ANALYSIS OF THE UNDERGRADUATE STUDENTS' LEARNING ENVIRONMENT IN A MEDICAL SCHOOL IN ZAMBIA

by

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SUPERVISOR: PROF MM MOLEKI

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DEDICATION

To the grace of my Lord Jesus Christ,

and to Mercy, Blessed, Praise, Christine, and Divine, my lovely family.

DECLARATION

Student number: 482-563-58

D E C L A R A T I O N

I declare that **ANALYSIS OF THE UNDERGRADUATE STUDENTS' LEARNING ENVIRONMENT IN A MEDICAL SCHOOL IN ZAMBIA** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before for any other degree at any other institution.

Christian Chinyere Ezeala	20th October 2016
Full names	**Date**

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ABTRACT

This study analysed the learning environment of undergraduate medical and health sciences students of the School of Medicine University of Zambia who were studying at the Ridgeway Campus. Premised on the theory that learner's perception of the learning environment determines approach to learning and learning outcome, the study utilized a descriptive, quantitative, and non-experimental design to articulate the issues that characterise the learning environment of the programmes. The aim was to provide framework based on these, and use it to propose a strategy for improving the learning environment of the School. The Dundee Ready Educational Environment Measure (DREEM) questionnaire was administered to 448 participants from year 2 to year 7 classes of medicine, pharmacy, and physiotherapy programmes. Total DREEM, subscale, and individual items' scores were analysed statistically and compared by analysis of variance among the programmes. The issues determined formed the framework for strategy development, and strategic options were proposed based on evidence obtained from literature. With a global DREEM score of 119.3 ± 21.24 (59.7 %), the students perceived their learning environment as "more positive than negative." One sample binomial test of hypothesis for categorical variables returned a p value <0.05, with a verdict to 'reject the null hypothesis,' thereby confirming a more positive than negative perception. Subscale scores also showed 'more positive' perception. There were no significant differences between scores from the different programmes when compared by Games Howell test, P> 0.05, thereby upholding the second hypothesis. Analysis of individual items revealed problems in six items, which were summarised into four strategic issues: inadequate social support for stressed students, substandard teaching and mentoring, unpleasant accommodation, and inadequate physical facilities. The implications of the findings for theory and practice were discussed and strategic options proposed to address the issues. The study concludes that analysis of the learning

environment of medical schools provides more insight for strategic planning and management.

Key Words: Accreditation, DREEM questionnaire, educational evaluation, factual overload, learning environment, medical education, medical school, social support, strategic planning, student-centred learning, students' satisfaction, undergraduate students, University of Zambia.

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LIST OF ABBREVIATIONS

ACGME	Accreditation Council for General Medical Education
AMA	American Medical Association
ANOVA	Analysis of Variance
ASP	Academic self-perception
CbD	Case-based discussions
CBME	Community-based Medical Education
CCS	Computer-based Case Simulation
CFR	Code of Federal Regulations
CLE	Classroom Learning Environment questionnaire
CLEI	Clinical Learning Environment inventory
CPCLES	Clinical Post-Conference Learning Environment Survey
DECLEI	Dental Clinical Learning Environment Inventory
DOPS	Direct Observation of Procedural Skills
DREEM	Dundee Ready Educational Environment Measure
DSLES	Dental Students Learning Environment survey
ESG	Standards and Guidelines for Quality Assurance in the European Higher Education Area
GMC	General Medical Council, UK
ICT	Information and Communications Technology
IRB	Institutional Review Board
LC	Lecture Capture
LCME	Liaison Committee on Medical Education
LEPO	Learning Environment, Learning Process, and Learning Outcomes
LEQ	Learning Environment Questionnaire
LMS	Learning Management System
MBChB	Bachelor of Medicine and Bachelor of Surgery degree
MiniCEX	Mini-Clinical Evaluation Exercise
MiniPAT	Mini-Peer Assessment Tool
MOOC	Massive Open Online Courses
MSLES	Medical Students Learning Environment Survey
OCW	Open Course Ware
OER	Open Educational Resources
OSCE	Objective Structured Clinical Examination
PBL	Problem-Based Learning
PCA	Principal Component Analysis
PLE	Personal Learning Environment
SD	Standard Deviation
SOM	School of Medicine
SPA	Students' Perception of Learning Atmosphere

SPICES	Student-centred, Problem-based, Integrated, Community-based, Elective, and Systematic curriculum model
SPL	Students' Perception of Learning
SPSS	Statistical Package for the Social Sciences
SPT	Students' Perception of Teachers (lecturers, course organizers)
SSP	Social Self-Perception
UNISA	University of South Africa
UNZA	University of Zambia
UNZABREC	University of Zambia Biomedical Research Ethics Committee
UTH	University Teaching Hospital, Lusaka
VLE	Virtual Learning Environment
WFME	World Federation for Medical Education
WHO	World Health Organization
WIHIC	What is Happening in this Class Questionnaire

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Learning outcomes of undergraduate students could be influenced by many factors including the learner characteristics, quality of the learning (educational) environment, and the learner's approach to learning (Fraser 2012:72-86; Lee, Srinivasan, Trail, Lewis, & Lopez 2011:158; Lim & Morris 2009:282-5). Learner characteristics take into account such factors as learner's personality, prior knowledge, and academic ability, all of which have been shown to predict academic achievement among undergraduate students (Ezeala, Swami, Lal, & Hussain 2012:61-66; Komarraju, Karau, Schmeck, & Avdic 2011:472-477). The learning environment includes situational factors such as curriculum models, quality of teaching, learning resources available to the learner, as well as organizational culture, and leadership style (AMA 2008:4).

> "A healthy university aspires to create a learning environment and organisational culture that enhances the health, well-being and sustainability of its community and enables people to achieve their full potential."

This quote from the Healthy Universities' project (2016), though primarily directed at promoting health and wellbeing in United Kingdom (UK) universities, underpins the fundamental belief that a positive learning environment enhances the educational achievement of the learners. Previous reports demonstrate that a learner's perception of the learning environment influences approach to learning and the ultimate learning outcomes (Lizzio, Wilson, and Simson 2002:27-52; Pimparyon, Roff, McAleer, Poonchai, & Pemba 2000:359-365). Thus, the more positive a learner perceives the sociocultural environment, institutional ethos, programme design and delivery, and the quality of the interactions within and between peers and instructors in the learning environment, the more motivated and engaged will the learner be. This is expected to translate into better learning outcomes. Hanrahan (Hanrahan 1998: 737) states "that both intrinsic and extrinsic motivation which could lead to deep involvement in learning, are constrained by a preponderance of teacher-centred methods of instruction."

Many health professions educational institutions now embrace situated learning, and this has kindled a lot of interest in the quest to understand the influences of the learning environment on students' learning. With the continuing innovations in teaching and assessment methods, evaluation of students' perception of the learning environment has become an important topic. The overwhelming acceptance of student-centred learning in medical and health professions education has been accompanied by a proportionately large number of studies on students' perception of their learning environments (Al-Mohaimeed 2013:156; Al-Naggar, Abdulghani, Osman, Al-Kubaisy, Daher, Nor Aripin, Assabri, Al-Hidabi, Ibrahim, Al-Rofaai, Ibrahim, Al-Talib, Al-Khateeb, Othman, Abdulaziz, Chinna, & Bobryshev 2014:180; Pai, Menezes, Srikanth, Subramanian, & Shenoy, 2014:105; Sundus, Haider, Ibrahim, Younus, Farooqui, Iftikhar, Siddique, & Aziz 2014:230). This is justified by the need to monitor quality in higher educational institutions, and because educational curricula of medical and health professions institutions are constantly undergoing modifications and innovations. It has been suggested that a learner's perception of educational environment could influence the learner's approach to learning and the learning outcomes, and recent studies confirm that how a student views the learning environment tacitly influences learning outcome (Henning, Shulruf, Hawken, & Pinnock 2011:83; Lee, Srinivasan, Trail, Lewis, & Lopez, 2011:160). Therefore, the assessment of the students' perception of the whole learning environment in which these innovations occur is considered imperative. This study was therefore implemented based on the theory that students' perceptions of the learning environment influence their approaches to learning and the learning outcomes (Lizzio, et al 2002:27-52; Pimparyon et al 2000:359-365). Moreover, it has been noted that the quality of educational environment reflects programme effectiveness, and that educational environment correlates well with students' academic achievement (Mayya & Roff 2004:280).

Educational or learning environment has been defined in several ways. Basically it includes the contexts, cultures, ethos, and physical structures in which learning occurs. The American Medical Association (AMA 2008:4) defines educational environment as a social system that includes the learner, peers, teachers, the settings and purposes of interactions, and the formal and informal rules that govern the interactions. It further specifies three broad components of educational environment to include the institutional culture, the curriculum, and feelings and attitude generated by learner's interactions with the environment (educational climate). Institutional culture refers to the composite of assumptions members hold in common, including assumptions about realities in the

institution (beliefs) and assumptions about ideals or values (Ng'ang'a & Nyongesa 2012:211). These generate organizational norms and expectations on standards of behaviour within the institution. On a similar note, the Medical Education England Medical Indicator Task and Finish Group states that the effectiveness of an educational environment depends on its leadership, infrastructure, and the quality of the trainers (General Medical Council 2013:4). The learners' perception of the educational environment therefore depends on how they view these determinants and the interactions between the learners and these determinants.

The School of Medicine of the University of Zambia, Lusaka, was established 50 years ago. It commenced the Bachelor of Medicine Bachelor of Surgery combined degree programme in 1966. Since then, it has undergone major transformations and programme expansions that could affect the quality of the learning environment. Presently, the School has 14 departments in the clinical and biomedical sciences areas, and runs several undergraduate and postgraduate degree programmes. The educational platforms include face to face and distance (online) learning. A unique "parallel programme" runs in most disciplines and departments alongside regular academic programmes. The "parallel programmes" are designed to provide opportunities to employed matured students so that they could advance their careers without leaving their jobs. Although several efforts have been made to promote student-centred learning and to integrate technology into teaching and learning in the School through curricular reforms, most programmes still stick to the traditional classroom lecture-based approach that are largely teacher-centred. The impacts of the modifications and transitions on teaching and learning in the School have not been appropriately assessed to the author's best knowledge. This study therefore analysed the educational environment in the medical school as seen by the students, with the aim of identifying areas of strength and weaknesses, and proposes a strategy for quality development in the learning environments of this and similar schools of medicine.

1.2 STATEMENT OF THE RESEARCH PROBLEM

How a student perceives the educational environment influences his approach to learning. Negative perceptions result in "fear and anxiety" that may block learning while positive perceptions could lead to a feeling of "attraction and interest" which may enhance learning (Kolb & Kolb 2005:193). The driver for this study is the realization that the

learning environments of the various programmes in the School of Medicine of the University of Zambia have not been assessed since the commencement of the School about 50 years ago despite significant changes in the School's structure and composition. The School was established in 1966 and since then, the School has grown phenomenally in staff strength, structure, and academic programmes. There have also been significant modifications in programmes and curricula to reflect developments in the various academic and professional fields. These changes are reported to influence students' perceptions of learning environment and consequently learning outcomes (Cerón, Garbarini, Parro, & Lavín 2015:63-72). Representatives of students have expressed concerns in Board meetings about curricula performance, in particular relating to perceived increases in failure and attrition rates in many programmes. These concerns provide empirical evidence for the need to assess the educational environments in the School as perceived by the students, more so taking note of Lizzio's logic (2002:27) that it is the students' perception of the environment that influences approaches to learning and the quality of learning outcomes. To the knowledge of the researcher however, there has been no study that evaluated how these modifications affected students' life or their learning. This study is therefore primarily diagnostic, using the assessment to identify areas that need attention.

Creating a learner-centred learning environment where the students can take charge of their learning and personal development, and the integration of technology into teaching and learning (Chang & Lim 2005:14-30; Doyle 2008:1-16; Doyle 2011:7-11; Markauskaite & Jacobson 2016:137-153) are topical issues in education that present both opportunities and challenges for medical schools in Africa. This study is concerned with how students view these issues, and how the local learning environment could be improved.

It is from this problem statement that the study sought to answer the following research questions:

1. What is the current status of the learning environment of undergraduate medical and health sciences students in the School of Medicine, University of Zambia as perceived by the students?
2. What are the medical and allied health students' perceptions of their learning environment in the Medical School of University of Zambia?

3. What interventions will enhance students' learning environments in the medical school of University of Zambia?

1.3 RESEARCH HYPOTHESES

Two hypotheses drive this study, namely:

1. The overall perception of the educational environment in the School of Medicine by undergraduate students is more positive than negative;
2. The perceptions are the same across different disciplines

1.4 PURPOSE OF THE STUDY

The purpose of the study was to analyse the undergraduate students' learning environment in a medical school in Zambia, the aim being to develop strategies which will enhance the learning environment of undergraduate medical and health sciences students in the School.

1.5 OBJECTIVES OF THE STUDY

Bearing in mind the aim of the study, the objectives of this study were, by November 2016, to:

1.5.1 Analyse the learning environment of undergraduate medical and health sciences student in the medical school of Zambia

1.5.2 Compare the perceptions by Medical, Pharmacy, and Physiotherapy students of the learning environment;

1.5.3 Develop strategies to enhance or reform the learning environment of undergraduate medical and health sciences students in University of Zambia School of Medicine.

1.6 THEORETICAL GROUNDING OF THE RESEARCH

The study is grounded on the theory that learners' perceptions of the educational environment influence their approach to learning and ultimately determines learning outcomes (Lizzio et al 2002:27; Pimparyon et al 2000:359). This is in consonance with

the situated learning theory which posits that active learning involves voluntary and involuntary interaction with the environment, that is to say, learning in context.

The concept of learning environment is not new. Educational philosophies emphasizing experiential learning have consistently recognized the importance of the learning environment on learning outcomes. According to Land and Hannafin (1996:396), "learning environments are rooted in five foundations: psychological, pedagogical, technological, cultural, and pragmatic." Psychological foundations relate to perceptions of how an individual acquires knowledge. There are several theories and assumptions on how a learner learns including the behaviourist, constructivist, cognitivist, social cognitivist, and humanist theories (Mann 2011:60). Pedagogical foundations relate to how knowledge is transferred - the methods, structuring, and activities that define the learning experience of the student. The pedagogical strategy should be tailored to the perceived learning theory that is appropriate for the particular programme. These theories overlap significantly, and in medical education, with focus on experiential, contextual, and learner-centred learning, pedagogical models commonly employed include problem based, case based, and process oriented guided inquiry learning (Ezeala, Ram, & Vulakouvaki, 2013:10; Taylor & Hamdy, 2013:e1561). Technological foundations are concerned with how technology use is efficiently integrated into the educational programme, including the potentials, capabilities, and limitations of technology use. Prevailing beliefs, value systems, and role modelling have significant impact on education, and underlie the cultural foundation. Pragmatic foundation, according to Land and Hannafin (1996:396), refers to what is feasible in the educational setting. It is as much concerned about the constraints and what can be done in the presence of the constraints. The manner in which these five foundations are integrated in the design of the learning environment determines the quality of the learning environment.

Lizzio and colleagues (Lizzio et al 2002:27; Lizzio et al 2007:195) in studies of randomly selected Australian students conclude that students' perception of their learning environment has strong influence on study habits and learning outcomes. Their study was based on the '3P' model of learning process proposed by Biggs (Biggs 1989:7). Biggs model describes 3 factors operating at different time points that influence learning. These are (1) the presage factors comprising learner's innate characteristics such as prior knowledge, motivation and interest and contextual factors, (2) process factors operating during the learning process, and (3) the product characterised by the learning outcome.

The theory is further explicated by Kolb and Kolb (2005:193) who proposed the concept of “learning space” to explain the dynamic interaction between the learner and the learning environment, and how these determine approach to learning and learning outcome. This study analysed the perceptions of undergraduate health professions students. The information generated has been used to identify areas of the School’s learning environment that needed improvement.

1.7 DEFINITION OF KEY CONCEPTS

1.7.1 Educational Climate

This construct refers to the attitude and feelings generated by learner’s interaction with the educational environment (Roff & McAleer 2001:333-334).

1.7.2 Educational (Learning) Environment

A social system comprising the learner, peers, teachers, programme organizers, settings, purposes of interaction and institutional ethos. Put in another way, it includes the educational climate, curriculum, and institutional culture. It is a multidimensional construct with social, academic and physical dimensions. In the words of the American Medical Association (AMA), “The intersection of the formal and informal curriculum with the institutional culture creates the learning environment.” In this thesis, learning environment and educational environment are used interchangeably (AMA 2008:4).

1.7.3 Learning

This concept has been defined in various ways – as a product (outcome) and as a process. As a product, learning has been defined as a change in behaviour, including the potential for such change to occur. Learning can also be defined as the process by which behavioural change occurs as a result of experience. According to Noe (Noe 1999, cited in Ng, Butts, Vandenberg, DeJoy, & Wilson 2006:477), “learning is a relatively permanent increase in human capabilities that is not a result of natural maturity.”

1.7.4 Learning Atmosphere

This is a composite of several factors underpinning the emotional state of the educational environment. It defines the quality of the relationship between teacher and learner, and between learner and peers. A good atmosphere is characterised by safety, motivation, and mutual respect for learners and teachers. Transcendent learning atmosphere build

trust, support, and love, whereas a bad atmosphere will result in alienation, lack of student engagement, and demoralization (O'Hara 2015:161-162).

1.7.5 Learning Outcomes

Learning outcomes refer to what the learner is able to do after undergoing the learning process – i.e. the product of a learning experience. The outcomes could be staged at different domains according to Bloom's taxonomy of learning – cognitive, affective, and psychomotor (Krathwohl 2002:212-218).

1.7.6 Learning Process

In the context of this study, the learning processes are ways in which the individual learner interacts with the learning environment, including the activities designed to enhance learning (Phillips, McNaught, & Kennedy 2010:2499). It includes all activities and experiences that contribute to meaning construction and behaviour modification such as reflection, problem solving, and critical thinking.

1.7.7 Learning Style and Learning Approach

Learning style refers the way a learner takes in and processes information. This is distinct from learning approach which refers fundamentally to a learners preferred methods of undertaking a learning task (Tsingos, Bosnic-Anticevich, & Smith 2015:492-494). This is determined by the learner's strengths, weaknesses and preferences, and how the learner perceives and responds to the learning environment (Lachman 1997: 477).

1.7.8 Perception of Learning

This is the process by which learning stimuli are recognized and interpreted, and how this interpretation influences interaction with the learning environment. In the context of this study, it refers to perception of curriculum structure and delivery. The study shall use 12 response items in the DREEM questionnaire to assess how the students perceive their learning in the School (McAleer & Roff 2001:29).

1.7.9 Perception of Learning Atmosphere

This variable which expresses how the learners view the learning atmosphere will be assessed using 12 response items in the questionnaire (McAleer & Roff 2001:29).

1.7.10 Perception of Programme Organizers

This concept expresses how the learners view the programme organizers and lecturers, as knowledgeable, cooperative, inspiring, and supportive or otherwise. The programme organizers include the teachers/lecturers and all others involved in the planning, design, delivery, and evaluation of the programme. In this study, the DREEM questionnaire uses 11 response items to determine this variable (McAleer & Roff 2001:29).

