduate physiotherapy programme, where stakeholders refer to students, the organisation (university) as well as the regulating body (HPCSA)?

6. In the premise of the programme’s resources being limited, what is your view regarding the practicality of the proposed framework?

7. In your opinion, which sections of the undergraduate physiotherapy programme would lend itself to being supplemented with the integration of the proposed framework in the event of external challenges posed to the programme?

Courtesy break for lunch once discussion has reached saturation and no new information is gathered.

Researcher makes suggested adjustments to proposed framework.

PART 2: Finalisation

Presentation of adapted framework to participants.

1. Do you view the adapted framework as accurate according to the views and suggestions aired during the meeting?

2. How can the planning for the integration of the framework be approached?

3. How can the implementation for the integration of the framework be approached?

4. How can the evaluation for the integration of the framework be approached?

Thank you for your willingness to participate in this research study. The researcher greatly appreciates your time and your valuable input.

[Stop recording]

APPENDIX Y.

Amendments following the first validation meeting exploratory discussion

APPENDIX Y. Amendments following the first validation meeting exploratory discussion.

Pre-exploratory study	**Post-exploratory study**	**Reason cited for change**
Information regarding the research process provided only in emailed information leaflet.	Immediately before meeting commencement a short explanation of the research process leading up to the validation meeting, including the research questions, was verbally provided by the researcher.	Detailed information provided research context for the participants and aimed to reiterate the research objectives.
No participant identifiers were included during the meeting.	Participants received visible participant numbers during the meeting.	Participant identification, by means of numbers, will assist the researcher when examining the transcriptions to provide context to the data, as well as enable participants to reply directly to previous participant opinions by stating the relevant participant's number they are answering to.
Supporting documents sent to participants only included the statements informing the framework, selected concept clarifications and the meeting guide.	Participants received both the framework and the statements informing the framework, concept clarifications as well as the required graduate attributes expected of graduating South African physiotherapy students. The meeting guide was removed.	Better informed participants would be able to provide specific feedback and suggestions relating to the framework's ability to result in the attainment of the expected graduate attributes. Provision of the meeting guide was revoked as this would have resulted in participants coming to the meeting with preconceived ideas and notions.

APPENDIX Z.

Amendments following the second validation meeting exploratory discussion

APPENDIX Z. Amendments following the second validation meeting exploratory discussion.

Pre-exploratory study	Post-exploratory study	Reason cited for change
Is the proposed framework clear, consistent and precise? **Probe:** Ensure that any recommendations for change are accompanied by clear suggestions on how to change each aspect.	Removed.	Addressed during the framework finalisation phase.
Is the framework appropriate, relevant and comprehensive for the South African undergraduate physiotherapy environment? **Probe:** Does the framework take into account the South African undergraduate physiotherapy programme structure?	Which elements of the framework do you view as being essential in achieving a competent physiotherapy graduate? Please provide your reasoning for the answer.	Inclusion of more explicit questions to elicit comprehensive data in accordance to the stated research aims.
	Please indicate the framework elements that you consider as being useful in producing a competent physiotherapy graduate. Do you feel, possible exclusion of these elements would compromise the framework and the final outcome? Please provide clarification for your answer.	
	Identify framework elements which you perceive as not applicable for inclusion in the framework, and that you feel would not compromise the framework and the final outcome if they are to be excluded? Please provide clarification as to why you are of the opinion these elements are to be excluded.	
Is the framework applicable, practical and sustainable for the South African undergraduate physiotherapy programme? **Probe:** Are all possible obstacles for the integration of simulation taken into account and addressed adequately?	In the premise of the programme's resources being limited, what is your view regarding the practicality of the proposed framework?	Question expanded for ease of answering.
	If external challenges such as a declining clinical platform and change in case mix, impact on the training of the undergraduate physiotherapy students, in your opinion, which areas could lend itself to be supplemented with simulation training?	

Pre-exploratory study	Post-exploratory study	Reason cited for change
Are the proposed constructs transferable and adaptable to the various areas in the physiotherapy programme? **Probe:** Can this framework easily be implemented in any area/ sub-module in the undergraduate physiotherapy programme from the first to final year of study. Areas of physiotherapy education: Neurology, cardiopulmonary therapy (medical conditions and post-surgical rehabilitation and treatment), orthopaedics (conditions and post-surgical rehabilitation and treatment), sport, neuromusculoskeletal therapy, paediatrics, community service learning.	Removed.	Addressed during the final framework finalisation phase.
Is the proposed framework credible according to published literature related to the subject at hand? **Probe:** Does an extensive and critical literature review form the basis for this framework?	Removed.	Repetition of the last question regarding validity and trustworthiness. Addressed during the final framework finalisation phase.
Is the scientific value, the implication for research, practice and physiotherapy education, of the framework evident? **Probe:** Does the framework have the potential to enhance South African undergraduate physiotherapy education?	Do you perceive the framework as being supportive in the development of graduate attributes, as stipulated by the Health Professions Council of South Africa (HPCSA), and please indicate which aspects of the framework supports the development of these attributes? What would the impact of the proposed framework be on the various stakeholders involved in the South African undergraduate physiotherapy programme, where stakeholders refer to students, the organisation (university) as well as the regulating body (HPCSA)?	Inclusion of more explicit questions to elicit more comprehensive data in accordance with the stated research aims.
Is the framework trustworthy/ valid? **Probe:** Has the evidence, supporting the framework implementation, been interpreted correctly by the researcher?	Removed.	Addressed during the final framework finalisation phase.

APPENDIX AA.

Information leaflet for validation meeting participants

APPENDIX AA. Information leaflet for validation meeting participants.

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A FRAMEWORK FOR THE INTEGRATION OF SIMULATION IN UNDERGRADUATE PHYSIOTHERAPY: CONTEXTUALISED FOR SOUTH AFRICA (VALIDATION MEETING)

Dear Participant

My name is Anke van der Merwe and I am currently enrolled for my PhD degree at the Department of Physiotherapy in the Faculty of Health Sciences at the University of the Free State (South Africa). To fulfil my qualification, I am undertaking to do research to develop a proposed framework for the integration of simulation in the South African undergraduate physiotherapy programme.

Research is defined as the process to learn the answer to a question. In this study the researcher wants to learn how a variety of simulation activities can be integrated into the South African undergraduate physiotherapy programme.

Simulation is widely used within the healthcare setting to enhance and develop skills which are deemed essential for patient evaluation and treatment within a safe and non-threatening environment (Labuschagne 2012). Various research studies have indicated the advantageous use of simulation in enhancing clinical confidence, the acquirement of psychomotor skills, facilitating effective communication and teamwork (Bednarek *et al.* 2014; Jones & Sheppard 2007; Ohtake *et* al.2013). Simulation-based education has received a great deal of attention over the past decade and subsequently shifted to the centre stage in healthcare education (Kneebone *et al.* 2006; Good 2003; Berragan 201; Bland *et al.* 2011).

Although simulation has been increasingly utilised for undergraduate training of healthcare professionals worldwide, very little information regarding the integration of simulation within the undergraduate physiotherapy curriculum could be found (Blackstock *et al.* 2013;Jones & Sheppard 2008; Ladyshewsky *et al*. 2000). South Africa also boasts with a very diverse student profile and experiences unique challenges when it comes to undergraduate healthcare education, therefore highlighting the need for a context specific educational research to be executed. No mention in both national and international literature was made regarding a specific framework detailing the integration of simulation within the South African undergraduate physiotherapy programme.

I am hereby inviting you to participate in this research study research study to enable me to collect the required data to compile a proposed framework for the integration of simulation within the South African undergraduate physiotherapy programme.

What is involved in the study? A multi method research study will be conducted by means of firstly, a systematic document review of all published simulation-based frameworks in healthcare education, with a focus on curricular integration of simulation. Secondly a Delphi survey will be executed amongst approximately eight to twelve national and international experts within the physiotherapy and/ or healthcare simulation-based education fields. Elements for possible inclusion in the conceptual framework will be sent to the expert review panel in the form of a Delphi survey for deliberation and discussion. The third and final study phase will be to subject the conceptual framework to a validation meeting to further deliberate and contextualise it for the South African undergraduate physiotherapy context.

If you agree to study participation you will participate in the validation meeting together with four other chosen experts as well as an independent meeting facilitator. You will receive an electronic copy of the conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme, including the statements informing the framework and any other relevant supporting documentation. You will have approximately two weeks to review the document. A convenient date and time will be arranged between all validation meeting participants for the execution of the meeting. This validation meeting will be executed in a private room at the University of the Free State. If you are currently not working or living in Bloemfontein, the researcher will arrange travel, accommodation and sustenance at your convenience.

During the validation meeting the facilitator will present the meeting with a set of structured questions regarding your opinion and recommendations for the framework presented to you. You are encouraged to enter into an open and free discussion with the other participants. The validation meeting will be audio-recorded and the researcher may also make some additional field notes. If for some reason the meeting is interrupted and cannot continue, a date and time which suites all participants will be arranged to complete the review. It is foreseen that the validation meeting could take approximately three to four hours of your time.

As no physical interventions are being tested, and no questions of a sensitive nature are being asked, the researcher foresees no risk for participation in this study. Participants will receive no remuneration for study participation, and no “out of pocket” expenses are foreseen for participants.

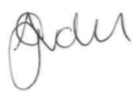
By participating in this study participants will provide the researcher with expert feedback and opinion regarding the context specific elements deemed essential for the proposed framework for the effective integration of simulation in the South African undergraduate physiotherapy programme. It is the vision of the researcher that by compiling this framework for simulation integration, all South African physiotherapy educators will be guided in the effective and quality integration of simulation within their undergraduate programme to address the unique needs of our South African student population. Participation in this research study is voluntary, and refusal to participate will involve no penalty or loss of benefits. You may discontinue participation at any time without penalty or loss of benefits.

Efforts will be made to keep all personal information confidential. Audio-recordings will contain no personal identifying information, only an assigned participant number. All audio-recordings will be kept safe by the researcher in a password protected hardrive in a locked safe. Absolute confidentiality cannot be guaranteed. If research results are published or presented at conferences, the researcher will ensure that no identifying information of participants is included. Personal information may however be disclosed if required by law.

Permission has been obtained from the Health Sciences Research Ethics Committee of the University of the Free State. You may contact the secretariat of the committee if you have any queries regarding your rights as research participant. Contact number: +2751-401 7795. If you have any questions or queries regarding the research study or participation in this study, feel free to contact the researcher at gonzelaesa@ufs.ac.za or alternatively on +27 824464923.

Thank you for your time.

Regards



Anke van der Merwe

APPENDIX BB.

Conceptual framework following the Delphi survey

APPENDIX BB. Conceptual framework following the Delphi survey.

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Dear Participant

A visual representation of the conceptual framework (Figure 1) as well as the proposed statements which were identified by published literature and a Delphi process as either being essential, useful or not applicable to be included in the framework for the integration of simulation in the South African undergraduate physiotherapy programme is included.

You will have time until the meeting date to deliberate the documents and formulate your opinion regarding the status of each statement (essential to be included, useful to be included, not applicable or uncertain). The percentage consensus achieved during the Delphi survey is indicated in the table below. The Delphi round where consensus/ stability was achieved is also indicated in the table. Statements achieving only stability during the Delhi survey are shaded in blue for your convenience.

Question regarding the proposed conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme, will be put forward to participants for deliberation. All relevant comments, concerns and recommendations raised will be explored in depth during the session by an independent facilitator.

Participants are encouraged to answer questions freely- as all data will be treated confidentially.

If you have any questions or concerns, please feel free to contact the researcher at gonzalesa@ufs.ac.za.

Thank you for your willingness to participate in my research project. Your time and valuable input is greatly appreciated.