1.7.11 Self Perception

This expresses the idea that the learners have about themselves in the learning environment. Academic self-perception is how the learners view themselves academically while social self-perception relates to their feeling of acceptance or otherwise in the learning environment. The DREEM questionnaire uses 8 items to assess participants' academic self-perception and 7 items to assess social self-perception (McAleer & Roff 2001:29).

1.8 CONCEPTUAL FRAMEWORK

A conceptual framework may be defined as textual or visual representation of the interactions between the concepts, variables and/or assumptions upon which the research is based (Miles, Huberman, & Saldana 2013:20). According to Bernd Heinrich (Heinrich 1984:151), "even carefully collected results can be misleading if the underlying context of assumptions is wrong". A conceptual framework is a tentative model which guides the logic and design of a research study.

Several models of learning have been proposed in literature (Biggs 1989:7; Entwistle 2003:1, 5, & 7). The most basic conceptualizes learning as having three components: the learning environment, the learning process, and the learning outcome, as shown in figure 1.1 (Phillips et al 2010:2495-2504). The two major actors within this framework are the learner (student) and the lecturer (teacher). The role of the environment is to facilitate the learning process which in turn determines learning outcome. The outcome itself influences the learning environment. Thus, learning stands on a tripod, analogous to the Biggs model (Biggs 1989:7).

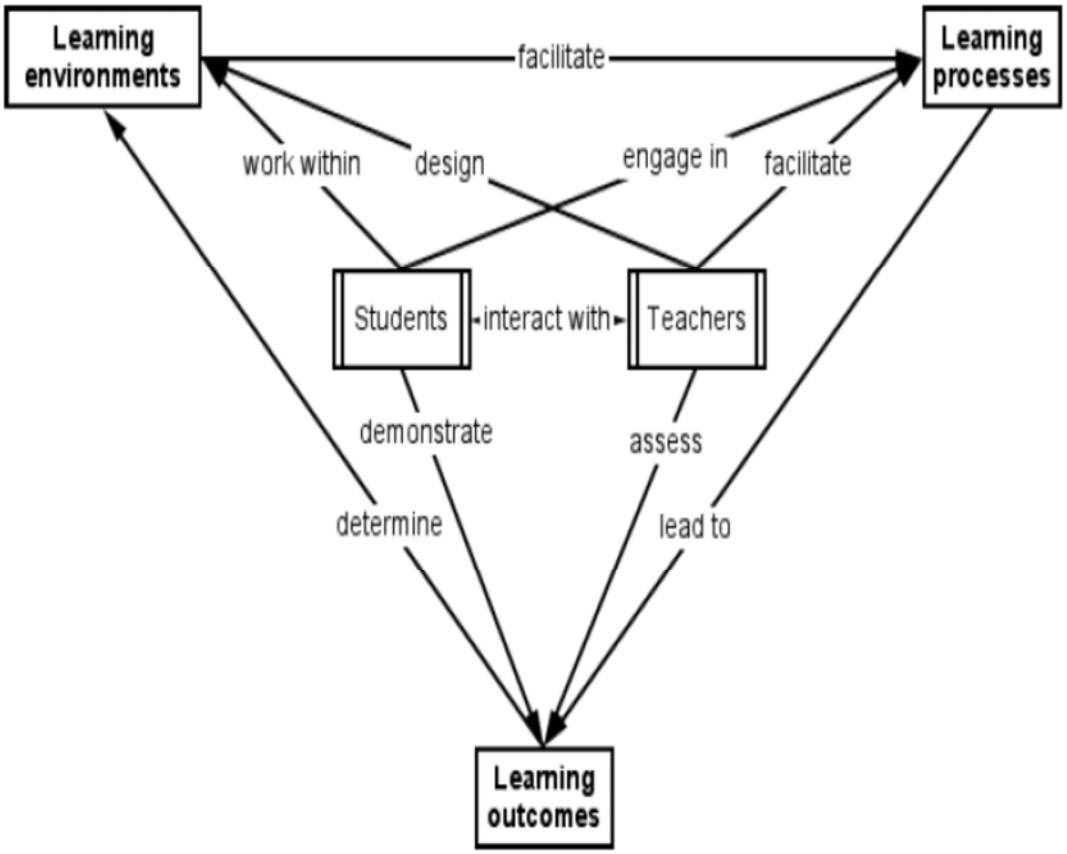


Figure 1.1 The learning environment, learning process, and outcomes (LEPO) model (Phillips et al 2010:2495-2504)

The learning environment conceptualized in the DREEM questionnaire comprises five subscales all of which interact to define the overall quality of the learning environment. These subscales are curriculum design and delivery (learning), teachers' qualities, learning atmosphere, and learners' perspectives about their academic abilities, and their social life. Based on these variables, a framework illustrating these interactions is described and presented in figure 1.2.

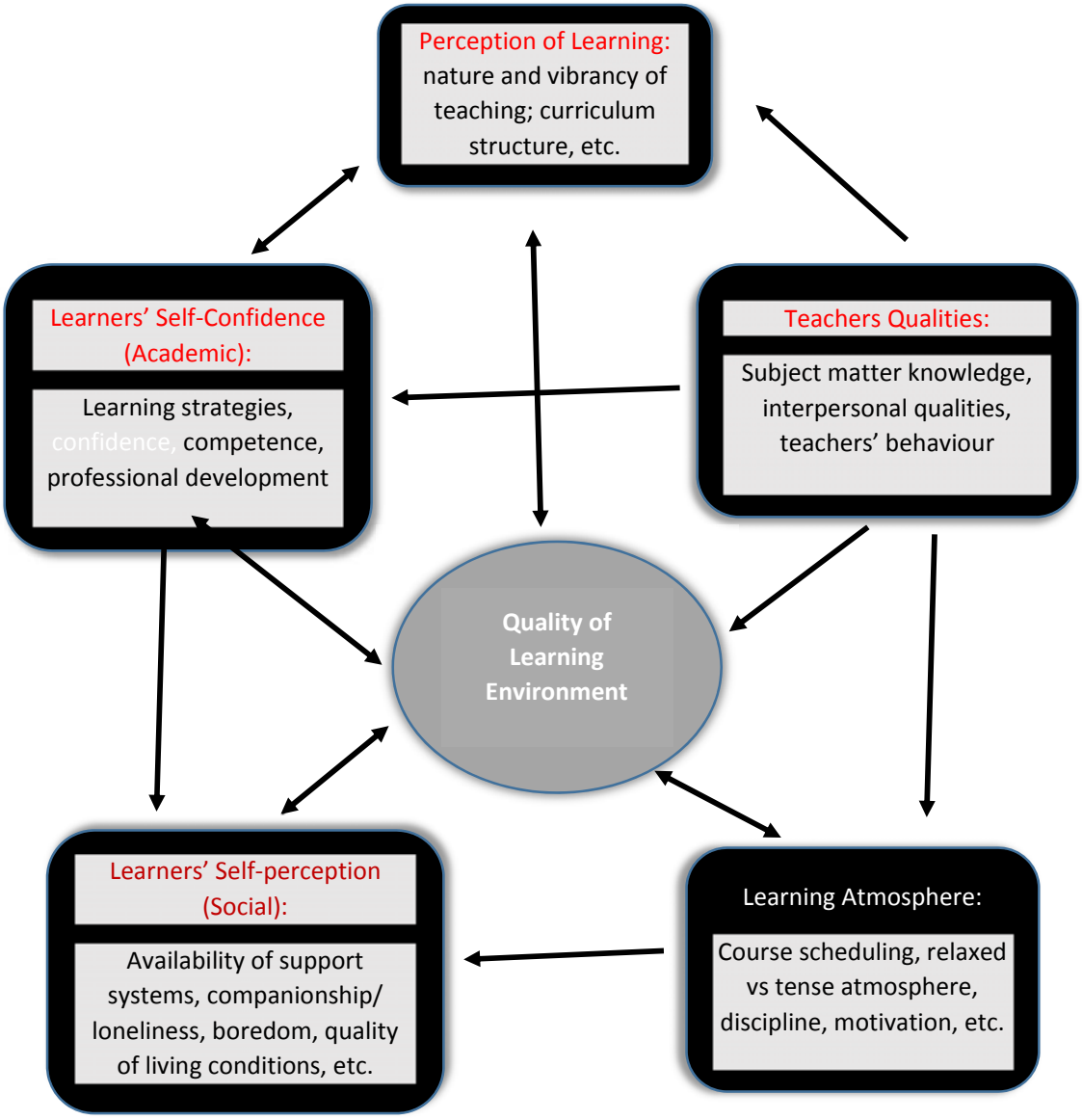


Figure 1.2 Interactions of the DREEM subscale factors and their influences on learning environment quality

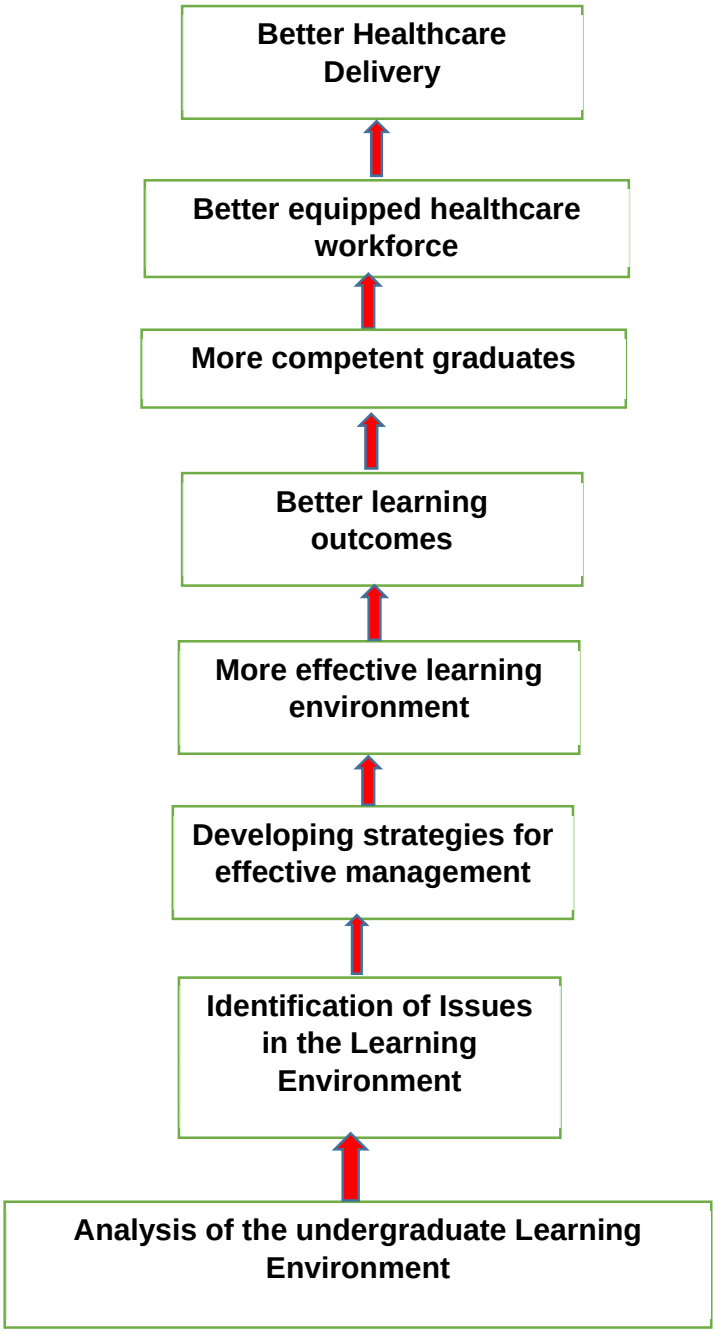


Figure 1.3 Concept map illustrating the ideological basis of the study

As shown in figure 1.1, learning environments determine learning outcomes. The quality of the learning environment as determined by the learner, influences approaches to learning and the learning outcome. Therefore, analysis of the phenomena which define the learning environment will provide medical school managers with frameworks for strategic planning for effective management. Effective learning environments result in the production of more competent healthcare workforce, and this will translate into better healthcare delivery. This study is rooted in a conceptual framework integrating the above logic as shown in figure 1.3. The strategic planning process which begins with environmental scanning involves articulation of the strategic issues, identification of objectives and strategic options, and setting of targets.

1.9 THE RESEARCH PARADIGM

A research paradigm expresses the perspective held by researches based on concepts, values, practices and assumptions (Johnson & Christensen 2010:31). Several research paradigms have been prosed including positivism whose ontological and epistemological stance postulates the existence of one overarching truth which can be verified by objective generalizable theory (Bunnis & Kelly 2010:361). Interpretivism, or what is otherwise called constructivism, is of the view that reality, and the ways of knowing it, is subjective. Therefore, according to this paradigm, there are multiple interpretations of reality. Critical theory believes that reality exists, but has been constructed by social bias. This reality can only be understood by exposing contradictory views that may be hidden by popular beliefs. More recently, pragmatic research paradigm started featuring prominently in education. Pragmatic paradigm is focused on problem solving. Powell (2001:884) describes pragmatism as rejecting both positivism and anti-positivism. Its focus is on problem solving.

Educational research can be divided into three broad categories: quantitative, qualitative, and mixed research (Bunnis & Kelly 2010:361). Quantitative research focuses on hypothesis/theory testing. It makes probabilistic predictions, and by collecting and analysing numerical data, confirms these through scientific methods. Qualitative research on the other hand is basically exploratory, and directed towards hypothesis generation and/or theory formulation. As an exploratory process, it uses qualitative data.

Mixed methods research combines qualitative (exploratory) and quantitative (confirmatory) methods, thereby harnessing the benefits of both methods. The extent of the combination varies, and mixed research could be:

a) Embedded design with predominantly quantitative design incorporating some qualitative philosophy or predominantly qualitative design incorporating some quantitative aspects);

b) Explanatory design with a quantitative study going before the qualitative phase (two phase design);

c) Exploratory design which is also in two phases, however, the qualitative phase preceding a quantitative phase; or

d) Triangulation design with both quantitative and qualitative studies going on simultaneously and with equal weighting.

This study used a quantitative method with embedded qualitative component to achieve the objectives stated above. It was hypothesis driven, objective, and used a well-tested method to test the hypotheses that the students' perception of their learning environment is "more positive than negative." The embedded qualitative component provided subjective data but nonetheless, in-depth information which further validated the quantitative results. The results generated from this design were generalizable and objective, and as such could be used to design strategies for quality development in medical education in Zambia. The study design was primarily non-experimental, and as such was not concerned with cause and effect relationships. Rather it was diagnostic, directed at establishing the strengths and weaknesses in the composite of the School's learning environment. Notwithstanding the inability of this design to make cause-effect predictions, it is considered appropriate, given that the primary purpose of the study was not to make such predictions, but rather, problem solving. A quantitative approach was adopted to maximize objectivity and generalizability of the findings, which may not have been possible with a qualitative design.

1.10 RESEARCH DESIGN

1.10.1 The Design

The study is a quantitative non-experimental research, designed to determine the students' perception of their learning environment. It is descriptive and cross sectional with self-administered questionnaires. It used the standard 50 items DREEM questionnaire, and included a qualitative component consisting of one open-ended question that could yield three answers, adapted from Henning and co-workers (2011:83). The DREEM design was chosen based on its popularity with studies of this kind in health professions education (Kelly, Bennett, Muijtjens, O'Flynn, & Dornan 2015:1027; Ostapczuk et al 2012:67; Ousey et al 2014:24; Pai et al 2014:103; Tempski, Santos, Mayer, Enns, Perotta, Paro, Gannam, Peleias, Garcia, Baldassin, Guimaraes, Silva, da Cruz, Tofoli, Silveira, Martins 2015:e0131535). The open ended question helped to elicit more in-depth exploration of views on the issues prevailing in the School's educational environment.

1.10.2 Samples and sampling method

The participants included undergraduate students enrolled in the Bachelor of Medicine and Surgery, Bachelor of Pharmacy, and Bachelor of Physiotherapy programmes of the School of Medicine, University of Zambia at the time of the study. This was the study population. The target population comprised all undergraduate students in medical and health sciences programmes to whom the results may be generalized. The proportion of participants from each programme reflected relative enrolments in the programmes. The sample size was determined using online sample-size software, using the parameters confidence interval (5 %), confidence level (95 %), and size of study population. Based on a study population of 1330, the sample size was 300 participants distributed across the disciplines. Stratified random sampling was adopted. For each programme, the maximum number of participants recruited was determined by comparing the number of students enrolled in the programme with the total number of students enrolled in the School. Sampling within the programme was by simple randomization.

1.10.3 Data Collection Method

Several tools have been used in measuring students' perceptions of their educational environment in health professions education (Levy, Morse, Liebelt, Dallman, & Mcdonald 1973:840). These include the Learning Environment Questionnaire (LEQ) (Levy et al 1973:840), Classroom Learning Environment questionnaire (CLE) (McGhee 2007:1-17), the "What is Happening in This Class' (WIHIC) questionnaire (Khine 2001:54), and the Medical Schools Learning Environment Survey (Rusticus, Worthington, Wilson, & Joughin 2014:423). However, the most widely adopted instrument in the medical education literature is the Dundee Ready Educational Environment Measure (DREEM) questionnaire developed by Roff and colleagues (Roff, McAleer, Harden, Al-Qahtani, Ahmed, Deza, Groenen, & Primparyon 1997:295). This questionnaire has been widely applied in medical and other healthcare professions in both developed and developing countries, although only a few institutions in African countries have applied this or similar instruments (Buhari, Nwannadi, Oghagbon, & Bello 2013:141; Foster, Kang, Anderson, Thomson, Meldrum, & Moffat 2013:134; Kohli & Dhaliwal 2013:5; Mojaddidi, Khoshhal, Habib, Shalaby, El-Bab, & Al-Zalabani 2013:39; Ostapczuk, Hugger, De Bruin, Ritz-Timme, & Rotthoff 2012:67; Payne, 2013:1388, Payne and Glaspie 2014:64). It has been translated into different languages and its psychometric properties tested in different cultures (Tomas, Casares-De-Cal, Aneiros, Abad, Ceballos, Gomez-Moreno, Hidalgo, Llena, Lopez-Jornet, Machuca, Monticelli, & Pales 2014:162; Vaughan, Mulcahy, & McLaughlin 2014:99). The DREEM questionnaire has been used in a variety of ways including diagnosing institutional weaknesses, comparing learning environments of medical schools or study sites, and revealing problems in curricula (Till 2004:39; Till 2005:332; Zawawi & Elzubeir 2012:s25). This study adopted the DREEM questionnaire to analyse the educational environment in the School of Medicine of the University of Zambia.

The Dundee Ready Educational Environment (DREEM) questionnaire contains 50 items and participants responded to these based on a 5 point scale from "strongly agree" to "strongly disagree." The items were further categorized into 5 subscales as follows:

1. **Perception of learning** (**SPL**) consisting of 12 items: 1, 7, 13, 16, 20, 22, 24, 25, 38, 44, 47, and 48;

2. Perception of programme organizers/Teachers (**SPT**) consisting of 11 items: 2, 6, 8, 9, 18, 29, 32, 37, 39, 40, and 50;

3. Academic self-perception (**ASP**) consisting of 8 items: 5, 10, 21, 26, 27, 31, 41, and 45;

4. Perception of the learning atmosphere (**SPA**) consisting of 12 items: 11, 12, 17, 23, 30, 33, 34, 35, 36, 42, 43, and 49; and

5. Social Self-Perception (**SSP**) consisting of 7 items: 3, 4, 14, 15, 19, 28, and 46.

On completion, the returned questionnaires were marked using the rating scales recommended by McAleer and Roff (McAleer & Roff, 2001:29) and described in appendix 2. Briefly, responses were given scores ranging from 0 (for "strongly disagree") to 4 (for "strongly agree"), except for negative items where the reverse was the case, with "strongly agree" assigned 0 and "strongly disagree" assigned a score of 4.