Kind regards

Anke van der Merwe

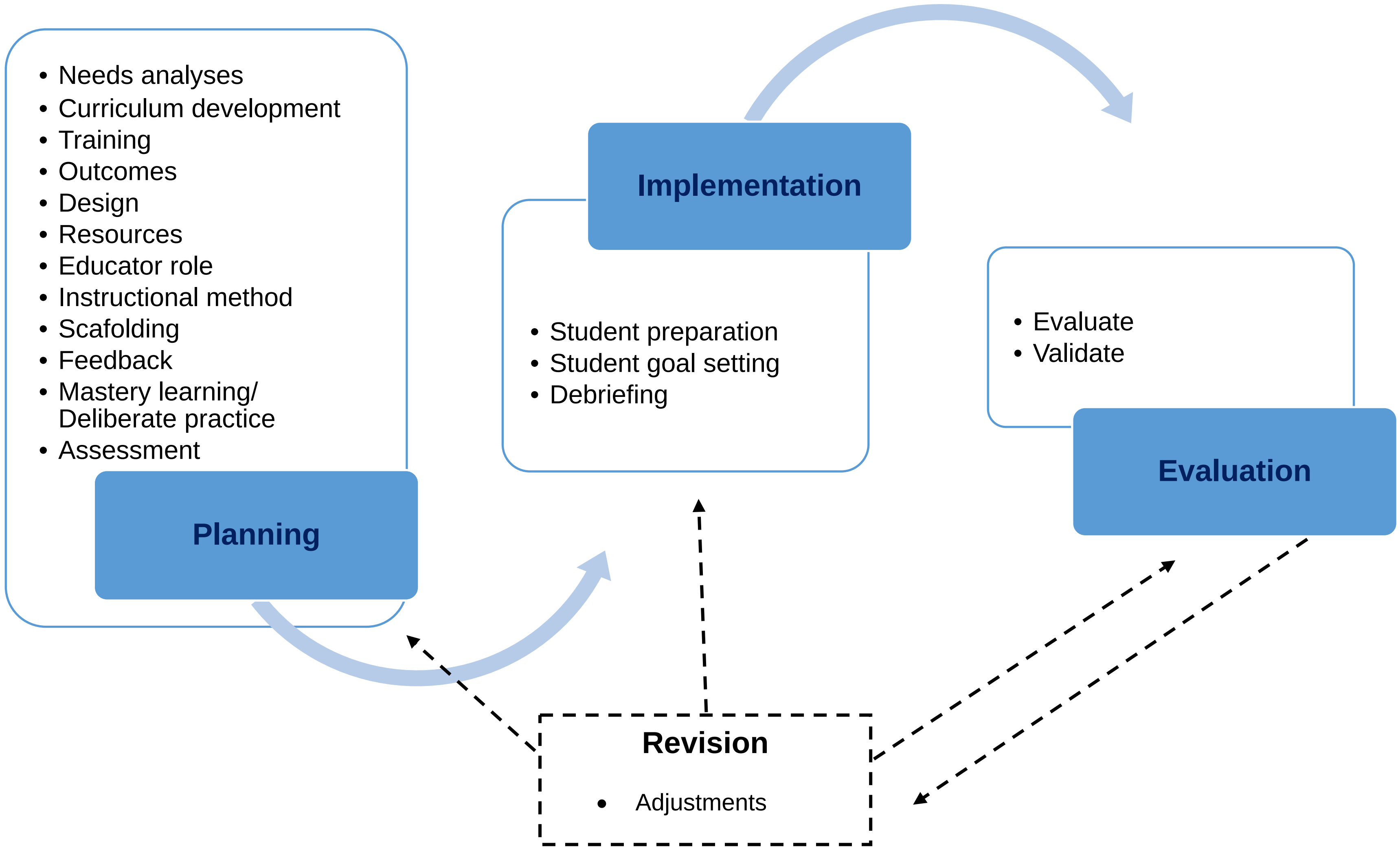

Figure 1. Conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme

APPENDIX CC.

Statements informing the conceptual framework

APPENDIX CC. Statements informing the conceptual framework.

**The percentage consensus/ stability achieved is indicated under the corresponding importance option; Round= Delphi round where consensus/ ** Statements achieving only stability are shaded in blue.*

****Italic sections refer to supplemental clarification provided for panellists.*

STATEMENTS RELATING TO PLANNING		Round	Essential	Useful	Not applicable / No	Uncertain
NEEDS ANALYSES	A needs analysis identifying institutional needs, which could be addressed by the integration of simulation into the programme, must be performed during the planning phase.	1	93%			
	A needs analysis identifying discipline specific needs, which could be addressed by the integration of simulation into the programme, must be performed during the planning phase.	1	93%			
	Identified societal needs should form the background context of simulated-based learning experiences, depending on the desired learning objectives for each planned learning experience.	3		64%		
CURRICULUM DEVELOPMENT	All involved stakeholders (educators, simulation experts, educationalists etc.) must collaborate to ensure curricular integration of simulation.	1	79%			
	A standardised educational model should be useful when designing a simulation programme, but must allow for contextual flexibility.	2	75%			
	All involved stakeholders (educators, simulation experts, educationalists etc.) must collaborate in the process of developing a curriculum, which integrates simulation.	1	71%			
	All involved stakeholders (educators, simulation experts, educationalists etc.) must assess where simulation will be used best, as opposed to other teaching strategies, to ensure optimal learning.	1	71%			

	Statement	Round	Essential	Useful	Not applicable / No	Uncertain
TRAINING	All educators involved in the facilitation of simulated-based learning experiences are required to receive training prior to facilitating these learning experiences.	1	93%			
	All educators involved in providing feedback following simulated-based learning experiences are required to receive training prior, to prepare them in the art of providing meaningful feedback.	1	79%			
	All educators involved in the facilitation of simulated-based learning experiences are required to receive training in debriefing.	1	71%			
	All involved stakeholders (educators, simulation experts, educationalists) involved in the development of simulated-based learning experiences are required to receive training on how to integrate and develop these learning experiences.	1	71%			
	All personnel involved in the development of simulated-based learning experiences are required to receive orientation regarding the available faculty/ institutional resources, which could be applicable to their field.	3	73%			
OUTCOMES	Specific learning outcomes for each simulated-based learning experience must be carefully developed prior to the learning experience.	1	100%			
	Educators must identify which of their intended subject/ module/ programme outcomes could be better achieved by the use of simulation-based activities, and plan such learning experiences accordingly.	1	86%			

	Statement	Round	Essential	Useful	Not applicable / No	Uncertain
OUTCOMES	Educators must ensure constructive alignment between each simulated-based learning experience outcomes and the subject/ module outcomes.	1	86%			
	Detailed learning outcomes for each simulated-based learning experience must be constructed.	1	86%			
	Inter-professional simulated-based learning experiences must include a non-technical training component.	1	79%			
	Non-technical training aspects, according to the stated learning outcomes, should increasingly be embedded in simulated-based learning experiences (from simple to complex) as the outcomes for the learning experiences become more complex.	2	75%			
DESIGN	The content of each simulated-based learning experience must be carefully developed prior to the learning experience.	1	93%			
	The logistics for each simulated-based learning experience must be planned carefully regarding the time frame of each simulated-based learning experience.	1	93%			
	The simulated-based learning experience time frame should include planning, preparation, setup, training of standardised patients (if used), actual simulation and dismantling. **Feedback and mastery learning is addressed under separate headings.*	1	93%			
	Simulated-based learning experiences must be designed according to the stipulated learning outcomes.	1	93%			
	The logistics regarding which simulation modality/ modalities are to be used to achieve the required learning outcomes must be planned carefully for all simulated-based learning experiences.	1	86%			