A single open-ended question: "If you could change three things about the School of Medicine, University of Zambia, what would they be?" was included in the questionnaire. A demographic questionnaire was used to gather demographic information from the participants, and these include programme, year of study, gender, age, marital status, and residential status.

1.10.4 Data analysis

Data was entered into a spread sheet and analysed with SPSS version 21 software. Statistical analysis included sample means, tests for normality of sampling distribution, analysis of variance, Pearson's correlation, Cronbach's alpha (α) coefficient for internal consistency, and confirmatory factor analysis (Squires et al 2013:1-9; Vaughan et al 2014:100). Qualitative data were analysed by deductive coding based on themes from the DREEM questionnaire and from literature, and the results were expressed as proportions.

1.10.5 Validity and reliability

Validity refers to the ability of the instrument to measure the actual construct it is intended to measure, and the extent to which the inferences and conclusions drawn from the datasets are meaningful. Reliability refers to the ability of the data collection instrument to produce consistent results (Velligan, Fredrick, Mintz, Li, Rubin, Dube, Deshpande, Trivedi, Gautam & Avasthi 2014:1047). Outcomes of many studies suggest that the DREEM is reliable and valid when used in different cultures. The internal consistency of the data sets was evaluated using Cronbach's alpha. Correlation of scores on individual items was assessed by determining Pearson's correlation coefficient and through regression analysis. The factor structure of the tool in this study was verified through confirmatory factor analysis.

1.11 ETHICS

The proposal for this study was approved by the Scientific and Ethics Committees of the Department of Health Studies, College of Human Sciences, UNISA (Ethical clearance certificate number REC-012714-039, annexe H). Authority to conduct the study was subsequently obtained from the University of Zambia Biomedical Research Ethics Committee, UNZABREC, (reference number IRB00001131 of IORG0000774), and a letter was obtained from the Dean's office of the School of Medicine, University of Zambia for permission to conduct the study in the School (annexe K). All principles relating to responsible and ethical conduct of research and the protection of human participants, including respect of participant autonomy, justice, beneficence, and non-maleficence, were strictly observed during the conduct of this study. Adequate information was provided to participants and their consent was obtained before enrolment into the study. Participants were encouraged to participate and complete the questionnaire. However, they were free to decline participation or to withdraw from the study without any consequences whatsoever. The importance of the study and degree of their involvement in the study were explained fully to the participants. Written consent was obtained from each participant before commencement. Confidentiality was maintained by avoiding the use of participants' names. Access to data was restricted to the investigators and the data analysts only.

1.12 SIGNIFICANCE OF THE STUDY

This study provided insight into how students viewed the learning environment in the School of Medicine, University of Zambia. The results from the analysis of the data revealed institutional strengths and weaknesses from the point of view of the learners. This information was vital for planning and development of strategies to enhance the learning environment of the School. From the study, four strategic issues were identified including inadequate social support system for the students, substandard teaching and mentoring, unpleasant accommodation, and inadequate physical facilities. These issues were used to propose strategies, which if implemented could lead to repositioning of the School to competitive advantage and improve the competences of the graduates.

1.13 SCOPE AND LIMITATIONS OF THE STUDY

The study was primarily a quantitative non-experimental study and it utilised a standardized and validated questionnaire. The design maximised objectivity of the result; the one open ended question provided additional data with in-depth information on the issues in the learning environment of the School. The reliability of the data was assessed using recommended statistical methods. The study used the findings of the survey as a framework to recommend strategies to improve the learning environment of the School. Strategic objectives were raised to address the issues identified in the learning environment survey. Strategic options were suggested based on evidence from published literature.

The major limitation of the study is that it is mostly quantitative. A mixed methods design could have enhanced the validity of the results. Ecological validity of the study may have been affected by limiting the study setting to the School of Medicine, University of Zambia. Involving other medical Schools in Zambia could enhance the generalizability of the study results. Furthermore, undergraduate students are only a subset of the internal stakeholders of the School. Other stakeholders including the lecturers and staff could provide more comprehensive dataset for decision making.

1.14 OUTLINE OF THE THESIS

Chapter 1 (Introduction) presented an overview of the study, highlighting the problem, study questions, objectives, significance of the study, theoretical grounding and conceptual framework, as well as the methodological approach used to answer the questions.

Chapter 2 presented the literature review. In this chapter, the concepts and theories of learning and the five foundations of learning environments were reviewed including psychological, pedagogical, technological, cultural and pragmatic foundations. The impact of rapid advances in technology and the application of evolving technology platforms in education were reviewed. The applications of technology and virtual learning environments (VLE) such as Moodle, blackboard, Web CT, and social media, and the recent advances in personal learning environments (PLE), were also reviewed. It focused on learning environments in health professions education, including learning theories and pedagogies underpinning medical education, curriculum models in medical and health professions education, and the impact of competency-based education models. Quality assurance and accreditation were reviewed with emphasis on their association with the quality of learning environments. The review also touched on the learning environment of medical schools in Africa, and turned attention to Zambia in particular. It ended with the evaluation of learning environments including the use of the DREEM questionnaire in learning environment research.

Chapter 3 (Study design and methods) described the methodology in detail, highlighting the study design and the research paradigm, along with description of population and sample, sampling method, data collection tool, data collection method, and data analysis plan. It also addressed the ethical aspects of the study, and validity and reliability issues related to data collection.

In chapter 4 (Analysis, presentation, and description of research findings), data management and analysis were described together with detailed description of the findings, using a combination of texts, tables, and figures. Relevant literature were used to justify the analytical approaches were necessary.

Chapter 5 (Discussion and Strategies for Improvement), discussed the imports of the findings using ample number of relevant recent literature. The second part used the findings of the study to propose strategies that could be adopted to improve the learning environment of the School and ultimately improve the quality of healthcare professionals graduating from the School. Chapter 6 (Conclusions and Limitations) outlined the conclusions from the study and highlighted the limitations. It also recommended further studies that could lead to more comprehensive understanding of the learning environment in the School.

1.15 CONCLUSION

This chapter presented an overview of the thesis. It provided a background to the research problem which bordered on the importance of an effective educational environment in the education of healthcare professionals. The problem statement, study purpose, research questions and study objectives were well delineated, as well as the conceptual framework and theoretical grounding of the research.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Medical education has become very complex and there are many challenges confronting its effective delivery. The massive expansion in knowledgebase, the constant changes in teaching and assessment methods, and rapid evolution and application of new technologies in education, all exert unprecedented pressure on learning in the health professions. These challenges are further complicated by the greater expectations from medical schools by the society, with the new demand that medical schools use their resources to address the priority health needs of the communities (Woollard & Boelen 2012:21-27).

To meet these challenges, and to be able to produce healthcare professionals who are competent to address the expanding roles of the profession, medical education is expected to provide effective learning environments conducive for proper academic and professional development. Studies have shown that the quality of the learning environment influences student motivation and learning outcome, and in the end, this could determine the professional competence of the healthcare practitioner (Hanrahan 1998:737-753; Lizzio et al 2007:195; Lizzio et al 2002:27). This chapter reviews current literature on the learning environments of medical schools, taking into account the five foundations of learning environments espoused in Land and Hannafin's theory (1996:396). It further examines literature on environments in medical education, methodological approaches to assessment of learning environments in higher education, the DREEM and its applications in analysis of learning environments in health professions education, and the learning environments of medical schools in Africa.

Articles for this review were retrieved using a variety of search strategies and search terms which included andragogy, DREEM, educational environment, health professions education, information technology, institutional culture, learning, learning environment, medical education, student-centred learning, students' perception of the learning environment, and social media. Databases and search engines used include Google Scholar, ERIC, PubMed, and Medline.

2.2 FIVE FOUNDATIONS OF LEARNING ENVIRONMENT

As defined in chapter 1, learning environment comprises the contexts, cultures, ethos, and physical structures in which learning occurs. It is the focus of much educational debate, yet significant divergences in the understanding and use of the term persist. This is made possible by recent rapid advances in information and communications technology, which has broken down institutional boundaries, and can link learners with the wider world, information sources and databases than never before. In his discourse on the ontology of learning environments, Brown (2008:220) posits that the learning environment consists of "the set of conditions that enable and constrain learning." Land and Hannafin's (1996:396) five foundations of learning environment alluded to in chapter 1, include perception of learning (psychological foundation), how learning is transmitted (pedagogical foundation), applications of technology to learning (technological foundation), beliefs and assumptions of programme operators (cultural foundation), and the issues and challenges within the educational setting, including the approaches used to address these issues (pragmatic foundation).

2.2.1 Psychological foundation

One can conceptualize learning from different perspectives, because the word "learning" bears several garbs in its meaning. Whereas one may think of learning as a "process" of acquiring knowledge, another may think of learning as an "outcome" of such a process. These different nuances have led to the development of different theories of learning. In the words of Dale Schunk (2012:4), "Learning is an enduring change in behaviour or in the capacity to behave in a given fashion, which results from practice or other forms of experience". Though learning is a natural phenomenon that may occur without the learner being aware of it, in its complex forms, learning involves application of concerted effort in order to improve ability to acquire and apply knowledge for growth and adaptation to challenges. The classical learning theories may be broadly categorised into behaviourism, cognitivism, and constructivism. From the behaviourist point of view, learning is a change in behaviour or behavioural potential, that is permanent, and that results from experience (Ng, Butts, Vandenberg, DeJoy, & Wilson 2006:477). Implicit in this definition is that learning is an adaptive process and involves learner's interaction with the environment. Central to the behavioural theories of learning is "conditioning,"

including “classical” conditioning, and “operant” conditioning that is rooted in positive reinforcement. The characteristics of the learning environment will have profound influence on the quality of the behavioural change. Classical behaviourist theorists like J. B. Watson, E. L. Thorndike, and B.F. Skinner assumed that behaviour is the focus of learning, and that if learning occurs it should be demonstrated by observable change in behaviour. They further assumed that the environment shapes behaviour, and that reinforcement consolidates learning (Merriam, Caffarella, and Baumgartner 2007:280-281). Torre and others (Torre, Daley, Sebastian & Elnicki 2006:903-907), and Taylor and Hamdy (2013:e1561) claim that behaviourism is the basis for competency-based education which is widely adopted in medical and health professions education. This theoretical approach is usefully employed when defining learning objectives, and in the development and assessment of clinical or practical skills in the medical and health professions (Torre et al 2006:903-907).

Cognitivist theories focus on mental and psychological processes involved in the processing of information. With no emphasis on behavioural change or external environmental influences, these theories are primarily concerned with brain-based processes such as critical thinking, reflection, problem solving, and creation of mental representations. Defining learning in this perspective, Foster and Jantzie (1998:11), states that learning is the process of receiving, encoding, and retrieving sensory data into and from brain structures. The attention is on how the individual conceptualises knowledge. Cognitive theorists such as D. P. Ausubel (1918–2008) believe that learning occurs through the creation of learning strategies that depend on conceptualization. An important feature of the cognitivist theory applicable to medical education is reflective practice through which the learner develops critical thinking abilities (Moon 2013:57; Thompson & Pascal 2012:311-325). Another feature of the cognitivist ideology relevant to medical and health professions education is the use of concept mapping to represent interrelations between different concepts (Azer, Guerrero & Walsh 2013:433-443; Charlin, Lubarsky, Millette, Crevier, Audétat, Charbonneau, Caire Fon, Hoff, & Bourdy 2012:454-463). Cognitivism is also the basis for self-directed learning, which is commonly featured in many medical educational curricula (Bergman, Sieben, Smailbegovic, De Bruin, Scherpbier, & Van Der Vleuten 2013: 114-124; Charlin et al 2012:454-463; Flynn, Jalali & Moreau 2015:1-5;).

Theories of constructivism held sway in the 1980's and 1990's as the basis of learning consequent upon the declining interest in behaviourism and cognitivism. The pitfalls of these latter two theories include the narrow standpoint of behaviourism, and the rather reductionist posture of cognitivism, along with the exclusion of the influences of the social environment on learning by both metaphors. The theories also portray the learner as a passive vessel that does not contribute to the learning (Mayer 1996:151-161; Phillips 1995:5-12). The constructivist's viewpoint on the other hand, is that learning occurs through active construction of meaning from individual experiences. Thus, according to this view, learning is an active process, not the final product. The construction of meaning is dependent on the learner's present or past experiences, and these experiences shape the mental models or "schema." Jean Piaget described the four notable progressive stages of human cognitive development. His concepts were extended by Seymour Papert (1993:142), who introduced the term - "constructionism" - to emphasise real world construction in learning (as opposed to mental constructions alone) as a support for mental representations. This formed the basis for the introduction of computer programmes to teaching and learning.

Constructivism bears two components: individual (or psychological) constructivism and social constructivism. While individual constructivism describes the individual learner's ability to make meaning from personal experiences, social constructivism implies that social interaction enhances learning within the cultural environment. By interacting with others, learning is reshaped and refined. Many concepts in medical education are embedded in the constructivist ideology. These include student-centred learning, situated learning, self-directed learning, and problem-based learning (Baeten, Dochy, & Struyven 2014:484-501; Bergman, Sieben, Smailbegovic, De Bruin, Scherpbier, & Van Der Vleuten 2013:114-124; Flynn et al 2015:1-5; Herrington, Reeves, & Oliver 2014:401-412; Jacobs, Van Luijk, Galindo-Garre, Muijtjens, Van Der Vleuten, Croiset, & Scheele 2014:1; Jarvis-Selinger, Pratt, & Regehr 2012:1185-1190; Shrivastava, Shrivastava, & Ramasamy 2013:197). Other concepts are scaffolding, cultural mediation, curriculum spiralling,, and reflective thinking (Flynn et al 2015:1-5; Langendyk, Mason, & Wang 2016:32-43; Nalliah & Idris 2014:3; Neve, Wearn, & Collett 2015:1-4; Taylor and Hamdy 2013:e1561-e1572). All of these concepts have had great innovative influence on medical and health sciences education.

2.2.2 Pedagogical foundation

This foundation is concerned with how the learner acquires knowledge. Instructional strategies in medical and health professions education are mostly anchored on adult learning principles (andragogy), intertwined with concepts based on the aforementioned learning theories. As such, in medical and health professions education, metaphors such as competency-based education (based on the behaviourist ideology), and self-directed learning, and reflective practice, have become very significant.

Andragogy has been defined as the "art and science of helping adults to learn" by the chief proponent of andragogy, Malcolm Knowles (1913-1997). Knowles (1990:57-63) proposes several assumptions about adult learning. These assumptions include:

a) The need to know, implying that adult learners would like to know why they learn a certain topic;

b) Self-concept: adults are self-motivated, independent; prefer to make their own decisions, and to take charge of their learning;

c) Learner's experience: adult learners have accumulated significant experiences through life; they learn best when learning builds on previous experiences;

d) Readiness to learn: adults are ready to learn when learning is goal-focused, relevant, and timely;

e) Orientation: adults learn best in the practical application of the learning, i.e. when learning is problem-centred or task centred; and

f) Motivation: adults learn best when the motivation for learning is internal rather than external. Internal satisfaction has to do with derivation of satisfaction and fulfilment, elevation of self-esteem and quality of life, as distinct from external motivation, which may result from job promotion, higher salaries, or better jobs.

Based on these assumptions, Knowles proposed the basic principles of adult learning to include:

1. Adults need to be involved in the planning and evaluation of their learning.
2. Adults' prior experience provides the basis for learning
3. Adults learn those things that have immediate relevance to their needs
4. Adults prefer problem-centred learning.

Adult learning metaphors such as self-directed learning, learning in context, task-based learning, problem-based learning, and student-centred learning, now dominate the

medical education literature (Brydges & Butler 2012:71-79; Davis 1999:130-140; Dolmans, De Grave, Wolfhagen, & Van Der Vleuten 2005:732-741; El-Gilany & Abusaad 2013:1040-1044; Li, Paterniti, & West 2010:1229-1236; Murad, Coto-Yglesias, Varkey, Prokop, & Murad 2010:1057-1068; Murad & Varkey 2008:580-590; Savery 2015:5-15). Consideration of learners' expectations has become increasingly important when designing instructional strategies (Sims 2003:87-103). Self-directedness has also become an important subject in medical and health professions education. Several articles report on the value of this approach in promoting professional development and life-long learning skills in health professionals (Brydges & Butler 2012:71-79; Li et al 2010:1229-1236; Murad et al 2010:1057-1068). Furthermore, while learners should be allowed to take charge of their studies through self-direction, faculty support should be provided to facilitate learner's growth and development. This could be achieved by providing context-based learning experiences, and opportunities for reflection and self-assessment through feedback. Currently, curricula of many medical schools' programmes espouse these ideologies, notwithstanding the model - whether traditional, hybrid, or SPICES.

2.2.3 Technological foundation

Rapid advances in information and communications technologies have had profound influence on teaching and learning at all levels. A variety of platforms and applications are now available, and have been successfully utilised to enhance individual and collaborative learning. These platforms include online web-based resources, databases, virtual learning environments (VLEs), social media, and personal learning environments (PLEs), as well as person items such as smart phones, tablets, notebooks, and personal computers. Of the considerable gains from applications of these technologies to teaching and learning, involvement of learners and educators in new ways in the learning process, greater access to a wide variety of information and data sources, and decentralisation of the physical learning environment, are worthy of special mention (Zandvliet 2002:49-50).

Apart from the phenomenal impact of these technologies on online, distance, and blended learning, several articles report on the successful adaptation of the newer technologies in medical and health sciences education (Cheston, Flickinger & Chisolm 2013:893; Usher, Woods, Casella, Glass, Wilson, Mayner, Jackson, Brown, Duffy, Mather,

Cummings & Irwin 2014:95). This section reviews application of some of these newer technologies in medical and health professions education.

The use of web-based media in interactive teaching and learning has been termed "Web 2.0." Compared to Web 1.0, which is characterised by static contents that are managed by the administrator, Web 2.0 is characterised by tools that allow the user to generate their own content and actively participate in discussions. Furthermore, technical expertise is not necessary for participation. McGee and Begg (2008:164-169), defined Web 2.0 as "a collection of Web-based technologies that share a user-focused approach to design and functionality where users actively participate in content creation and editing through open collaboration between members of communities of practice." Web 2.0 tools include heterogeneity of web-based platforms and applications such as Blogs, Wikis, Twitter, instant messengers, podcasts, and social media such as WhatsApp, Facebook, Skype, and Viber. Medical and health professions educational programmes are increasingly adopting these platforms. Students and lecturers utilise these platforms for teaching and learning. The use of Web 2.0 tools such as Wikis, blogs, social media and YouTube, enhance student engagement in learning, and stimulate reflection, and critical thinking. The tools also encourage peer to peer and student-teacher interactions according to research studies (Bahner, Adkins, Patel, Donley, Nagel, & Kman 2012:439-444; Cheston, Flickinger, & Chisolm 2013:893-901; Jeffries and Szarek 2010:60; McGee and Begg 2008:164-169; McLean, Richards & Wardman 2007:174; Pander, Dimitriadis, Fischer 2014:3; Sandars, Homer, Pell, & Croker 2008:308-312; Varga-Atkins, Dangerfield & Brigden 2010:824-829).

In table 2.1 are listed some selected Web 2.0 websites, while table 2 compares the characteristics of Web 1.0 and Web 2.0 as presented in McGee and Begg (2008:164-169).

TABLE 2.1 SELECTED WEB 2.0 TOOLS WEBSITES

	TOOL	DESCRIPTION	WEBSITE

1	Delicious	Community bookmarking and indexing	http://delicious.com/about
2	Facebook	Social networking	www.facebook.com
3	FlickR	Photo sharing	www.flickr.com
4	Google maps	Open cartographic data	www.maps.google.com
5	Digg	Community editorial site	www.digg.com
6	HEAL	Medical image sharing	www.healcentral.org
7	MedEdCentral	Medical education reference	www.mededcentral.org
8	MySpace	Social networking	www.myspace.com
9	ScienceRoll	Blog about medical Web 2.0	www.scienceroll.com
10	Wikipedia	Community edited online encyclopaedia	www.wikipedia.org
11	Wikispace	Virtual classroom for sharing with teacher and peers	https://www.wikispaces.com/
12	YouTube	Movie sharing	www.youtube.com
13	LinkedIn	Social networking	www.linkedin.com
14	Slideshare	Platform for sharing presentations	http://www.slideshare.net/?ss
15	Prezi	Platform for sharing presentations	https://prezi.com/
16	Edmodo	Platform for teachers and learners to connect	https://www.edmodo.com/
17	NING	Platform with tools needed to publish and connect with your community	http://www.ning.com/
18	Smart Board Revolution		http://smartboardrevolution.ning.com/
19	Creative Commons	Platform for sharing knowledge and creativity	http://creativecommons.org/
20	Classroom 2.0	Social network for Web 2.0 users	http://www.classroom20.com/
21	Animoto	Video platform for educational purposes	https://animoto.com/business/education

(Modified and updated from McGee and Begg 2008:165)

TABLE 2.2 COMPARISON OF WEB 1.0 AND WEB 2.0 EDUCATIONAL SITES

WEB 1.0	WEB 2.0

Course websites using content management systems	Faculty blogs, student discussion groups, podcasts
An expert (course director) produces a syllabus which resides on a curriculum website	Students in a course contribute to syllabus content with questions and answers to supplement expert materials
Single website which displays the same content and design for all users	Personal websites with customised data sources and layout for individual users
Posting problem based learning cases to a curriculum website	Small groups have their own websites to which the add learning objectives and educational content related to their coursework

(Source McGee & Begg 2008:167)

The issues and challenges surrounding the use of these tools in medical and health sciences have been highlighted to include posting of inappropriate content including sexual, discriminatory, and racists' comments (Chretien, Greysen, Chretien, & Kind 2009:1309-1315). The article also highlights concern for patient confidentiality. These issues are more important in view of some findings that many universities do not have guidelines or policies for appropriate use of these new technology platforms (Chretien, et al 2009:1309-1315; Kind, Genrich, Sodhi, & Chretien 2010:15; Skiba 2011:126). Other challenges may arise from the difficulty in tailoring the use of these technology platforms to individual learners' preferences, issues of technology literacy, and the aversion to technology by some teachers and learners (Sandars & Schroter 2007:759-762). Despite these concerns, social media and other Web 2.0 tools have been successfully integrated into the curricula of several programmes in medical and health professions education (Luo, Boland, & Chan 2013:117-123; McLaughlin, Roth, Glatt, Gharkholonarehe, Davidson, Griffin, Esserman, & Mumper 2014:236-243; Mehta, Hull, Young, & Stoller 2013:1418-1423).

Other technology platforms that have been used include Learning Management Systems (LMS) and Lecture Capture (LC), which Chu and colleagues (Chu, Young, Ngai, Cun,

Pearl, & Macario 2010:27-51) reports to enhance learning flexibility in time and place. Open Educational Resources (OER) have contributed immensely to the sharing of high quality educational content across the globe. OpenCourseWare (OCW), consisting of organised courses offered free and hosted by many frontline universities, have had transformative impact on both learners and educators (DeVries 2013: 56-60; Gomez, Callaghan, Eick, Carchidi, Steve Carson, & Andersson 2012:29; Vahdati, Lange, & Auer 2015:73-82). Recently, Massive Open Online Courses (MOOC) was introduced, and is now widely utilized to reach thousands of students in different locations globally (Aboshady, Radwan, Eltaweel, Azzam, Aboelnaga, Hashem, Darwish, Salah, Kotb, & Afifi 2015:e006804; Fini 2009:10; Hoy 2014:85-91; Liyanagunawardena and Williams 2014:e191; Rodriguez 2012:15). Many universities, including top class universities in the world, now offer free educational content via online platforms such as Coursera, EdX, Udacity, Udemy, FutureLearn, NovoEd, etc. Liyanagunawardena and Williams (2014:e191) reviews the application of MOOC in healthcare education. The review identifies 225 healthcare courses delivered through MOOC platforms in 2013 of which it reviews 98. Coursera offers the majority of courses on the MOOC platform. Table 2.3 presents the websites of MOOC providers offering health related courses.

TABLE 2.3 MOOC PROVIDERS OF HEALTH RELATED COURSES

SN	MOOC provider	Description	Website
1	**Coursera**	Company founded by professors from Stanford University, USA	https://www.coursera.org/
2	**EdX**	Company founded by MIT and Harvard Universities	http://www.edx.org/
3	**NovoEd**	Founded by a professor in Stanford University	http://www.novoed.com/
4	**FutureLearn**	Multi-institutional platform based in UK	https://www.futurelearn.com/
5	**Canvas**		https://www.canvas.net/
6	**Open2Study**	Open university Australia	https://www.open2study.com/
7	**CourseSites**	Provided by Blackboard	https://www.coursesites.com/
8	**Miriada X**	Leading MOOC for Spanish speakers	https://miriadax.net/web/general-navigation/cursos

2.2.4 Cultural foundation

Cultural foundations of the learning environment are rooted in the beliefs, assumptions, the values, and roles of individuals and society in education. In the education of healthcare professionals, the current trend is to produce professionals who are equipped with skills and competencies to address the priority healthcare needs of the communities in their catchment areas (Woollard & Boelen 2012:21-27). Because of this, medical schools' curricula now include placements in the immediate communities that the medical schools are designed to serve. Community-based education is now a prominent feature of many educational programmes in medical and health sciences, and has been shown to impact on the professional development of students and doctors (Van Schalkwyk, Bezuidenhout, Burch, Clarke, Conradie, Van Heerden, & De Villiers 2012:1064-1069; Van Schalkwyk, Bezuidenhout, Conradie, Fish, Kok, Van Heerden, & De Villiers 2014:2493; Van Schalkwyk, Bezuidenhout, & De Villiers 2015:589-594). The designs of

learning programmes strongly reflect the social mores. As an example, exploration of indigenous knowledge systems related to traditional healthcare practices are strongly encouraged in medical and health sciences education programmes.

Whereas the influence of culture on teaching and learning in higher education is well captured in literature, an undisputed definition of culture in the context of higher education remains elusive (Maasen 1996:153-159). It has been viewed from organisational/ entrepreneurial perspective, referring to the norms, values, and codes of behaviour of individuals, units, and management in the university system. From the ethnographic viewpoint, the focus is on diversity, multiculturalism, and equitable representation. This often applies to both staff and students recruitment (Maasen 1996:153-159), as well as in appointments and the distribution of responsibilities. In an attempt to define culture (in terms of what he termed the "symbolic side"), Clark (1983:72) describes culture as 'social structures,' 'shared accounts,' 'and common beliefs' that characterise a social entity's ways of doing things. Clark outlines three important levels of culture in higher education to include disciplinary culture, organisational culture, and academic culture.

Disciplinary culture refers to the unique characteristics, norms, and values of individual disciplinary groups that make up the university. Cultural variation across disciplines has been reported in many studies. Squires (2005:130) distinguishes the cultures of the disciplines of the pure sciences that has emphasis on understanding and interpretation of knowledge from the cultures of the applied sciences such as medicine and social sciences whose emphasis lie in the practical application of knowledge. These differences clearly manifest in faculty expectations from learners, and often in the content and manner of rating of learners' academic works (Parry 1998:273-299), as well as in the content and valuation of faculty productivity (Purves 1986:38-51).

The university system is a collection of subunits, each with separate and distinct culture, with unique sets of functions and traditions (Tierney 1988:7). Organizational culture in higher education pertains to the cultural influences that impinge on management functions in universities. As diverse as these influences are, understanding of the norms and assumptions of the university system is central to good management decision making. These influences occur at many levels, from departmental to national level and transcend several aspects of organisational management including appointment of chief executives of institutions (Enders, De Boer & Weyer 2013:5-23; Kezar & Eckel 2002:435-

460; Tierney 1988:7; Wolfe & Dilworth 2015:0034654314565667). According to Tierney (1988:3), economic, demographic, and political conditions are some of the external factors that shape the cultural environment of institutions. Internal forces include the values, goals and processes associated with its functions. In other words, the institution's culture manifests in its choices, behaviour, and the type of actors involved.

Organizational culture therefore influences the pragmatic foundation of the learning environment, and more than that defines the quality of the educational environment as hostile or friendly. A pragmatic approach requires understanding of the interacting cultures within the institution in order to make right choices and minimise cultural conflicts arising from the diversity that exist in the university system. Tierney (2008:28) outlines a framework for understanding organisational culture in universities to include environment, mission, socialization, information management, strategy, and leadership, arguing that institutional interpretations of these constructs differ widely. He also argues that trust is a cultural phenomenon, although academics view this construct as a rational choice.

2.2.5 Pragmatic foundation

Pragmatic foundation focuses how to address issues and challenges within the educational system. Financial constraints, infrastructural challenges, and increasing student numbers, pose significant constraints to the educational system. These constraints are more in developing countries where funding and infrastructure are limited. According to Hannafin and Land (1997:177), pragmatic foundations "bridge the gap between theory and reality," and emphasizes the practicality for the choice of a course of action in a given learning environment. For example, adoption of a particular educational innovation may be influenced by practical realities in the environment (Frehywot, Vovides, Talib, Mikhail, Ross, Wohltjen, Bedada, Korhumel, Koumare, & Scott 2013:11; Young, Rohwer, Van Schalkwyk, Volmink, & Clarke 2015:e0131121; Macdougall, & Riley 2010:83).

2.3. CONCEPTUAL MODELS OF LEARNING ENVIRONMENTS

The five foundations presented above integrate functionally in any learning system as previously stated by Hannafin and Land (1997:167-202). However, differences in the perception of teaching and learning have overarching influence on the manifestation of the learning environment. The level of alignment between the foundations determines the effectives of the learning environment for the desired purpose. For example, a psychological foundation that is based on constructivist ideology, supported by a pedagogical foundation that is characterised by student-centeredness, experiential and situated learning, and a sound technological foundation with well-functioning ICT, will perform best if the beliefs and priorities of the managers and stakeholders are aligned with these ideologies. In a system that is resource constrained and with poor technological infrastructure, as in many African countries, or in which the implementers favour a curriculum that provides direct, structured teaching, psychological and pedagogical foundations consistent with behaviourist ideology might be more appropriate. Pragmatism demands that managers adopt and adapt psychological and pedagogical foundations that are culturally compatible and technologically feasible to maximise effectiveness in the learning system. Hanna fin and Land (1997:178) presents models of integration in the foundations of the learning environment that could produce an ideal situation with complete coincidence among the foundations (figure 2.1), or a mismatch among the factors, wherein some foundations are not properly aligned with the others (figure 2.2). The design of effective learning environments therefore requires understanding of the dynamics of interaction of the various system components that form the learning environment.

- Authority
- Anchoring

- Situated cognition
- Dominance of prior knowledge & experience
- Role of context in learning and applying knowledge
- Personal theories, models, &

- Inquiry & discovery
- Depth vs breadth
- Critical thinking
- Evaluation &

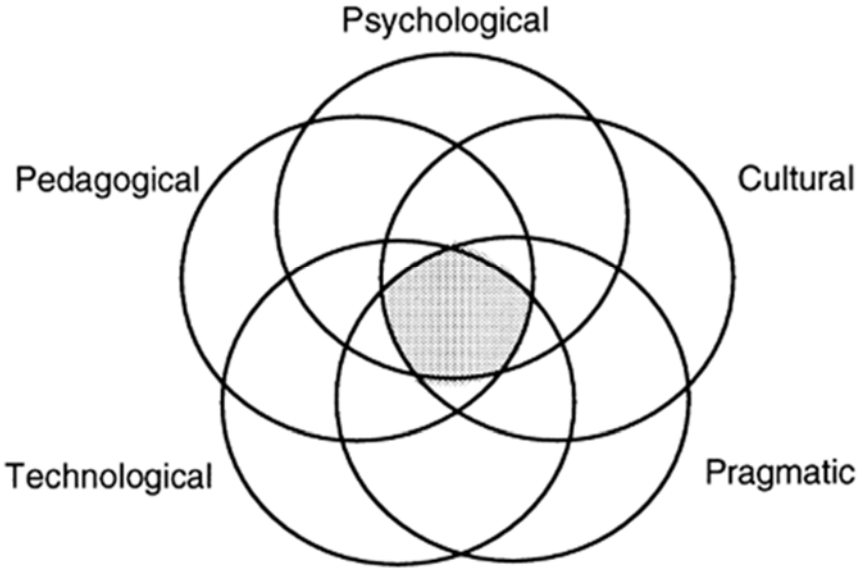


Figure 2.1 Conceptual model of fully integrated learning environment

(Reconstructed from: Hannafin & Land 1997:179; Hannafin, Land, & Oliver 2009:122)

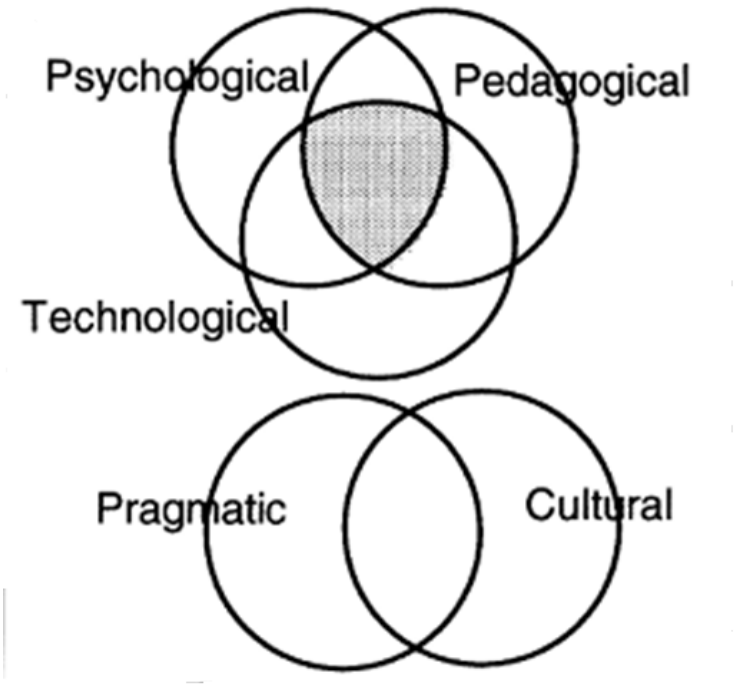
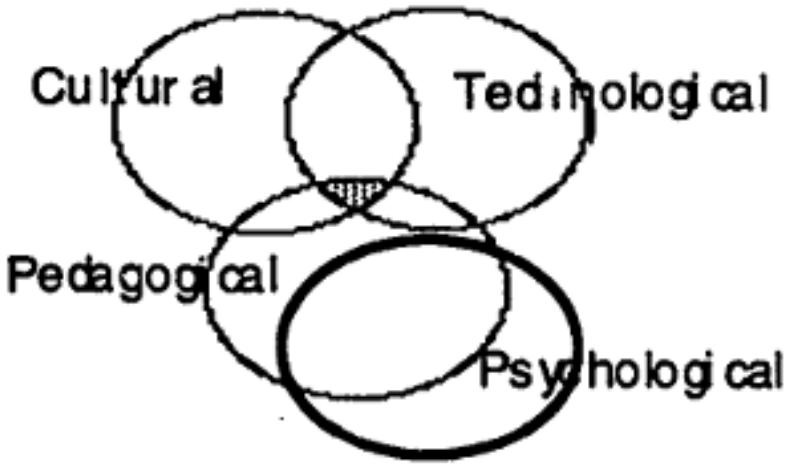


Figure 2.2 Models of learning environment with complete integration of psychological, pedagogical, and technological foundations, which is not compatible with cultural and pragmatic foundations.

(Source: Hannafin & Land 1997:179)

a.



b.

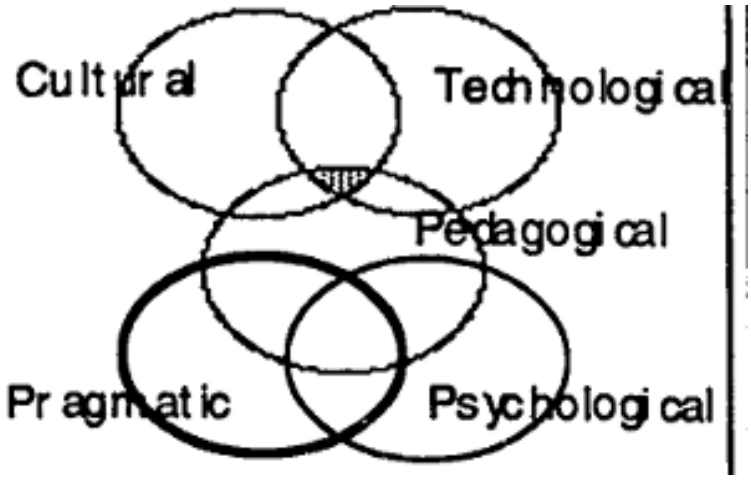


Figure 2.3 Models of learning environments with disconnected foundations.

(Source: Land & Hannafin 1996:397)

2.4 LEARNING ENVIRONMENTS IN MEDICAL AND HEALTH SCIENCES EDUCATION

2.4.1 Learning theories underpinning medical education programmes

Medical and health professions education programmes are complex and often lengthy, as such pose a number of challenges. Many programmes comprise a basic science component that teaches fundamental scientific principles that form the foundations of professional practice, a clinical component, usually in the advanced stages of study, that emphasize professional competence and ethics, and varying degrees of admixture of medical humanities disciplines. More often than not, these components are integrated horizontally and vertically. The justification for this has been that the human patient is a whole being, and that healthcare delivery should be holistic, and not fragmented.

In view of the complicated nature of healthcare delivery, and variations in societal mores and beliefs, education of health professionals is often characterised by constant programme innovations in a bid to produce professionals with competencies to address the health-related challenges and issues that may be peculiar to specific communities. As Cooke et al says: "Medical education seems to be in a perpetual state of unrest" (Cooke, Irby, Sullivan, & Ludmerer 2006:1339).