	Statement	Round	Essential	Useful	Not applicable / No	Uncertain
DESIGN	Educators must identify the team/ group composition for each simulated-based learning experience.	1	79%			
	The level of fidelity required for each simulated-based learning experience must be considered by educators and planned accordingly.	1	79%			
	Simulated-based learning experiences can be designed by students, with educator facilitation.	1		79%		
RESOURCES	Educators must identify the specific available simulation modalities, which could best achieve each of the individual learning outcomes.	1	100%			
	Time must be allocated specifically for simulation planning and scenario development for all involved educators.	1	86%			
	Available financial resources must be identified to assist with the implementation of simulation within the programme.	1	86%			
	Personnel (educators and support staff) as well as participants must be identified who will be able to assist with each of the planned simulated-based learning experiences.	1	86%			
	Facilities equipped for hosting simulated-based learning experiences may be shared between health care disciplines (e.g. medical and allied health science students).**These facilities should be designed in such a way as to be able to accommodate the needs of various health care disciplines (e.g. ward setting, consultation room, skills training areas).*	2	83%			
	Simulation experts, which could include experts from other disciplines where deemed necessary, should be identified and included in the initial planning process.	3	82%			

	Statement	Round	Essential	Useful	Not applicable / No	Uncertain
RESOURCES	All available institutional simulation modalities should be identified and considered for use, as is deemed appropriate to achieve the set learning outcomes for each individual simulated-based learning experience.	3	73%			
	A simulation team or committee should be established to assist with the general administrative duties (e.g. recruitment and training) when utilising simulated patients for identified simulated-based learning experiences.	3	73%			
EDUCATOR ROLE	The role of the educator must be clearly defined prior to the simulated-based learning experience.	1	71%			
	The educator's role in formative simulated-based learning experiences, not used for formal assessment, would be that of facilitator and providing feedback.	3	64%			
	The educator's role in summative simulated-based learning experiences is that of post-simulation feedback/ debriefing and discussion.	3	40%	40%		
INSTRUCTIONAL METHOD	The instructional method to be utilised during each simulated-based learning experience must be identified during the planning phase of the programme.	1	79%			
	When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator should provide student training prior to the learning experience with regards to the resources (e.g. equipment) which will be utilised.	1	79%			
	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to a trained facilitator and debriefer during and after the learning experience.	1	71%			

	Statement	Round	Essential	Useful	Not applicable / No	Uncertain
INSTRUCTIONAL METHOD	When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator should provide the student with access to the course content, required resources and detailed outcomes for the learning experience.	2	83%			
	The educator is required to provide orientation to all involved stakeholders (educators, students, facilitators), with regards to the course content, outcomes and required resources which will be addressed/ utilised during the simulated learning experience.	2	83%			
	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide training of all involved stakeholders (educators, facilitators, simulated patients, students) prior to the learning experience with regards to the specific expectations and outcomes of the learning experience.	2	79%			
	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator should provide the student with access to the course content, required resources and detailed outcomes for the learning experience.	2	75%			
SCAFFOLDING	Simulated-based learning experiences must be incorporated and structured according to the level of the student. The complexity of the simulated-based learning experiences must therefore increase from novice to expert as the student progresses in the programme	1	93%			
	Simulated-based learning experiences would tend to move from basic cognitive, non-technical and technical skills training for novice students, towards more complex patient scenarios in which the mentioned skills should be integrated as well.	2	75%			

	Statement	Round	Essential	Useful	Not applicable / No	Uncertain
FEEDBACK	When simulated-based learning experience feedback will be provided must be decided upon during the simulation planning phase (during or following completion of the learning experience).	1	86%			
	How simulated-based learning experience feedback will be provided must be decided upon during the simulation planning phase (simulator, facilitator/ peer/ self).	1	79%			
MASTERY LEARNING/ DELIBERATE PRACTICE	Attainment of an educator's set benchmark during formative assessments could be peer-assessed, while the educator is only responsible for assessing benchmark achievement during summative assessments.	3		73%		
	Students should be allowed to redo all formative simulated-based learning experiences until they have reached their individual level of satisfaction. * *This would be dependent on the course structure, available time and resources.*	3		55%		
	Students should be allowed to redo all formative simulated-based learning experiences until they have reached their individual level of satisfaction. * *This would be dependent on the course structure, available time and resources.*	3		55%		
	The educator should assess attainment of the educator's set benchmark, for identified summative simulated-based learning experiences, at all times. **Options for peer- and/ or self-assessment are provided in the following questions.*	3	55%			
	The educator should assess attainment of the educator's set benchmark, for identified formative simulated-based learning experiences, at all times. **Options for peer- and/ or self-assessment are provided in the following questions.*	3		45.5%		

	Statement	Round	Essential	Useful	Not applicable / No	Uncertain
ASSESSMENT	A specific assessment tool for each summative simulated-based learning experience should be developed, according to the desired learning outcomes, during the planning phase.	2	83%			
	A self-assessment element should only be included in simulated-based learning experiences identified by the educator. Therefore, not every learning experience should have an element of self-assessment embedded.	2			75%	
	Attainment of an educator's set benchmark during formative assessments could be peer-assessed, while the educator is only responsible for assessing benchmark achievement during summative assessments.	3		73%		
	A specific assessment tool (formative/ summative) for each simulated-based learning experience must be developed during the planning phase.	1	71%			
	All simulated-based learning experiences should have an element of self-reflection.	3	64%			
	Educators should identify which simulated-based learning experiences are to be used for summative assessment. Only these identified assessments should be performed on a one-to-one student-educator basis.	3	55%			
	Educators should identify which simulated-based learning experiences could accommodate a peer-assessment element, and it should be implemented as such.	3	55%			
	Educators should identify which simulated-based learning experiences are to be used for formative assessment. Only the identified assessments should be performed on a one-to-one student-educator basis. **An element of peer-assessment could be added if deemed appropriate by the educator.*	3	45.5%			