Competency-based education is a common feature of medical and health sciences curricula. Competency-based education implies that pre-specified learning outcomes or competencies (skills set) have to be achieved by the learner before certification. Competency-based education has its roots in the behaviourist learning theory (Taylor & Hamdy 2013:e1561-e1572; Torre et al 2006:903-907). Behaviourist ideology emphasises reinforcement, and in medical and health sciences education, preliminary steps have to be mastered as a prerequisite for progression to higher responsibilities (Torre et al 2006:903-907). Clinical skills instruction, which features prominently in many disciplines of the health and medical sciences, is well rooted in competency-based learning and as such in behaviourism.

Pedagogical strategies based on cognitivism are also prominent in medical and health sciences educational programmes. Concepts such as reflective practice and critical thinking appear regularly in many curricula. Educators of health professionals believe that

these practices are vital for successful transition of the learner into a professional with good decision making abilities. This practice has wide applications in several health care disciplines, as well as in a variety of settings. Similarly, concept mapping is a regular tool in many learning scenarios. Concept maps may be used for broader conceptualization of clinical cases, or to enhance deeper understanding of underlying concepts.

Instructional and assessment practices congruent with constructivism also abound in medical education programmes. The primary posits of constructivist ideology is that it is learner-centred – individuals construct meaning based on their previous experiences. The learner as an individual is the focus of learning. According to Savery and Duffy (2001:136), the purpose of the learner in learning (i.e. the goal) stimulates and determines what the learner attends to. Social negotiation is an important feature in the construction of knowledge, and through social negotiation, individual understanding is reshaped and validated. These concepts are fully embedded in problem-based learning strategies now widely adopted in its various shades and presentations in medical and health sciences education. Clinical problems presented to learners challenge them to explore the underlying concepts individually and collaboratively and construct their own meaning (self-directed learning). Collaborative and small group sessions challenge individual student's understanding of the problems and construction of knowledge. Von Glasersfeld (1989:121-140) provides this widely quoted statement: "other people are the greatest source of alternative views to challenge our current views and hence to serve as the source of puzzlement that stimulates new learning." Other constructivist vibes that are common in educational programmes of the medical and health sciences include keeping or developing practice portfolios and reflective journals, both of which have been reportedly used in assessment as well (Burch 2011:1029-1031; Ezeala, Ezeala & Dafiewhare 2010:15-16).

What is clear from the foregoing discussion is that the design of instructional and assessment strategies in medical and health sciences education utilises a variety of learning theories. Rarely is one learning theory sufficient as the foundation of educational curriculum in any healthcare educational programme. The manner in which these ideological bases are integrated, reflect on the quality of the learning environment of the programme, and will in the long run impact on the outcomes of the educational programme. Differences in the emphasis given to particular theories define the

uniqueness of individual programmes, and distinguish them from similar programme in other settings.

2.4.2 Pedagogical principles in medical education

Educational programmes of disciplines in the medical and health sciences utilize a variety of adult learning principles outline in section 2.2.2 above. Thus, principles of self-determination, contextual learning, the importance of previous experience, and situated learning, feature prominently in most educational programmes (McNeil, Hughes, Toohey, & Dowton 2006:527-534; Russell 2006:349; Stagnaro-Green 2004:79-85). Adult learning metaphors are intermixed in a variety of ways to design instructional strategies that the operators consider most appropriate for a given situation. Below, some of these metaphors are reviewed.

Taylor and Hamdi (2013:e1561–e1572) discusses the place of adult education theories in medical education, and categorised them into instrumental, humanistic, transformational, social, motivational, and reflective theories or models. Instrumental learning involved development of competencies and skills, and has its roots in a blend of experiential, behavioural, and cognitivist ideologies. The place of experiential learning in medical education is reviewed in Yardley and colleagues (Yardley, Teunissen, & Dornan 2012:e102-e115), which also emphasizes authentic workplace based learning experiences.

Humanistic theory is learner-centred, and focuses on individual development, self-actualization, self-direction and internal motivation. Self-directed learning, which should be differentiated from directed self-learning, has been extensively researched in medical education. Self-directed learning implies that the learner has freedom to independently plan and conduct their learning, and evaluate the achievements from such learning. As one of the key principles underpinning problem-based learning, the applications and value of self-direct learning in medical and health sciences education has received sustained interest over the decades (Brydges, & Butler 2012:71-79; Choi, Lindquist & Song 2014:52-56; El-Gilany & Abusaad 2013:1040-1044; McGrath, Crowley, Rao, Toomey, Hannigan, Murphy, & Dunne 2015:1; Monroe 2015:75; Gagnon, Gagnon, Desmartis, & Njoya 2013:377-382; Premkumar, Pahwa, Banerjee, Baptiste, Bhatt & Lim 2014:934-943; Savery 2015:5-15). The limitation of the humanistic model, according to

Taylor and Hamdi (2013:e1561–e1572), is the exclusion of context and social mechanisms in learning. Durning and Artino (2011:188) highlights the importance of context and social interactions in medical education, and contrasted this with information processing approach.

Transformative learning theory is based on using critical reflection to challenge learners' long-held assumptions and beliefs, and enhance a shift in perspective (Brookfield 2012: 131-146). Transformative learning theory assumes a prominent position in medical education discourse. Currently, a number of studies are advocating the greater incorporation of transformative learning ideologies into medical and health sciences educational programmes (Garneau 2016:125-132; Kaufman & Mann 2010:7-29; Taylor 2008:5-15; Wittich, Reed, McDonald, Varkey, & Beckman 2010:1790-1793;)

2.4.3 Curriculum models in medical education

Curriculum structure and delivery is an important aspect of the learning environment of any medical education programme. There have been major transitions in the design of curricula of medical and health professions educational programmes over the years. A major shift was the transition from subject centred design to integrated model. Current curriculum design in medical and health professions education follow generally one of two models or a mixture of the two models to different with different levels of emphasis (Harden 1984:284-297). In the subject centred design modelled after Flexner's report of 2011, disciplinary boundaries are maintained and courses in the basic and clinical sciences are taught independently. The second model is the SPICES model proposed by Harden in 1984 (Harden 1984:284-297). Each one of the above models addresses the six issues in medical education (presented in figure 2.4). The SPICES model is characterised by learners' greater involvement in the learning process, in contrast to the traditional curriculum which is largely teacher-centred and revolves around information gathering. The current international trend in medical education is a shift towards student-centred learning. However, many of the older universities in Africa are still conservatively leaning towards the traditional teacher-centred model inherited from the West in the colonial and post-colonial era. A second feature of the SPICES model is the integration of curriculum content, such that the traditional boundaries between the disciplines disappear (horizontal integration) thereby enabling the learner to see the patient as a whole being. Vertical integration involves the introduction of clinical cases into the basic

science courses, while emphasising the basic science underpinnings of the clinical courses during the clinical years (Brauer & Ferguson 2015:312-322). Figure 2.5 depicts the trend in scholarship concerning integrated curriculum in medical education from 1983 to 2013 (Brauer & Ferguson 2015:313). A similar pattern is observed with publications on competency based medical education between 1990 and 2015 (figure 2.6). These two figures illustrate the growing interest in both ideologies over the years.

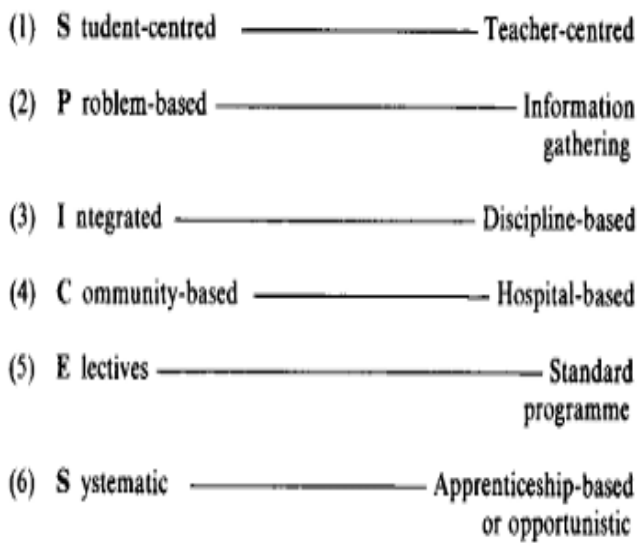


Figure 2.4 Curriculum strategies in medical education (Harden et al 1984:285**)**

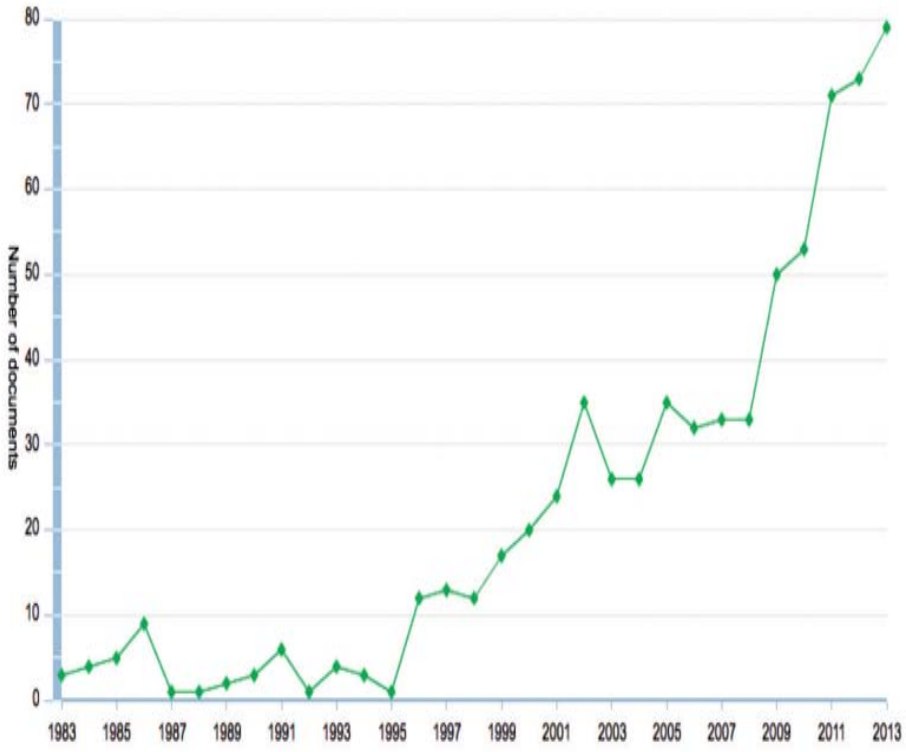


Figure 2.5 Articles on integrated curriculum from 1983 to 2013

(Brauer and Ferguson 2015:313)

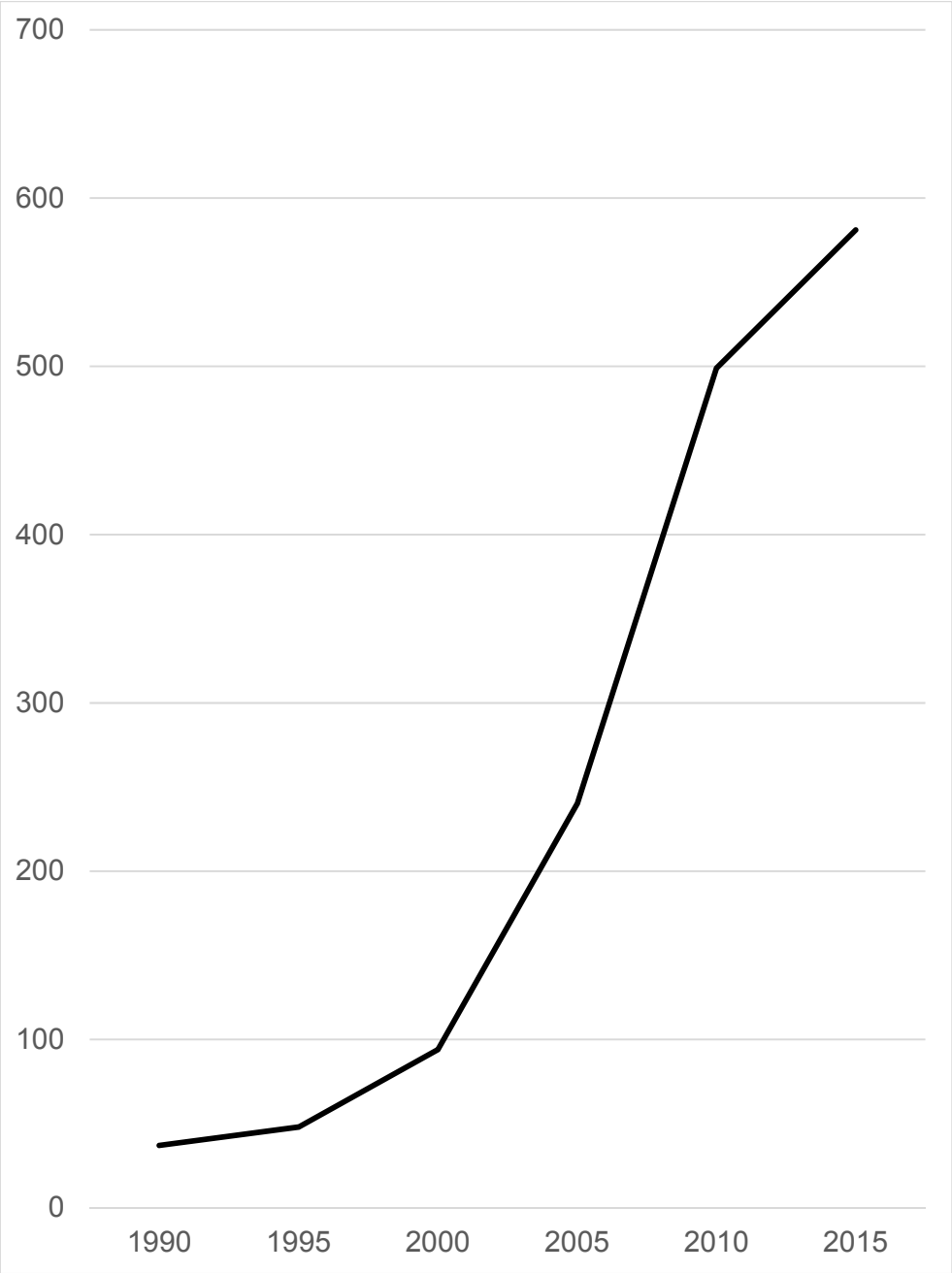


Figure 2.6 Articles on Competency Based Medical Education from 1990 to 2015 **(**produced by the author from a scoping search by author on PubMed using the term "competency based medical education")

Another significant transition in medical education curriculum has been the resurgence of advocacy for competency based medical education (CBME) since the late 1990s. CBME emphasises acquisition of competencies, i.e. achievement of predefined outcomes (in the place of learning objectives or learning process), learner centeredness, and a de-emphasis on time-based training (Frank, Mungroo, Ahmad, Wang, De Rossi, & Horsley 2010a:631-637; Frank, Snell, Cate, Holmboe, Carraccio, Swing, Harris, Glasgow, Campbell, Dath, Harden, Iobst, Long, Mungroo, Richardson, Sherbino, Silver, Taber, Talbot, & Harris 2010b:638-645; Hatcher, Fouad, Campbell, McCutcheon, Grus, & Leahy 2013:225). Competency based education is also strongly catching up with other professions in the healthcare industry (Faller, Cruz–Bacayo, & Abustan 2016:215-226; Fullerton, Thompson, & Johnson 2013:1129-1136; Hatcher et al 2013:225; Marriott, Nation, Roller, Costelloe, Galbraith, Stewart, & Charman 2008:1; Melnyk, Gallagher-Ford, Long, & Fineout-Overholt 2014:5-15; Pijl-Zieber, Barton, Konkin, Awosoga, & Caine 2014:3-27).

2.4.4. Assessment models in medical education

According to Harlen and Crick (2002:1) assessment covers any activity planned and executed in a systematic manner to gather evidence and make judgement about learning. In medical and health sciences education, assessment has undergone significant transformations in the past half century or so. Written and oral examinations were the main methods of assessment before the 1950's in medical education. Newer methods have emerged, driven in part by the failure of the written and oral exam techniques to assess certain core competencies of the medical profession, and in part by the shift in emphasis from process-based to outcomes-based or performance-based education in healthcare education programmes (Norcini & McKinley 2007:239, Norcini, Lipner, & Grosso 2013:S62). Other factors recognized to influence assessment include changes in technology and psychometrics. The increasing complexity of medical and health sciences education, along with expansion in the required core competencies in most programmes, imply that a single method of assessment would be ineffective, and a variety of methods may be required (Al-Wardy 2010:203).

Notwithstanding the approach or approaches adopted, assessments serve two general purposes which can be categorised as formative or summative. Formative assessment is defined as that which "provides the information needed to adjust teaching and learning

while they are happening" (Dixson & Worrell 2016:153-159, Garrison & Ehringhaus 2007). Generally, formative assessments are used for diagnosis of academic problems, for feedback, and for motivation of learners. Black and William (2009:4-5) proposed five key strategies for formative assessments, including:

a. clarifying and sharing learning intentions and criteria for success,
b. engineering effective classroom discussions and other learning tasks that elicit evidence of learner understanding,
c. providing feedback that moves learners forward,
d. activating learners as instructional resources for one another, and
e. activating students as owners of their own learning.

These five strategies identify three key players in the teaching and learning field: the teacher, the peer, and the learner. Black and William (2009:5) further summarised the roles of these players in figure 2.7. It is based on the utility of formative assessment in providing the above functions that the axiom "assessment drives learning" emerged (Wormald, Schoeman, Somasunderam & Penn 2009:199-204).

<table>
<tr><th></th><th>Where the learner is going</th><th>Where the learner is right now</th><th>How to get there</th></tr>
<tr><td>Teacher</td><td rowspan="3">1 Clarifying learning intentions and criteria for success

Understanding and sharing learning intentions and criteria for success

Understanding learning intentions and criteria for success</td><td>2 Engineering effective class-room discussions and other learning tasks that elicit evidence of student understanding</td><td>3 Providing feedback that moves learners forward</td></tr>
<tr><td>Peer</td><td colspan="2">4 Activating students as instructional resources for one another</td></tr>
<tr><td>Learner</td><td colspan="2">5 Activating students as the owners of their own learning</td></tr>
</table>

Figure 2.7 Components of formative assessment (Source: Black and William 2009:5**)**

Summative assessments serve the purpose of making judgements about learning that has already taken place – to grade, record progress, or certify a candidate as possessing defined competencies (Harlen and Crick 2002:1). In medical education, summative assessments may be employed for student selection, promotion, or for licensure (Epstein 2007:388; Norcini, Lipner, & Grosso 2013:S62; Vanderbilt, Feldman, Wood 2013:1-5). Whereas summative assessments are not intended for feedback and pedagogical purposes, Epstein (2007:388) argues that summative assessments could also influence learning even in the absence of feedback, because students tend to study stuff they expect in examination and often use past questions for review.

Whatever may be the purpose or purposes of an assessment, the utility of any tool depends on its ability to fulfill the historical requirements of validity and reliability. Validity of an assessment refers to the degree of correctness of the inferences made on clinical competence based on the assessment results (Messick 1989:5-11 cited in Norcini & McKinley 2007:240). Van der Vleuten and Schuwirth (2005:309) contends that assessment is a design problem that involves "context-dependent compromises," and adds three additional qualitative criteria defining the utility of an assessment tool to include educational impact i.e. ability to motivate learners, acceptability of the tool to the stakeholders, and feasibility i.e. investment requirements to conduct the test (Norcini & McKinley 2007:240).

Miller's pyramid for the assessment of clinical competencies was published in 1990, and encompasses four hierarchical domains of learning, namely "knows," "knows how," "shows how," and "does." Different methods assess different levels of competence as shown in figure 2.8.

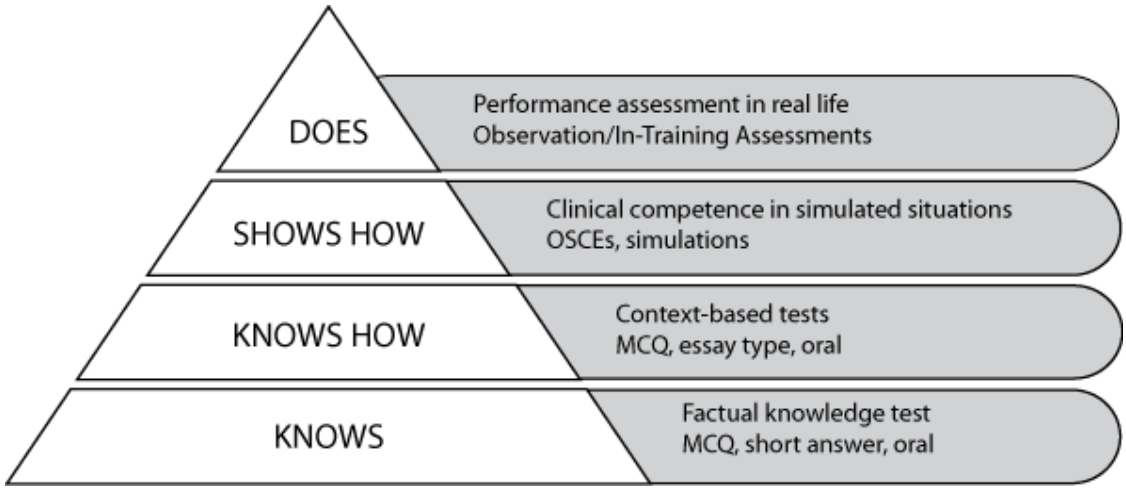


Figure 2.8 Millers pyramid for assessment of clinical competence (source: Australian Medical Council Workplace-based Assessment Online. From: http://wbaonline.amc.org.au/about/ (accessed 23rd June 2016)

A variety of newer methods for assessment of higher order competencies are now dominant in medical and health sciences education. These include use of objective structured clinical examination, simulation-based assessment, and workplace-based assessment (Norcini & McKinley 2007:239-249). Simulation has become an important component of many assessment schemes world-wide. Tekian (1999:105) states that simulation is useful for assessing knowledge, skills and affect, and the ability to integrate these competences in patient care. Norcini & McKinley (2007:239-249) provides an expansive overview of simulation schemes used in clinical assessment including use of standardized patients and computer-based simulators. It also describes the issues in the use of simulators for assessment such as fidelity, equivalence, reliability, standardization over time, and security. Computer-based simulations include computer programmes such as Computer-based Case Simulation, CCS, (Fida & Kassab 2015:135), model driven (or high fidelity) simulations (Tun, Alinier, Tang, Kneebone 2015:1046878115576103), and virtual reality devices (Cook, Brydges, Zendejas, Hamstra, & Hatala 2013:872-83).

Objective structured clinical examination (OSCE), was introduced in 1975 by Harden (Harden 1975:447–451), and has since become a part of clinical assessment in many

medical education programmes. Despite the challenges in its implementation, recent reviews indicate that OSCE is a reliable tool for competency assessment in medical education (Harden 2016:376-379; Patrício, Julião, Fareleira, & Carneiro. 2013:503; Pugh, Hamstra, Wood, Humphrey-Murto, Touchie, Yudkowsky, & Bordage. 2015:85; Smith, Muldoon, & Biesty 2012:242-247). According to van der Vleuten and Schuwirth (2005:312), OSCE enabled movement of assessment away from the clinic to a controlled environment, nevertheless providing authentic clinical tasks and objectivity. The need for workplace-based assessments remains evident however, and methods that allow assessment in the setting of the workplace have emerged such as case-based discussions (CbD), mini-clinical evaluation exercise (MiniCEX), direct observation of procedural skills (DOPS), mini-peer assessment tool (miniPAT), and video assessment (Barrett, Galvin, Steinert, Scherpbier, O'Shaughnessy, Horgan, & Horsley 2015:65; Moonen-van Loon, Overeem, Donkers, Van der Vleuten, & Driessen 2013:1087-1102; Norcini & McKinley 2007:245-246).

2.5 QUALITY ASSURANCE AND ACCREDITATION IN MEDICAL EDUCATION

2.5.1 Quality assurance

Since the 1990's, quality in higher education have become topical, and many institutions are concerned about how to put in place credible quality assurance mechanisms for their programmes (Harman & Meek 2000:7). In Africa in particular, there has been a rapid expansion in the number of medical schools and in the number of health care educational programmes. In a study, Chen et al (Chen, Buch, Wassermann, Frehywot, Mullan, Omaswa, Greysen, Kolars, Dovlo, & Bakr 2012:4) reports that more than 58 new medical Schools have been founded in sub-Sharan Africa since 1990, including 22 new private schools. Figure 2.9 shows the dates of establishment of African medical schools (up to 2009) and their ownership. Mullan et al (Mullan, Frehywot, Omaswa, Buch, Chen, Greysen, Wassermann, Abubakr, Awases, & Boelen 2011:1113-1121) reports that many African countries are prioritizing medical education scale-up as a part of health systems strengthening. This is intended to address manpower shortages in the health sectors of these countries. Accompaniments of these scale-up initiatives include sharp increases in medical schools' student intakes and expansion of the variety of educational programmes offered by the schools. The situation is complicated by inadequate funding and infrastructures, and significant faculty shortages in both basic and clinical sciences.

These developments impact on the educational environments, and on the quality of education offered by the medical schools. A formal system of quality assurance and accreditation is therefore required to ensure stakeholder confidence in the higher education system.

The concept of quality in higher education bears several garbs however. Many scholars regard quality as a relative term which can only be defined in the context of the needs of the communities which the institutions serve (Harman & Meek 2000:9). Harvey and Green states: “First, quality means different things to different people. Second, quality is relative to ‘processes’ or ‘outcomes’. The widely differing conceptualisations of quality are grouped into five discrete but interrelated categories. Quality can be viewed as exception, as perfection, as fitness for purpose, as value for money, and as transformative. Determining criteria for assessing quality in higher education requires an understanding of different conceptions of quality that inform the preferences of stakeholders” (Harvey & Green 2006:9)

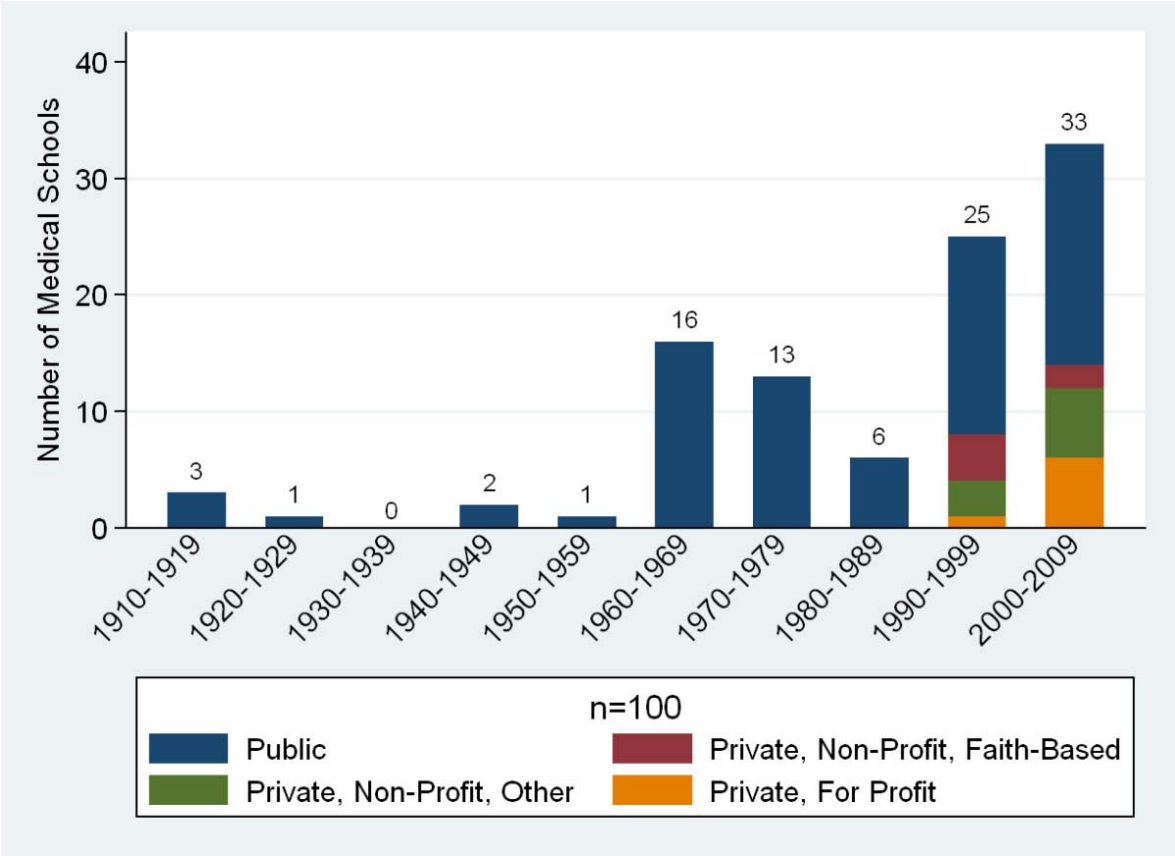


Figure 2.9 Date of establishment of African medical schools (source: Chen et al 2012:4)

Vlasceanu and others from UNESCO-CEPES comments: "Quality in higher education is a multi-dimensional, multi-level, and dynamic concept that relates to the contextual settings of an educational model, to the institutional mission and objectives, as well as to the specific standards within a given system, institution, programme, or discipline" (Vlasceanu, Grünberg, & Pârlea 2007).

Therefore the focus of quality assurance will largely depend on the conceptualization of quality by the stakeholders. Quality assurance, as used in this thesis, refers to the systematic approach adopted to assess and monitor performance and achievement, and to ensure that performance complies with predefined standards. This philosophy underpins the use of different approaches for quality assurance. These approaches include internal regulation (in the form of self-review) and accreditation (of which there several versions). The World Federation for Medical Education (WFME) has proposed clearly defined guidelines for standards setting in basic medical education, which many

medical schools now adopt for self-review (WFME 2015). Such a review was previously conducted in the School of Medicine, University of Zambia in 2003 (Banda 2003). However, this review focused on the Bachelor of Medicine and Surgery programme only, and the outcomes of any intervention that was based on the study has not been determined.

The WFME trilogy mentioned above, states that only a minority of the many medical schools worldwide are subject to accreditation, despite the importance attached to it in programme evaluation and quality assurance (WFME 2015:11). It further raises concern about the rapid expansion of medical schools from both public and private sectors. In Zambia, the number of medical schools is rapidly growing.

The trilogy further emphasizes what should be the characteristics of any set of standards for quality assurance in medical education. It states:

> "Standards must be clearly defined, and be meaningful, appropriate, relevant, measurable, achievable, and accepted by the users. They must have implications for practice, acknowledge diversity and foster adequate development. Evaluation based on generally accepted standards is an important incentive for improvement and for raising the quality of medical education, both when reorientation and reform are pursued, and also when continuous development is strived for" (WFME 2015:12).

2.5.2 Accreditation

Eaton (2011:1) defines accreditation as a process of external review whose purpose is to scrutinize higher educational institutions and programmes for quality and for improvement. The process is useful for certification of the institution as having met or surpassed certain predefined criteria, and to assure confidence in stakeholders. The Accreditation Council for Graduate Medical Education (ACGME 2013:2) defines accreditation as "a voluntary process of evaluation and review based on published standards and following a prescribed process, performed by a non-governmental agency of peers." At this juncture, it is imperative to point out that accreditation may be voluntary or mandatory. Voluntary accreditation implies that the institution has requested to be accredited. It often reflects good administration. Accreditation is mandatory if it is required for licensure for example. In many parts of the world accreditation is voluntary. Abdalla (2012:11-12) identifies six goals of medical school accreditation to include ensuring

quality, encouraging improvement, enhancing stakeholders' confidence, fostering international recognition, providing basis for comparison, and facilitating mobility across borders.

Different systems of accreditation are used by countries world-wide. In the same country different professions may adopt different approaches. McKimm (2012:28) identifies three generic models in common use:

i. Regional approval with minimal interference from professional bodies. This system is operational in the United States where individual states approve educational institutions, while professional bodies are responsible for licensure;
ii. National agency solely responsible for accreditation and licencing. This is the practice in United Kingdom and Australia where the General Medical Council (GMC) and Australian Medical Council, respectively, carry out these duties;
iii. Multi-agency accreditation by independent bodies. These agencies are formed by representatives of governments, universities, professional organizations, and other stakeholders. In collaboration with professional associations, they accredit medical schools, while professional bodies are responsible for licensure. Examples include Liaison Committee on Medical Education (LCME) and the Accreditation Council for Graduate Medical Education (ACGME) in USA and Canada.

In many African countries, accreditation of medical schools is entrusted in nationally appointed agencies. In Nigeria, the Medical and Dental Council of Nigeria is responsible for this role; the Pharmacists Council of Nigeria and the Medical Laboratory Sciences Council of Nigeria are other similar bodies. In South Africa, the Health Professions Council of South Africa carries accreditation duties for healthcare schools. Other Southern African countries such as Namibia and Zambia have similar councils.

The WHO/WFME Guidelines for accreditation of medical schools (WFME 2005:5) specifies that the processes of accreditation must include a self-evaluation, external evaluation and site visit based on the report of self-evaluation, a report of the external

evaluation, and decision on accreditation. The WFME global standards are recommended as criteria for evaluation of medical schools.

2.6 LEARNING ENVIRONMENTS OF MEDICAL SCHOOLS IN AFRICA

The majority of the first generation medical schools in Africa were established in the colonial and early post-colonial era. In order to ensure comparability in standards, most of these schools and colleges ran programmes based on western philosophies at the time, which were largely dependent on behaviourist ideology, i.e. the traditional subject-based curriculum structure (Gukas 2007:887-892). Western education has since witnessed phenomenal paradigm shift in pedagogical strategies, along with significant and ongoing innovations in teaching, learning, and assessment methods (Gukas 2007:887-892; Lonka 2013:29; Mansur, Kayastha, Makaju, & Dongol 2014:78-82; Norman 2012:6-14) However, due to socioeconomic and political constraints, African medical schools were not able to keep pace with the transformations that took place in western medical education. Due to inertia, arising from lack of the will to effect changes, relics of the old order still abound in the academic programmes of many African medical schools.

However, several medical schools in sub-Saharan Africa have adopted changes and embarked on innovations with promising results. Of note are successful transitions to problem-based learning (PBL) curricula and inclusion of community-based medical education in many schools (Iputo & Kwizera 2005:388-393; Kiguli-Malwadde, Olapade-Olaopa, Kiguli, Chen, Sewankambo, Ogunniyi, Mukwaya, & Omaswa 2014:483; Kwizera, Igumbor, & Mazwai, 2008:920; Omotara, Padonu & Yahya 2004:6-16; Talib, Baingana, Sagay, Van Schalkwyk, Mehtsun, & Kiguli-Malwadde 2013:109; Van Schalkwyk, Bezuidenhout, Burch, Clarke, Conradie, Van Heerden, & De Villiers 2012:1064-1069; Van Schalkwyk, Bezuidenhout, & De Villiers 2015:589-594), establishment of rural medical schools akin to aboriginal projects in Australia (Van Schalkwyk, Bezuidenhout, Conradie, Fish, Kok, Van Heerden, & De Villiers 2014:2493; Von Pressentin, Waggie, & Conradie 2016:1), adoption of more modern assessment methods such as objective structured clinical examination (OSCE) (Burch, Nash, Zabow, Gibbs, Aubin, Jacobs, & Hift 2005:723-731), and multidisciplinary/inter-professional education (Mullan et al 2011:1113-1121). Advances in technology have also had significant impact on medical education in Africa (Williams, Pitchforth, & O'callaghan 2010:485-488). Students and

faculty can access the abundant resources in the world-wide web thus enhancing self-direct and lifelong learning skills. Several schools now experiment with innovations involving the use of social media and other Web 2.0 features as well as mobile medical education (Mullan et al 2011:1113-1121).

However, African medical schools face a host of challenges including poor funding, shortages of teaching faculty in both clinical and basic sciences, and poor infrastructure (Mullan et al 2011:1113-1121). Staff shortages have been credited to poor salaries, limited opportunities for professional development, heaving teaching loads, and limited research capacities. Some studies report that adaptation of students and faculty to community-based education could be hard, complicated by unreliable public utilities and language barriers (Greysen, Dovlo, Olapade-Olaopa, Jacobs, Sewankambo, & Mullan 2011:973-986). Other issues identified include the cost of start-up, availability of learning materials, difficulty in transition from lecture-based to adult learning pedagogy for the learners, unavailability of trained PBL tutors (Gukas 2007:887; Kwizera et al 2008:920), and the lack of a global standard for medical education in sub-Saharan Africa.

2.7 EVALUATION OF THE LEARNING ENVIRONMENT OF MEDICAL SCHOOLS

An understanding of the quality of the learning environment is vital for proper appraisal of any educational programme. Genn (2001:337) itemises five 'focal terms' considered central to any educational programme and these include curriculum, environment, quality, and change. These, according to the author, interact in a complex manner, but it is the perception of the learning environment that determines students' behaviour (Baeten, Dochy, & Struyven 2013:484-501; Fraser 2015; Lizzio et al 2002:27; Pimparyon, Pemba, Roff 2000:359-364). Genn (2001:337) defines the learner's perception of the environment as the educational "climate." In the words of the author, "it is argued that the climate is the soul and spirit of the medical school environment and the curriculum. Students' experiences of the climate of their medical education environment are related to their achievements, satisfaction, and success."

Given the importance of understanding the educational climate (students' perspectives on learning environment), it is not surprising that most measures of the learning environment focus on the learners' perception. Several tools have been developed and used to assess the learning environment of higher education programmes. In the

paragraphs below, this thesis examines these tools and the way they have been applied in the assessment of learning environments.