STATEMENTS RELATING TO IMPLEMENTATION		Round	Essential	Useful	Not applicable / No	Uncertain
STUDENT PREPARATION	Students should be orientated at the beginning of the debriefing/ feedback session regarding what will be evaluated/ discussed as well as the method of feedback to be used for the simulated-based learning experience.	3	82%			
	Students should receive simulation related orientation (logistics of the session, timing of feedback/ debriefing, outcomes) only at the beginning of the module and at no further time.	2			75%	
	Students are only required to complete an informal formative assessment (e.g. online multiple choice questionnaire) of theoretical knowledge before participating in simulated-based learning experiences relating to technical skills training.	2			75%	
	Students should receive simulation related orientation (logistics of the session, timing of feedback/ debriefing, outcomes) at the beginning of the module and again prior to each simulated-based learning experience.	3	73%			
	Students are required to complete an informal formative assessment (e.g. online multiple-choice questionnaire) of theoretical knowledge before participating in specific educator identified simulated-based learning experiences.	3		64%		
	Students are encouraged to revisit the specific simulated-based learning experience outcomes, as well as their individual goals, as they progress through the module/ programme/ academic year.	3	64%			
	Students are required to complete an informal pre- and post-formative assessment (e.g. online multiple-choice questionnaire) when participating in specific educator identified simulated-based learning experiences (technical and non-technical training). **Debriefing could be utilised as a post-formative assessment.*	3	45.5%	45.5%		
	Relevant theory pertaining to each individual simulated-based learning experience must be completed prior to the students participating in the learning experience. **The simulated-based learning experience may be used to identify theoretical gaps and needs.*	3	45.5%	45.5%		

	Statement	Round	Essential	Useful	Not applicable/ No	Uncertain
STUDENT GOAL SETTING	It is necessary for students, in addition to the set learning outcomes, to set individual goals applicable to each of the planned simulated-based learning experiences.	2		83%		
	Students are encouraged to revisit the specific simulated-based learning experience outcomes, as well as their individual goals, as they progress through the module/ programme/ academic year.	3	64%			
DEBRIEFING	When debriefing of each simulated-based learning experience will take place must be decided upon during the planning phase (immediately following completion of the learning experience, or at a later stage).	1	85%			
	Students must be debriefed by a trained facilitator, following the completion of each simulated-based learning experience.	1	85%			
	The specific debriefing method and tool used for each simulated-based learning experience should be decided upon prior to the simulated-based learning experience to ensure facilitators are trained in the method utilised.	3	100%			

	Statement	Round	Essential	Useful	Not applicable / No	Uncertain
STATEMENTS RELATING TO EVALUATION						
EVALUATE	A form of programme evaluation is required once simulation has been integrated into the programme.	1	100%			
	Feedback from educators involved in the simulated-based learning experiences is required for programme evaluation following simulation integration.	1	100%			
	Feedback from students partaking in the simulated-based learning experiences is required for programme evaluation following simulation integration.	1	100%			
	Summative assessments, using standardised assessment tools, should be used for programme evaluation following simulation integration.	2		75%		
	Informal evaluations (e.g. satisfaction surveys in the format of checklists/ rating scales) completed by all educators, participants (e.g. simulated patients) and students involved in simulated-based learning experiences, could be used for programme evaluation following simulation integration.	3		64%		
	Formative student assessments, using standardised assessment tools, should be used for programme evaluation following simulation integration. **Questions pertaining to further programme evaluation methods are provided in the following questions.*	3		45.5%		

Statement		Round	Essential	Useful	Not applicable / No	Uncertain
VALIDATION	Existing national requirements and standards, as proposed by the national regulating body (Health Professional Council of South Africa), must be used when designing a simulation programme to validate the programme.	1	77%			
	Expert consensus and literature reviews must be used when designing an integrated simulation programme in order to validate such a programme.	1	77%			
STATEMENTS RELATING TO REVISION						
ADJUSTMENTS	Adjustments to the programme following simulation integration must be made according to the feedback received from all stakeholders and participants.	1	92%			
	Adjustments to the programme following simulation integration must be made according to the new technological advances or educational best practices identified.	1	77%			

APPENDIX DD.

Concept clarification for validation meeting participants

APPENDIX DD. Concept clarification for validation meeting participants.

SELECTED DEFINITIONS AND TERMS

Clinical Simulation: Clinical simulation includes a wide variety of educational techniques used for education and training of health professionals and includes the use of technology and simulated patients to replace or amplify real-life experiences with guided experience that evoke or replicate aspects of the clinical area in an interactive way (Gaba 2004:i2; Milkins *et al.* 2014:11).

Computer-based simulation: Computer-based programmes allowing for interaction between learner and computer, and the ability to provide instant automated feedback, for instance virtual patients, virtual worlds, second life and avatars. (Ostergaard & Dickman 2013:209; Milkins *et al.* 2014:11).

Curriculum: A curriculum comprises of specific modules from various disciplines, which form part of a learning programme for which students must achieve stated learning outcomes (UFS 2017).

Debriefing: Debriefing is defined as the facilitator led reflective session following a simulated-based learning experience where the learning experience is re-examined with regards to performance aspects and emotions experienced (Lopreiato *et al*. 2016). **Debriefing methods fall beyond the scope of this research study.*

Fidelity: The degree of realism with which a specific simulation activity is conducted. Simulation can involve a variety of fidelity dimensions for example physical factors including the environment, equipment used, psychological factors (i.e. participant emotions and beliefs), social factors (i.e. motivation and goals), group culture and the degree of trust between participants (Chiniara *et al.* 2013:e1385; Lopreiato *et al.* 2016:11).

Formative assessment: Formative assessments can be defined as assessments for learning with the aim to assess achievement of the set learner and educator goals (Purva *et al.* 2016).

Framework: The operational definition for framework in this study refers to the basic structure of the proposed research product- a set of elements used to guide choices regarding the content, educational methods and interpretation of outcomes and results. (Thackray 2013:93, 96; Bordage *et al.* 2015:1).

Human patient simulators: Making use of a life-like high-fidelity simulators/ manikins to accurately recreate and mimic realistic clinical conditions, patient behaviours and characteristics (Chiniara *et al.* 2013:e1387; Silberman *et al.* 2013:26; Milkins *et al*. 2014:11)**.**

Instructional methods: Instructional methods refer to the specific techniques utilised for learning and can be self-directed learning or instructor-based learning (Chiniara *et al.* 2013:e1384).

Module: A coherent and self-contained unit of learning which is specifically designed in order for students to achieve a detailed set of learning outcomes (UFS 2017).

Non-technical training: Non-technical training refers to aspects such as communication, leadership, professionalism, collaboration, health advocacy and scholarship. It can also include problem solving skills and clinical reasoning (HPCSA 2018).

Part task trainer: A simulator replicating specific components of a system or patient and is designed for practicing isolated procedures allowing for the procedural skills training (Chiniara *et al.* 2013:e1387; Kneebone *et al.* 2006:920; Milkins *et al* 2014:11).

Relevant healthcare simulation: The operational definition for relevant healthcare simulation in this study refers to the use of simulation modalities which are applicable to undergraduate physiotherapy training.