2.7.1 Learning environment measurement tools in healthcare education

In the late 1970s, Marshall developed and used the Medical Students' Learning Environments Survey (MSLES) "to measure aspects of the learning environment relevant to student stress" in the Chicago Medical School (Marshall 1978:98-104). The original item contained 50 items but was later modified and now contains 55 items, with the 7 subscales. These subscales include breadth of interest, emotional climate, flexibility, meaningful learning experience, organization, nurturance, and student-student interaction. The MSLES was widely used in the 1980s and 1990s by many medical schools in North America. Modified versions of this tool have also been used with reliable results in other settings (Moore-West, Harrington, Mennin, Kaufman, & Skipper 1989:151-157; Rosenbaum, Schwabbauer, Kreiter, & Ferguson 2007:508-515). Some studies on the psychometric properties of this tool show that its factor structure, construct validity, and internal consistency are acceptable (Feletti & Clarke 1981a:92-96; Feletti & Clarke 1981b:875-882; Rusticus, Worthington, Wilson & Joughin 2014:423-435).

The Clinical Post-Conference Learning Environment Survey (CPCLES), the Clinical Learning Environment Inventory (CLEI), and some others have been used in nursing education research (Chan 2001:624-631; Chan 2002:69-75; Chan 2003: 519-532; D'Souza, Karkada, Parahoo, & Venkatesaperumal 2015:833-840; Letizia & Jennrich 1998:206-213). The CPCLES contains 54 items in six subscales, while the CLEI contains 42 items in six subscales also. Studies report on the reliability and successful use of these tools to evaluate learning environments of nursing education programmes (Bjørk, Berntsen, Brynildsen, & Hestetun 2014:2958-2967; Papathanasiou, Tsaras, & Sarafis 2014:57-60; Salamonson, Everett, Halcomb, Hutchinson, Jackson, Mannix, Peters, & Weaver 2015:206-211).

In dentistry, the Dental Students Learning Environment Survey (DSLES) is the most widely used instrument for assessing learning environment of dental programmes. The tool is a modification of the MSLES, and evaluates the learning environment in seven areas: flexibility, student-student interactions, emotional climate, supportiveness, meaningful experience, organization, and breadth of interest (Henzi, Davis, Jasinevicius,

Hendricson, Cintron, & Isaacs 2005:1137-1147). Other scales that have been used in this profession include the Dental College Learning Environment Survey (Kamal & Mamata 2014:11) and the Dental Clinical Learning Environment Inventory (DECLEI) (Kossioni, Lyrakos, Ntinalexi, Varela, & Economu 2014:71-79).

2.7.2 Dundee Ready Educational Environment Measure (DREEM) questionnaire

The above educational environment measurement tools have provide useful and reliable in their specific disciplines. The DREEM questionnaire however has been more widely used across the disciplines and programmes than any other instrument (Hamid, Faroukh, & Mohammadhosein 2013:56-63; Ostapczuk, Hugger, De Bruin, Ritz-Timme, & Rotthoff 2012: 67-77; Wong, John, Deslandes & Hughes 2015:15). It has been used in different cultures and in almost all continents with good results. It has been translated into different languages, and used for a variety of purposes in medical schools, including comparing study sites, comparing educational curricula, diagnosing institutional weaknesses, etc.

The DREEM questionnaire was developed by Sue Roff and her colleagues at the University of Dundee in 1997 (Roff, McAleer, Harden, Al-Qahtani, Ahmed, Deza, Groenen, and Primparyon 1997:295). Since then, the questionnaire has caught the attention and interest of the medical education community as none other ever has. Unlike the instruments described above that are often disciplines specific, it has found use in a variety of health and medical education areas. Its psychometric properties, when used in different populations, has demonstrated that it is culturally non-specific, has good construct validity, good consistent factor structure, and excellent internal consistency (Hammond, O'Rourke, Kelly, Bennett, O'Flynn 2012:1, Vaughan, Mulcahy, McLaughlin 2014:1).

The DREEM consists of 50 items to which study participants respond on a 5 point Likert scale of 0 – 4. The factor structure consists of five sub-scales including 'perception of learning' with 12 items, 'perception of programme organizers' with 11 items, 'academic self-perception' with 8 items, 'perception of learning atmosphere' with 12 items, and 'social self-perception' with 7 items. The first subscale, perception of learning, focuses on pedagogical foundational issues such as motivation for learning, learner-centeredness compared to teacher-centred pedagogy, competency-based as opposed to factual

learning, learner participation, and life-long learning skills. The 11 items in subscale II, perception of lecturers and programme organisers, focus on social and interpersonal qualities of lecturers and programme organisers. Subscale III, focuses on the learner as an individual, and addresses such issues as self-confidence, problem solving skills, critical thinking abilities, and study skills. In subscale IV, perception of learning atmosphere, issues pertaining to fairness, discipline, organization, emotional tone, and overall academic stress, are addressed. Subscale V deals with the social life of the learner in the school setting. Issues addressed include stress and boredom, availability of support systems, student to student interaction, and living conditions. Perhaps, it is the robustness of the DREEM that has endeared it to researchers in different disciplines of the medical and health sciences education. McAleer and Roff (2001:29) provides a guide for rating and interpreting total and subscale scores of the completed questionnaire, adopting categorical interpretation rather than interpretation based in absolute scores of responses.

2.8 CONCLUSION

The learning environment comprises a variety of factors that impinge on teaching and learning in medical and health sciences education. These factors include the beliefs and assumptions about learning and teaching, the influence of technological advancements on education in general, and unique sociocultural and management factors in the educational setting, all of which interact in different ways to shape the quality of the learning environment. The manner in which these factors are integrated in a particular programme determines the programme's effectiveness. Learners' perception of the learning environment influences learners' behaviour and learning outcome. Measurement of this perception is vital for quality development of medical schools. In the context of the medical school at the University of Zambia, analysis of the educational environment will provide valuable data for the evaluation of programmes currently running in the school, itemisation of areas of concern, and eventual policy formulation for quality development. Although several tools are available for evaluating the educational environment, the Dundee Ready Educational Environment Measure (DREEM) is preferred by many researchers on account of its robustness, cultural competence, discipline non-specificity, and psychometric qualities. For these reasons, this study adopted the DREEM questionnaire to analyse the learning environment of the programmes in the School of Medicine, University of Zambia.

CHAPTER 3

RESEARCH DESIGN AND METHOD

3.1 INTRODUCTION

This chapter describes the study design and methods for sample collection, with a view to determining and comparing the perspectives of learners from selected programmes, on the learning environment prevailing in the School of Medicine of the University of Zambia. The study paid attention to learners' perception of learning, perception of lecturers and programme organizers, academic self-perception, the learning atmosphere, and social self-perception, which constitute the *a posteriori* established subscales of the Dundee Ready Educational Environments Measure (DREEM) questionnaire. Since paradigmatic perspective is pivotal to any research, a brief description is hereby presented.

Four paradigms have ostensibly manifested in medical and health sciences educational research. These are positivism, post-positivism, interpretivism, and critical theory (Bunnis & Kelly 2010:361). Their ontological, epistemological, and methodological differences translate into different designs and methodologies in conducting medical education research and the manner in which the results are interpreted (Weaver & Olson 2006:459). These differences are illustrated in table 3.1 below. Bunnis and Kelly (2010:258, 358, 364) further argues that for legitimacy, medical education research should discuss the epistemological stance, suggesting that the quality of research is defined by the integrity and transparency of the research philosophy. The epistemological stance of this study is fundamentally positivism with a tinge of post-positivism. It is rooted in positivism with the view that the reality can be discovered using deductive approach in which ideas or concepts are deduced into variables (Polit & Beck 2010:314) as illustrated in table 3.1.

Table 3.1 Characteristics of different research paradigms used in education

	Positivism	Post-positivism	Interpretivism	Critical theory

Ontology: What is the nature of reality?	Reality is static and fixed; The world is ordered according to an overarching objective truth;		Reality is subjective and changing. There is no one ultimate truth	Reality may be objective but truth is continually contested by competing groups
Epistemology: What is the nature of knowledge?	Objective, generalizable theory can be developed to accurately describe the world; Knowledge can be neutral or value-free	Objective knowledge of the world is not necessarily fully accessible; Seeks to establish 'probable' truth	Knowledge is subjective; There are multiple, diverse interpretations of reality; There is no one ultimate or 'correct' way of knowing	Knowledge is co-constructed between individuals and groups Knowledge is mediated by power relations and therefore continuously under revision
Methodology: What is the nature of the approach to research?	The aim is to discover what exists through prediction and control; Theory is established Deductively; Uses scientific method to develop abstract laws to describe and predict patterns Looks for causality and fundamental laws	Seeks to develop knowledge through the falsification of hypotheses Emphasis on well-defined concepts and variables, controlled conditions, precise instrumentation and empirical testing	Focus on understanding Uses inductive reasoning Meaning is constructed in the researcher–participant interaction in the natural environment Gathers diverse interpretations (e.g. grounded theory, ethnography)	Focus on emancipation Research is used to envision how things could change for the better; Seeks representation of diverse and under-represented views; Characterised by continual redefinition of problems and cooperative interaction (e.g. action research)
Methods: What techniques can be used to gather this information?	Tends to use quantitative methods, often including statistical testing of hypotheses (e.g. randomised controlled trials, questionnaires)	Quantitative and qualitative methods: systematically gathered and analysed data from representative samples (e.g. surveys, interviews, focus groups)	Tends to use qualitative methods to capture various interpretations of a phenomenon (e.g. naturalistic observation, interviews, use of narrative)	May use both quantitative and qualitative methods, usually in a participatory way; Often uses iterative research design (e.g. case studies, focus groups, participant observation)

(Source: Polit & Beck 2010:314)

3.2 RESEARCH DESIGN

Bryman and Bell (2015:49) and Happner Wampold, Owen, Thompson, and Wang (2015:118) define research design as the conceptual framework to guide research structure and its execution. The frame work specifies criteria for data collection and analysis, including the criteria to be used for evaluating the research result. Such criteria according to Bryman and Bell (2015:49) include study validity, study reliability, and trustworthiness. Trochim, Donnelly, and Arora (2015), and Donnelly and Trochim (2007) outline the critical components of research design to include the sample, the measurement, the conditions, methods of assignment to study groups, data collection methods, and timing of study procedure (Happner et al 2015:118). The importance attached to some defining factors associated with research results determines the adoption of a specific research design. These factors include, but are not limited to, objectivity of the findings, generalizability to populations beyond that from which the actual study participants were drawn, and the possibility of establishing a cause-effect relationship (Bryman & Bell 2015:49). In medical and health sciences education, quantitative, qualitative, and more recently, mixed methods research are commonly adopted, the choice of approach being determined by the type and uniqueness of the research questions being addressed by the research (Bearman & Dawson 2013:252-260; Clement, Schauman, Graham, Maggioni, Evans-Lacko, Bezborodovs, Morgan, Rüsch, Brown, & Thornicroft 2015:11-27; Holloway & Wheeler 2013; Triola, Huwendiek, Levinson, & Cook 2012:e15-e20; O'brien, Harris, Beckman, Reed, & Cook 2014: 1245-1251).This study adopted the quantitative , descriptive, non-experimental design.

3.2.1 Quantitative design

A quantitative non-experimental descriptive research design was used to investigate the research problem. Quantitative research is described as a study that involves using a systematic scientific method to gather numerical data which when analysed by a mathematical (statistical) procedure, yields results that could be interpreted deductively, and generalized to a wider population (Bryman & Bell 2015:37-38). Bryman and Bell (2015:37-38) further states that quantitative research entails a deductive approach to unravelling the relationship between research and theory, adopts the scientific process, and views reality as external and objective. The outcomes of a quantitative study are therefore objective, generalizable, and neutral (i.e. value-free) (Bunnis & Kelly 2010:361).

3.2.2 Descriptive design

Descriptive designs describe the existence and characteristics of phenomena, and are useful in exploratory inquiry (Happner et al 2015:286-287). Descriptive designs have been classified into surveys, variable-centred, and person-centred designs. Whereas survey designs are used to characterise occurrence of attributes in the population, variable-centred designs examine relationships between variables, while person-centred designs identify groups of persons with a common attribute within a population (Laursen & Hoff 2006:377).

3.2.3 Non-experimental design

A non-experimental study design is a study design in which the investigator merely observes the phenomenon in its natural setting without actively interfering (Colamesta & Pistelli 2014:249). The design is often referred to as observational study. Observational studies are cheaper to conduct than experimental studies, and in some cases, as in the problem under study, may be the only alternative where the variables such as "perception" are not amenable to experimentation. The methodological quality of observational studies could be assessed using the Newcastle Ottawa Scale-Education (NOS-E) specifically designed for evaluating research in education (Colamesta & Pistelli 2014:251; Liu, Peng, Zhang, Hu, Li & Yan 2016:e2), or with the Medical Education Research Study Quality Instrument (MERSQI) tailored to the needs of evaluation in medical education research (Batt-Rawden, Chisolm, Anton & Flickinger 2013:1171-1177; Cheston, Flickinger, & Chisolm 2013:893-901). The usefulness of both instruments in appraising medical education research was recently evaluated and reported to be comparable (Cook & Reed 2015:1067).

3.3 RESEARCH METHOD

A research method specifies the techniques for data collection, including the description of the study population, sampling frame, sampling method, sample size, data collection instrument, as well as the measures to ensure validity and reliability of the data. Polit and Beck (2013:8) defines research method as "the techniques researchers use to structure a study and to gather and analyse relevant information."

3.3.1 Study setting

The setting for this study was the School of Medicine of the University of Zambia which is located in the Ridge Way Campus of the University in Lusaka, and has offices and facilities in the University Teaching Hospital (UTH) situated adjacent to the Ridge Way Campus.

The School of Medicine was established in 1966 to run only the Bachelor of Medicine and Bachelor of Surgery degree. Overtime, the School has transformed and now runs other programmes as well. These include the Bachelor of Pharmacy, Bachelor of Physiotherapy, Bachelor of Nursing Sciences, Bachelor of Environmental Health Sciences, and Bachelor of Biomedical Sciences degrees. In addition, a host of other postgraduate degree programmes are on course such as Masters and Doctor of Philosophy degrees in several disciplines of the Basic Biomedical Sciences, Nursing Sciences, the specialities of Medicine and Surgery, Health Professions Education, and Public Health.

The Bachelor of Medicine and Surgery degree is a seven (7) year programme comprising four (4) preclinical years that leads to the award of a Bachelor of Science in Human Biology degree on successful completion, and three (3) clinical years culminating in the award of Bachelor of Medicine and Bachelor of Surgery (MBChB) degree. The first two years are spent in the main campus (Great East Road Campus) of the University, where students take courses in advanced basic sciences. For this reason, only students in year 3 to year 7 participated in the study. The curriculum is outcomes based, but primarily lecture based as well. A significant community-based component is integrated into the programme. Assessment methods include continuous assessment and end of year examinations using a variety of approaches such as multiple choice and essay type written examinations, and in the clinical years, objective structured clinical examinations (OSCEs).

The Bachelor of Pharmacy programme lasts 5 years, and like the MBChB programme, its curriculum is competency and lecture based. Students spend the first two years in the main campus as well, and return to the Ridgeway Campus for the clinical years, year 3 to year 5. The Bachelor of Physiotherapy programme is also of 5 years duration, and is

also competency and lecture based. However, the students report to the Ridge Way Campus in the second year of the programme.

Zambia has four recognised medical schools – the University of Zambia School of Medicine, Lusaka Apex Medical University (a private university), Cavendish University School of Medicine, and Copper Belt University School of Medicine. The first three universities are located in Lusaka, while Copper Belt University is situated in Kitwe (see figure 3.1). More recently, the Mulungushi University open a new medical school in Kabwe in January 2016, making the fifth medical school in Zambia.

3.3.2 Population

In order to answer the research question, individuals, objects or elements that can shed light to the issues related to the topic under investigation have to be identified. These are termed the 'research population'.

The study population refers to the population from which the sample is drawn. In this study, this included all undergraduate students enrolled and studying at the School of Medicine, Ridgeway Campus of the University of Zambia at the time of this study. This number was determined to be 1,330. The target population has been defined by Statistics Canada as "the set of elements about which information is wanted and estimates are required" (Statistics Canada 2003). Put in another way, it is the population to whom the results of the study may be generalised.

The target population for this study comprised all undergraduate students enrolled in full time studies in medical and health sciences programmes in universities in Zambia. The study population for this project were those students actively enrolled in full time studies at the School of Medicine of the University of Zambia at the time of this study

However the universal population was not manageable due to size, location, numbers and other practical considerations. In this instance the accessible population becomes practical for sampling (Brink 2006:1230). The accessible population in this study comprised only students studying at the Ridgeway Campus and the University Teaching Hospital, at the time of this study. These included students in year 3 to year 7 for the

Medicine/Surgery programme, year 3 to year 5 for the Pharmacy programme, and year 2 to year 5 for the Physiotherapy programme.

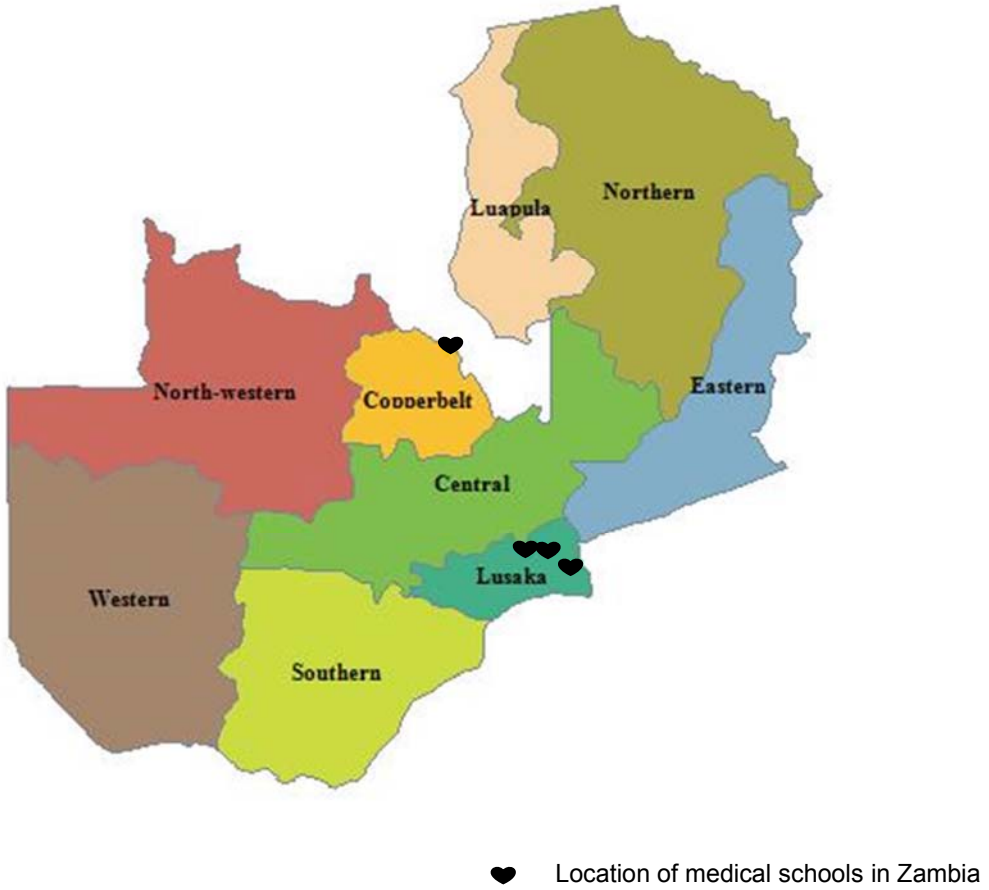


Figure 3.1 Map of Zambia showing location of medical schools in Zambia.