Simulation: An educational technique creating a situation or environment allowing learners to experience the portrayal of a real situation for the purposes of practice, learning, assessment, or to gain insights into the functioning of systems or human actions (Lopreiato 2016:33).

Simulation-based learning experience: A simulated-based learning experience is defined as various structured activities that represent either actual or potential situations in education and practice (Lopreiato *et al.* 2016).

Simulation expert: The operational definition for simulation expert in this study will be defined as an individual who is directly involved in healthcare simulation and has specific simulation training and/ or has conducted relevant research in the field of simulation.

Simulation facilities: Facilities where students can engage in various simulation-based activities. These facilities should be designed in such a way as to be able to accommodate the needs of various health care disciplines (e.g. hospital ward setting, consultation room, skills training areas).

Simulated patient: A carefully trained individual portraying the role of a patient, or other relevant party, in a health care simulation in a realistic and accurate way (Chiniara *et al.* 2013:e1387).

Specific assessment tool: A specific assessment tool in this study refers to, for example, a detailed checklist of what the student should demonstrate during the simulated activity/ scenario.

Summative assessment: Summative assessments (high-stakes assessment) are defined as the assessment of learning outcome achievement indicating the readiness of the student to progress to the next study level (pass/ fail) (Purva *et al.* 2016).

APPENDIX EE.

Finalised validation meeting guide

APPENDIX EE. Finalised validation meeting guide.

Pre-interview:

Testing of equipment and area set-up (6 chairs and table for audio-recorders)

Interview administration:

Time:_____________________________________

Date:_____________________________________

Participant details:

Participant number	**Area of expertise**	**Years' experience in field**

Answering of any questions pertaining to provided information leaflet, clarifying of simulation glossary, signing of informed consent form.

Validation meeting procedure:

Presentation by researcher detailing meeting procedure- discussion will be facilitated regarding the proposed conceptual framework for the integration of simulation in the South African undergraduate physiotherapy programme. Participants should please state their participant number before providing their views during the meeting. All relevant comments, concerns and recommendations raised will be explored during the meeting and you are encouraged to answer questions freely as all data will be treated confidentially.

Validation meeting commences following switching on of audio-recorder.

Time for interview completion- estimated at four hours.

[Ensure that each participant signed consent before commencement of the session]

[Switch on audio-recorder and commence interview]

QUESTIONS

Participants should please note that, even though not stipulated in each question, all questions **related to the South African undergraduate physiotherapy context** and should please be considered and answered as such.

Courtesy break for refreshments 10:30.

1. Which elements of the framework do you view as being <u>essential</u> in achieving a competent physiotherapy graduate? Please provide your reasoning for the provided answer.

2. Please indicate the framework elements that you consider as being <u>useful</u> in producing a competent physiotherapy graduate, with possible omittance of these elements not compromising the framework and the final outcome. Please provide clarification of your answer.

3. Identify framework elements which you perceive as <u>not applicable</u> for inclusion in the framework, and that you feel would not compromise the framework and the final outcome if they are to be excluded? Please provide clarification as to why you are of the opinion these elements are to be excluded.

4. Do you perceive the framework as being supportive in the development of graduate attributes, as stipulated by the Health Professions Council of South Africa (HPCSA), and please indicate which aspects of the framework supports or could be enhanced to develop these attributes?

5. What would the impact of the proposed framework be on the various **stakeholders** involved in the South African undergraduate physiotherapy programme, where stakeholders refer to <u>students</u>, the <u>organisation (university)</u> as well as the <u>regulating body (HPCSA)</u>?

6. In the premise of the programme's resources being limited, what is your view regarding the practicality of the proposed framework?

7. If external challenges such as decreasing training platform and change in case mix, impact on the training of the undergraduate physiotherapy students, in your opinion, which areas could lend itself to be supplemented with simulation training?

Courtesy break for lunch once discussion has reached saturation and no new information is gathered.

Researcher makes suggested adjustments to proposed framework.

PART 2: Finalisation

Presentation of adapted framework to participants.

1. Do you view the adapted framework as accurate according to the views and suggestions aired during the meeting?
2. In your opinion, are the proposed constructs transferable and adaptable to the various areas in the physiotherapy programme?
3. How can the planning, implementation and evaluation for the integration of the framework be approached?
4. In your opinion, is the framework trustworthy/ valid?

Thank you for your willingness to participate in this research study. The researcher greatly appreciates your time and your valuable input.

[Stop recording]

APPENDIX FF.

Adjusted statements informing the framework following the validation meeting

APPENDIX FF. Adjusted statements informing the framework following the validation meeting.

** Sections highlighted in blue indicates additions or changes made by validation meeting participants.*
*** Sections highlighted in grey were removed from the statements informing the final framework by validation meeting participants*.
**** Sections highlighted in yellow were reallocated from other sections following the validation meeting.*
***** Italic sections refer to supplemental clarification provided to Delphi panel members.*

STATEMENTS RELATING TO NEEDS ANALYSES		**Essential**	**Useful**	**Not applicable/ No**
Simulation as a strategy	A needs analysis identifying institutional and discipline specific needs, which could be addressed by the integration of simulation into the programme, must be performed prior the planning phase.	√		
	A cost-benefit analysis relating to initial and ongoing maintenance costs is required prior to the planning phase.	√		
	A needs analysis identifying societal and student needs, which could be addressed by the integration of simulation into the programme, must be performed prior the planning phase.		√	
	A needs analysis identifying discipline specific needs, which could be addressed by the integration of simulation into the programme, must be performed during the planning phase.	√		
Curriculum development and simulation design	A needs analysis identifying clinician identified needs as well as student needs, which could be addressed by the integration of simulation into the programme, must be performed prior the planning phase.	√		
	A needs analysis identifying contextual needs (societal, environmental and content), which could be addressed by the integration of simulation into the programme, must be performed prior the planning phase.	√		

STATEMENTS RELATING TO PLANNING		Essential	Useful	Not applicable/ No
Responsive curriculum ("Curriculum development")	All involved stakeholders (interprofessional educators, simulation experts, educationalists, clinicians and students) must collaborate to ensure curricular integration of simulation.	√		
	An educational model/ educational pedagogy should be used when designing a simulation programme. ("standardised"; "but must allow for contextual flexibility")	√		
	All involved stakeholders (interprofessional educators, simulation experts, educationalists, clinicians and students) must collaborate in the process of developing a curriculum, which integrates simulation.	√		
	All involved stakeholders (interprofessional educators, simulation experts, educationalists, clinicians and students) must assess where simulation will be best integrated with other teaching strategies, to ensure optimal learning. ("as opposed to")	√		
	The curriculum developed must be authentic in nature	√		

Statement		Essential	Useful	Not applicable/ No
Instructional method Adaptive instructional method incorporated in curriculum development and student-centred preparation	When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator should provide student training prior to the learning experience with regards to the resources (e.g. equipment) which will be utilised.	√		
	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide the student with access to a trained facilitator and debriefer during and after the learning experience.	√		
	When utilising self-directed learning as an instructional method for a simulated-based learning experience, the educator should provide the student with access to the course content, required resources and detailed outcomes for the learning experience.	√		
	The educator is required to provide orientation to all involved stakeholders (educators, students, facilitators), with regards to the course content, outcomes and required resources which will be addressed/ utilised during the simulated learning experience.	√		
	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator must provide training of all involved stakeholders (educators, facilitators, simulated patients, students) prior to the learning experience with regards to the specific expectations and outcomes of the learning experience.	√		
	When utilising instructor-based learning as an instructional method for a simulated-based learning experience, the educator should provide the student with access to the course content, required resources and detailed outcomes for the learning experience.	√		
Scaffolding	Simulated-based learning experiences must be incorporated and structured according to the level of the student throughout the curriculum. The complexity of the simulated-based learning experience design and outcomes must therefore increase from novice to expert as the student progresses in the programme	√		
	Simulated-based learning experiences would tend to move from basic competency training (skill, knowledge and attitudinal) for novice students, towards more complex patient scenarios in which the mentioned skills should be integrated as well.	√		

Statement		Essential	Useful	Not applicable/ No
Learning outcomes	Specific learning outcomes for each simulated-based learning experience must be carefully developed prior to the learning experience.	√		
	Educators must ensure constructive alignment between each simulated-based learning experience outcomes, the subject/ module outcomes and assessment.	√		
	Detailed learning outcomes for each simulated-based learning experience must be constructed.	√		
	Training of all graduate attributes and competencies, according to the stated learning outcomes, should be embedded in simulated-based learning experiences (from simple to complex) as the outcomes for the learning experiences become more complex. (removed "non-technical training aspects", "increasingly")	√		
	Educators must identify which of their intended subject/ module/ programme outcomes could be better achieved by the use of simulation-based activities, and plan such learning experiences accordingly.	√		
	Inter-professional simulated-based learning experiences must include a non-technical training component.	√		
Simulation design	The content of each simulated-based learning experience must be carefully developed prior to the learning experience.	√		
	The logistics for each simulated-based learning experience (time for planning, set-up and execution, level of authenticity, team/ group composition, modality utilised and technologies used) must be planned carefully for each simulated-based learning experience. ("regarding the time frame of")	√		
	The adaptive instructional method to be utilised during each simulated-based learning experience must be identified during the planning phase of the programme. Adaptive instructional methods can include, amongst others, self-directed learning, facilitated learning, peer-led learning, problem-based learning and computer-based learning.	√		
	Simulated-based learning experiences can be designed by students, with educator facilitation.		√	
	Time must be allocated specifically for simulation planning and scenario development for all involved educators.		√	
	The simulated-based learning experience time frame should include planning, preparation, setup, training of standardised patients (if used), actual simulation and dismantling. **Feedback and mastery learning is addressed under separate headings.*	√		

Statement		Essential	Useful	Not applicable/ No
Simulation design	Simulated-based learning experiences must be designed according to the stipulated learning outcomes.	√		
	The logistics regarding which simulation modality/ modalities are to be used to achieve the required learning outcomes must be planned carefully for all simulated-based learning experiences.	√		
	Educators must identify the team/ group composition for each simulated-based learning experience.	√		
	The level of fidelity required for each simulated-based learning experience must be considered by educators and planned accordingly.	√		
	Educators must identify the specific available simulation modalities, which could best achieve each of the individual learning outcomes.	√		
	Available financial resources must be identified to assist with the implementation of simulation within the programme.	√		
	Personnel (educators and support staff) as well as participants must be identified who will be able to assist with each of the planned simulated-based learning experiences.	√		
	Facilities equipped for hosting simulated-based learning experiences may be shared between health care disciplines (e.g. medical and allied health science students).**These facilities should be designed in such a way as to be able to accommodate the needs of various health care disciplines (e.g. ward setting, consultation room, skills training areas).*	√		
	Simulation experts, which could include experts from other disciplines where deemed necessary, should be identified and included in the initial planning process.	√		
	All available institutional simulation modalities should be identified and considered for use, as is deemed appropriate to achieve the set learning outcomes for each individual simulated-based learning experience.	√		
	A simulation team or committee should be established to assist with the general administrative duties (e.g. recruitment and training) when utilising simulated patients for identified simulated-based learning experiences.	√		

Statement		Essential	Useful	Not applicable/ No
Competent facilitator ("Training")	Educators involved in the facilitation of simulated-based learning experiences are required to receive training prior to facilitating these learning experiences. ("all")	√		
	Educators involved in providing feedback following simulated-based learning experiences are required to receive training to prepare them in the art of providing meaningful feedback. ("all")	√		
	Educators involved in the facilitation of simulated-based learning experiences are required to receive training in debriefing. ("all")	√		
	Involved stakeholders (educators, simulation experts, educationalists) involved in the development of simulated-based learning experiences are required to receive training on how to integrate and develop these learning experiences. ("all")	√		
	Personnel involved in the development of simulated-based learning experiences are required to receive training to ensure competency in the use of faculty/ institutional resources. ("orientation", "which could be applicable to their field")	√		
	Educator training should be provided by the respective faculty to ensure educator competency in the above mentioned fields as is appropriate to each educator.	√		
	The role of the educator must be clearly defined prior to the simulated-based learning experience. The educator role may include facilitation, debriefing, assessment (formative/ summative) and may vary as the educator moves through the process of planning, implementing and evaluating the simulation programme.	√		
	The educator's role in formative simulated-based learning experiences, not used for formal assessment, would be that of facilitator and providing feedback.	√		
	The educator's role in summative simulated-based learning experiences is that of post-simulation feedback/ debriefing and discussion.	√	√	

Statement		Essential	Useful	Not applicable / No
Student-centred preparation	Students should be orientated at the beginning of the debriefing/ feedback session regarding what will be evaluated/ discussed as well as the method of feedback to be used for the simulated-based learning experience.	√		
	Students should receive simulation related briefing (logistics of the session, timing of feedback/ debriefing, outcomes) prior to each simulated-based learning experience, regardless of the adaptive instructional method utilised. (“orientation”, “at the beginning of the module and again prior to each simulated-based learning experience”)	√		
	The educator must identify methods how students should be prepared for each simulated-based learning experience.	√		
	Students are encouraged to revisit the specific simulated-based learning experience outcomes, as well as their individual goals, as they progress through the module/ programme/ academic year.	√		
	Students should receive simulation related orientation (logistics of the session, timing of feedback/ debriefing, outcomes) only at the beginning of the module and at no further time.			√
	Students are only required to complete an informal formative assessment (e.g. online multiple choice questionnaire) of theoretical knowledge before participating in simulated-based learning experiences relating to technical skills training.			√
	Students are required to complete an informal formative assessment (e.g. online multiple-choice questionnaire) of theoretical knowledge before participating in specific educator identified simulated-based learning experiences.		√	
	Students are required to complete an informal pre- and post-formative assessment (e.g. online multiple-choice questionnaire) when participating in specific educator identified simulated-based learning experiences (technical and non-technical training). **Debriefing could be utilised as a post-formative assessment.*	√	√	
	Relevant theory pertaining to each individual simulated-based learning experience must be completed prior to the students participating in the learning experience. **The simulated-based learning experience may be used to identify theoretical gaps and needs.*	√	√	

STATEMENTS RELATING TO IMPLEMENTATION		Essential	Useful	Not applicable/ No
Debriefing	When simulated-based learning experience feedback/ debriefing will be provided must be decided upon during the planning phase. (“during or following completion of the learning experience”)	√		
	How simulated-based learning experience feedback will be provided must be decided upon during the simulation planning phase (simulator, facilitator/, peer, self, video-based).	√		
	Students must be debriefed by a trained facilitator, following the completion of each immersive simulated-based learning experience.	√		
	The specific feedback and/ or debriefing method and tool used for each simulated-based learning experience should be decided upon prior to the learning experience to ensure facilitators are trained in the method utilised.	√		
	It is necessary for students, in addition to the set learning outcomes, to set individual goals applicable to each of the planned simulated-based learning experiences.	√		
	The educator must identify the critical skills which are required to be mastered and should structure simulated-based learning experiences accordingly.	√		
	Mastery learning is achieved when the student attains the specific curriculum/ programme set benchmark.	√		
	Repetitive practice opportunities are required when aiming to achieve mastery learning.	√		
	All simulated-based learning experiences should have an element of self-reflection	√		
	Educators should identify which simulated-based learning experiences could accommodate a peer-assessment element, and it should be implemented as such.	√		
	A self-assessment element should only be included in simulated-based learning experiences identified by the educator. Therefore, not every learning experience should have an element of self-assessment embedded.			√
	When debriefing of each simulated-based learning experience will take place must be decided upon during the planning phase (immediately following completion of the learning experience, or at a later stage).	√		

Statement		Essential	Useful	Not applicable/ No
Debriefing	Attainment of an educator's set benchmark during formative assessments could be peer-assessed, while the educator is only responsible for assessing benchmark achievement during summative assessments.		√	
	Students should be allowed to redo all formative simulated-based learning experiences until they have reached their individual level of satisfaction. * *This would be dependent on the course structure, available time and resources.*		√	
	Students should be allowed to redo all formative simulated-based learning experiences until they have reached their individual level of satisfaction. * *This would be dependent on the course structure, available time and resources.*		√	
	The educator should assess attainment of the educator's set benchmark, for identified summative simulated-based learning experiences, at all times. **Options for peer- and/ or self-assessment are provided in the following questions.*	√		
	The educator should assess attainment of the educator's set benchmark, for identified formative simulated-based learning experiences, at all times. **Options for peer- and/ or self-assessment are provided in the following questions.*		√	
Assessment	The terms of assessment should be clarified and provided to students before taking part in the simulated-based learning experience**.**	√		
	A rubric/ mark sheet/ tick sheet for each simulated-based learning experience focussing on task training should be developed, according to the desired learning outcomes, during the planning phase. ("specific assessment tool", "summative")	√		
	Attainment of an educator's set benchmark during formative assessments could be peer-assessed, while the educator is only responsible for assessing benchmark achievement during summative assessments.		√	
	A specific assessment tool (formative/ summative) for each simulated-based learning experience must be developed during the planning phase.	√		

Statement		Essential	Useful	Not applicable/ No
Assessment	Educators should identify which simulated-based learning experiences are to be used for summative assessment. Only these identified assessments should be performed on a one-to-one student-educator basis.	√		
	Educators should identify which simulated-based learning experiences could accommodate a peer-assessment element, and it should be implemented as such.	√		
	Educators should identify which simulated-based learning experiences are to be used for formative assessment. Only the identified assessments should be performed on a one-to-one student-educator basis. **An element of peer-assessment could be added if deemed appropriate by the educator.*	√		
STATEMENTS RELATING TO PROGRAMME EVALUATION				
Evaluate	A form of programme evaluation is required once simulation has been integrated into the programme.	√		
	Feedback from educators involved in the simulated-based learning experiences is required for programme evaluation following simulation integration.	√		
	Feedback from students partaking in the simulated-based learning experiences is required for programme evaluation following simulation integration.	√		
	Informal evaluations (e.g. satisfaction surveys in the format of checklists/ rating scales) completed by all educators, participants (e.g. simulated patients) and students involved in simulated-based learning experiences, could be used for programme evaluation following simulation integration.		√	

	Statement	Essential	Useful	Not applicable/ No
Evaluate	Performance in summative assessments, using standard assessment tools, should be used for programme evaluation following simulation integration.		√	√
	Performance in formative student assessments, using standard assessment tools, should be used for programme evaluation following simulation integration. **Questions pertaining to further programme evaluation methods are provided in the following questions.* (“standardised”)		√	√

Statement		Essential	Useful	Not applicable/ No
Validation	Existing national requirements and standards, as proposed by the national regulating body (Health Professional Council of South Africa), must be used when designing a simulation programme to validate the programme.	√		
	An evidence-based approach should be used when designing and implementing an integrated simulation programme in order to validate such a programme. ("Expert consensus and literature reviews must")	√		
STATEMENTS RELATING TO PROGRAMME REVISION				
Review ("Adjustments")	Adjustments to the programme following simulation integration can be made according to the feedback received from all stakeholders and participants. ("must")	√		
	Adjustments to the programme following simulation integration can be made according to the new technological advances or educational best practices identified. ("must")	√		