3.3.3. Sampling

The goal of quantitative research is to generalize results from a sample to the larger population from which the sample was extracted. Probability sampling allows these inferences to be made with precision, and is very vital to ensuring the validity of the research results (Bryman 2016:178, 181). Stratified random sampling was adopted for this study. This sampling strategy ensures that the sampling distribution is similar to that

of the population from which the sample was extracted, and that the variance is minimised thereby improving the precision by eliminating variation between strata (Bryman 2016:178-182).

The programmes in the School are Medicine/Surgery, Pharmacy, Nursing, Physiotherapy, Environmental Health, and Biomedical Sciences. Nursing, Medicine/Surgery, and Pharmacy enrolled the highest number of students. Nursing was not included in the programme because of the heterogeneity of platforms within the programme. The programmes are delivered using a variety of platforms including distance learning, online, regular, and parallel models. Medicine/Surgery, Pharmacy, and Physiotherapy were purposively selected as representative programmes for the study based on researcher's best judgement.

3.3.3.1 Sampling frame

The sampling frame specifies the list from which the sample was drawn. In this study, two lists were used – the list of programmes running undergraduate degrees in the School of Medicine and the list of students enrolled in the programmes as indicated in table 3.2.

3.3.3.2 Inclusion criteria

The inclusion criteria for the study were:

1. Participant must be currently and actively enrolled in one of the selected undergraduate degree programmes;
2. The participant must be a full time student in good standing;
3. The participant must give informed consent to volitionally participate in the study.
4. The participant must be studying at the School of Medicine, Ridgeway Campus of the University of Zambia.

3.3.3.3 Sample size

The sample size was calculated using an online sample size calculator provided by Raosoft Inc. (available at http://www.raosoft.com/samplesize.html). The calculation utilised a margin of error of 5 %, confidence level of 95 %, population size, and response distribution of 50%, using the formula:

$$[n = (Z^2 \times P (1 - P))/e^2]$$

where n is the sample size, Z is the confidence level, P is the response distribution, and e is margin of error. To maximize the reliability of the data, sample size was calculated for each individual programme included in the study. To analyse the overall School learning environment, the samples from the selected programmes were pooled. Table 3.2 shows the computed sample sizes for the individual programmes that participated in the study. The list of students enrolled in each programme was drawn to provide the sampling frame. Each programme was stratified into classes according to the level of study. Based on the enrolment in each class, the number of participants required from the class was calculated as follows:

(Sample size for the programme ÷ Total enrolment in programme) × Class enrolment

Participants were then selected from the list by simple random sampling using an online randomization program, Research Randomizer (available at: https://www.randomizer.org/). The students whose serial numbers on the class list correspond to the random numbers generated by the Randomiser were invited to participate in the study.

TABLE 3.2 SAMPLE SIZES FOR THE THREE PROGRAMMES AND THE SCHOOL OF MEDICINE, UNIVERSITY OF ZAMBIA

Programme	Study population	Calculated Sample Size
Medicine/Surgery	632	240
Pharmacy	220	141
Physiotherapy	105	83
School of Medicine	1,330	300

3.4 DATA COLLECTION

3.4.1 Data collection instrument

Literature on learning environment measurement was reviewed to identify the most appropriate instrument for data collection in this study. The characteristics of some of these instruments were reviewed in chapter 2. The DREEM questionnaire was selected based on its wider application in medical and health sciences education research, and because a number of studies report on its reliability and validity in different cultural and socioeconomic settings.

3.4.1.1 Description of the DREEM questionnaire

The DREEM questionnaire was developed by Roff and colleagues in 1997 as a generic tool for measuring the educational environment of medical schools, using a Delphi panel consisting of seasoned international educator (Miles, Swift & Leinster 2012:e620-e634, Roff 2005:322-5). For two decades, it has been used as the most suitable tool for a variety of purposes relating to assessment of learning environments of medical and health sciences educational institutions. It has been translated into eight languages in over 20 countries (Miles et al 2012:e620), and it has also been modified for use in postgraduate medical education (Roff, McAleer, & Skinner 2005:326-331) and agricultural education (Atapattu, Kumari, Pushpakumara & Mudalige 2015:22-30).

The DREEM consists of fifty (50) close-ended items that would yield quantitative data, to which study participants respond on a five (5) point Likert-like scale ranging from strongly agree to strongly disagree. The sample questionnaire is included as annex C.

The factor structure of the DREEM consists of five (5) subscales, namely students' perception of learning (SPL) containing 12 items, students' perception of teachers - lecturers/programme organizers (SPT) containing 11 items, academic self-perception (ASP) containing eight (8) items, perception of the learning atmosphere (SPL) containing 12 items, and social self-perception (SSP) containing 7 items. Of the 50 items in the DREEM, nine (9) are negative statements (items 4, 8, 9, 17, 25, 35, 39, 48, and 50) while the remaining 41 items are positive. McAleer and Roff (2001:29-33) provides a guide to rating the completed copies of the questionnaire (Annex E).
For the positive items, responses are rated as follows:

Strongly agree	4
Agree	3
Uncertain	2
Disagree	1
Strongly disagree	0

For the 9 negative items, responses were rated as:

Strongly agree	0
Agree	1
Uncertain	2
Disagree	3
Strongly disagree	4

Based on the above rating rubric, the maximum global score for the entire 50 items is 200. Scores of 0-50 are rated as “Very Poor,” scores of 51-100, as “Plenty of Problems,” 101-150 as “More Positive than Negative,” and 151-200 as “Excellent.” A score of 100 is interpreted as an environment which is viewed with “considerable ambivalence” needs to be improved.

Maximum score for the 12 items in the subscale of perception of learning is 48. Scores were interpreted as: 0-12 “Very Poor,” 13-24 “Teaching is viewed negatively,” 25-36 “A more positive perception,” and 37-48 “Teaching highly thought of.” For the subscale of perception of teachers/course organizers, the maximum score for the 11 items was 44. Scores for this subscale were interpreted as: 0-11 “Abysmal,” 12-22 “staff in need of some retraining,” 23-33 “Moving in the right direction,” and 34-44 “Model lecturers/ course organisers.” The subscale of academic self-perception had 8 items with a maximum score of 32. Interpretation was as follows: 0-8 “Feelings of total failure,” 9-16 “Many negative aspects,” 17-24 “Feeling more on the positive side” and 25-32 “Confident.” The 4th subscale of perception of atmosphere had 12 items and a maximum

score of 48. Interpretation of scores in the subscale was as follows: 0-11 “A terrible environment,” 13-24 “There are many issues which need changing,” 25-36 “A more positive attitude,” and 37-38“A good feeling overall.” Finally, the subscale of social self-perception had 7 items and a maximum score of 28. Scores were interpreted as 0-7 “Miserable,” 8-14 “Not a nice place,” 15-21 “Not too bad,” and 22-28 “Very good socially.” Details of interpretation of the subscales are presented in the annexure E.

3.4.2 Data collection process

Collection of data was carried out in the month of March 2016 at the Ridgeway Campus and the University Teaching Hospital, Lusaka. Research assistants comprising undergraduate students who volunteered for the purpose collected the data. After briefing the research assistants at the Ridgeway Campus, they were assigned to different programmes for data collection. This enhanced administration and collation of the questionnaires according to programmes. Before or after a lecture, the students were addressed by their class representatives and the research assistant assigned to the programme, to explain the purpose of the study. Each participating student was given the information sheet (Annex A) and after reading and confirming understanding of the content, signed the consent form (Annex B). The participant was then handed a copy of the DREEM questionnaire (Annex C) and a copy of the demographic questionnaire (Annex D). Permission to use the DREEM questionnaire was sought and obtained from one of the authors (Dr McAleer; see annexes F & G). Each participant was asked to respond as truthfully as possible to each item in the questionnaire unassisted, and to provide 3 responses to the one open ended question included in the questionnaire. It should take about 15 minutes to complete the questionnaire, but the students were allowed to fill the questionnaire at their convenience. Follow up was by personal visits to the class by the research assistants and phone calls to the participants through their class representatives.

Completed copies of the questionnaire were returned in large envelopes to the investigator, who then rated the responses and entered the raw data in an excel spreadsheet template developed by the investigator.

3.4.3 Reliability and Validity

3.4.3.1 Reliability

Validity and reliability are important attributes of any research report. Reliability measures the consistency and stability of a measurement tool. In quantitative studies, test-retest reliability may be used to assess the stability of the test instrument overtime (Velligan, Fredrick, Mintz, Li, Rubin, Dube, Deshpande, Trivedi, Gautam & Avasthi 2014:1047). Most often, computation of Cronbach's alpha is used to measure internal consistency (inter-item correlation) of items designed to measure the same construct in a data collection tool (Hammond, O'rourke, Kelly, Bennett & O'flynn 2012:1; Peterson & Kim 2013:194; Tang, Cui & Babenko 2014:205; Tavakol & Dennick 2011:53; Yusoff 2012b:509638; Vaughan, Mulcahy & McLaughlin 2014:1).

3.4.3.2. Validity

Validity, as used in this study, refers to the ability of the test instrument to provide data that would lead to inferences and conclusions that could be considered "the best approximation to the truth" (Research Methods Knowledge Base, Accessed April 18, 2016). Several factors influence the validity of a research report. These generally arise from the operationalization of the research process. Construct validity refers to the ability of the instrument to measure the construct which it is intended to measure (Yussoff 2012a:314). Construct validity of a quantitative research is often measured by analysing principal component (PCA) which in effect determines the factor structure of the tool used for data collection.

Internal validity refers to ability of the research to demonstrate cause-effect relationships, a factor that is very important in experimental studies. Since this study is non-experimental and descriptive, such cause-effect inferences were not the prime concern of the study, and external and construct validity are given more emphasis.

3.5 EXTERNAL VALIDITY OF THE STUDY

External validity of a research report refers to the generalizability of the research report to populations or groups beyond which the sample was collected. External validity is an

important accompaniment of any good research whether the design is quantitative, qualitative, or mixed method. External validity is subject to several threats. These are "explanations of what may go wrong when we try to transport results from one study to another while ignoring their differences" according to Pearl and Bareinboim (2014:579). Some of the threats to the external validity of this study could arise from selection bias, homogeneity of the populations, and stability of test instrument. Probability sample technique which was employed in the study helps to control for selection bias. To a large extent, the study sample was representative, as statistical methods were used to calculate sample size for each programme, and each student had a fair chance to participate in the study. To control for heterogeneity, the study population was comparable to the target population in the sense that these are undergraduate students in similar programmes in the healthcare professions, and they were drawn from the same country. Furthermore, the curricula of these four schools are similar, having been designed and developed by teams drawn from the same pool of university faculty in Zambia. The schools share resources include teaching staff, laboratories, and the clinical facilities provided by the University Teaching Hospital in Lusaka. They are also regulated by the same policy frameworks provided by the Health Professions Council of Zambia, General Nursing Council, and the Higher Education Commission. The reliability of the data collection tool has already been discussed above.

Several studies report on the construct validity and internal consistency of the DREEM when used across different cultures (Hammond 2012:1; Vaughan et al 2014:1). Most of these studies employed confirmatory factor analysis to confirm or disprove the factor structure, and computation of Cronbach's alpha to measure internal consistency. Although some concerns are expressed about the factor structure of the DREEM (Hammond 2012:1; Jakobsson, Danielsen, & Edgren 2011:e237), such concerns have been attributed to the use of sample sizes that are less than the minimum recommended for such analysis (Roff & McAleer 2015:602-603; Wetzel 2012:1066), and the usefulness of DREEM as a tool for measuring educational climate of medical schools globally remains disputed. This justification led to the adoption of the tool for this study.

3.6 DATA ANALYSIS

The purpose of data analysis in research is to organise, order on a large body of information so that general conclusions can be reached and communicated in the research report (Polit & Hungler 2003:500).

Quantitative research involves the use of statistical methods to analyse numerical data. According to Singpurwalla (2013:9), descriptive statistics involves the use of numerical and graphic methods to summarise, present and describe patterns in a data set. Inferential statistics, on the other hand, utilizes information from a sample data set to make estimates, predictions, and generalizations about a larger data set (e.g., a population). Currently, statistical analysis involves the use of statistical software, and in this study, Microsoft excel spreadsheet version 2013 was used to initially collate and sort the data, while statistical analysis was carried out with the aid of the Statistical Software for Social Sciences, SPSS, version 21. Descriptive statistical tests carried out included sample means, standard deviations, frequency distribution (displayed as histograms), confidence intervals, skewness and kurtosis. These analyses are important to verify if the underlying assumptions of inferential statistical test are fulfilled.

The data for each of the three participating programmes were analysed and compared. As well, data for the total participants from all the programmes were also analysed. Inferential statistical tests used included one way analysis of variance (ANOVA) with Friedman's Test and Tukey's Test for Non-additivity. The traditional significance level (p value) of 0.05 was used, p values equal to or less than 0.05 were considered to imply significant difference. Other statistical tests were confirmatory factor analysis for test validity and Cronbach’s alpha for internal consistency as a measure of reliability.

The completed copies of the questionnaire were scores and categorically interpreted according to the rubric of McAleer and Roff described above (annexure E). Mean scores in individual items were also computed and interpreted to determine areas that require attention and improvement.

Samples of the open ended responses were randomly selected and coded deductively based on themes derived from the literature. The number of respondents in each theme was expressed as a percentage of the total number analysed.

3.7 ETHICAL CONSIDERATIONS

Ethics, this diminutive word bearing both singular and plural meanings, has a lot of imperatives in health sciences research (Vera & Ezeala 2013:159). According to the World Health Organization (WHO 2009:19), ethics does not prescribe a specific set of rules or policies, but rather specifies frameworks upon which evaluation and resolution of moral issues in research are based. In any health science research, the four basic principles of ethics are considered: autonomy, beneficence, non-maleficence, and justice. Autonomy refers to the ability of the individual to make decisions for himself, beneficence has to do with the obligation of the researcher to do "good," non-maleficence implies minimizing harm, and justice refers to equity in distributing benefits and burdens to study participants. These four principles are the framework for ethical appraisal of any research.

Beyond these basic principles, health researchers increasingly recognise a number of ethical issues that impinge on research, especially in some unique populations. Jamieson et al (Jamieson, Paradies, Eades, Chong, Maple-Brown, Morris, Bailie, Cass, Roberts-Thomson & Brown 2012:16-18) outlines five essential principles that are relevant to health research in indigenous populations in Australia, and five desirable principles. The five essential principles include:

1. Addressing a priority health issue as determined by the community
2. Conducting research within a mutually respectful partnership framework
3. Capacity building as a key focus of research partnership…
4. Flexibility in study implementation while maintaining scientific rigour
5. Respecting communities' past and present experience of research

These five principles are applicable to medical and health sciences education research in different shades. This study addressed an issue considered important and a priority concern by both the investigator and the management of the School of Medicine. A research partnership was formed between the researcher, the programme managers and the students. By involving students as research assistants, capacity building in quantitative research was achieved. The research entails significant rigour in planning, data collection and analysis, and scientific interpretation. Finally, the rights and opinions of each party in the research were respected. The following sections further describe how the basic principles of ethics were adhered to as they relate the study participants, the institutions and programmes, and the researcher.

3.7.1 Ethical considerations relating to study participants

All the study participants had good understanding of the purposes and the objectives of the study, the procedures to be followed, the credibility of the researcher, how results will be published, and their likely impact on participants were explained before enrolment (see Annexure A). They were given detailed information about the study. Those who participated freely gave their consent by signing a consent form, and they also had the liberty of living the study at any point in the data collection process. The confidentiality of each participant was protected by not collecting their names or computer (registration) numbers, and keeping the signed consent forms separate from the completed questionnaires. Optionally, phone numbers were collected to assist follow-up. The completed questionnaires shall be in the sole custody of the investigator who shall keep them for a minimum period of 3 years in secured lockers in line with Code of Federal Regulations (Department of Health and Human Services 2009:6) stipulation.

By using probability sampling and stratification, each participant was given a fair chance of participation in the study. The study involved no known risks, and although there was no direct benefit to the participants, using the results to inform policy for improving the learning environment of the programmes will be to the advantage of the students.

3.7.2 Ethical considerations relating to institutions and the programmes

The Code of Federal Regulations (Department of Health and Human Services 2009:6) specifies guidelines for the conduct of research in institutions. Subsection 45CFR46.109 specifies that “an IRB shall review and have authority to approve, require modifications in (to secure approval), or disapprove all research activities covered by this policy.” This study was conducted under the guidance and supervision of UNISA, as a requirement for the degree of DLitt et Phil in Health Studies. Accordingly, a proposal module was completed and certificate of ethical approval was obtained from the Department of Health Studies for the conduct of the study (Annex H).

The study site was the University of Zambia, School of Medicine in Lusaka. In line with the requirements of the School, a proposal was also developed and submitted according to the University of Zambia Biomedical Research Ethics Committee guidelines, and authority was granted (Annex I). Upon granting authority to conduct the study, a formal

request was made to the Dean of the School of Medicine, and a letter of authority was issued to commence the study (Annexes J & K).

The investigator consulted with the heads of the programmes that participated in the study to obtain information about the programmes and to get their cooperation, prior to the study. All the programmes were given a fair chance of participation in the study through the sampling method described above. The design of this study was not to disparage any programme or staff of the School. The study believes that the information generated will be useful for self-review, and lead to better understanding and quality development of the learning environments of the programmes.

3.7.3 Ethical considerations relating to the investigator

The researcher in this study was cognisant of the possibility of power differential between the researcher and the students. Peterson (1994:303), cited in Van der Wal (1995:279), describes 'power differential' as the perception of either the researcher or the participants having more or less status or authority than the other. Participants who perceive themselves as subordinates or lesser in power to the researcher may wish to please the researcher or to gain the researchers approval. This may naturally alter their responses and behaviour accordingly. The other important issue regarding the power differential is the participant's perception of the researcher as an insider or an outsider (Campbell 2006:6 cited in Moleki 2008:96). The researcher was not directly involved in data collection, but rather used the participants' peers as data collectors to avoid this power differential. Moreover, the researcher has not been involved in teaching the undergraduate students in the programmes under study, further enhancing the validity of the generated data.

Conflict of interest is another ethical factor that could impinge on scientific integrity of a research report. Conflict of interest has been defined by Thompson (1993:573), cited in Lemmens and Singer (1998:960), as "a set of conditions in which professional judgment concerning a primary interest tends to be unduly influenced by a secondary interest." The researcher is an employee of the University of Zambia, but any conflict that could arise from this was overcome by the observance of the principles of academic freedom by the University as espoused in the 1940 statement by the American Association of University Professors (Dreyfuss & Ryan 2016:1-9; Lieberwitz 2015:10). In addition this research did

not receive any direct funding from the University of Zambia, so there is minimal, if any, conflict of interest.

3.8 CONCLUSION

This chapter provides a description of the research paradigm, design and methodology, and the theories underpinning the research approach. The epistemological stance of the study is positivism with a tint of pragmatism. A quantitative non-experiment descriptive design was used in that it was expected to yield objective and generalizable results about the issues in the learning environment of programmes in the School of Medicine, University of Zambia. A stratified probability sampling method was used to ensure adequate representation of all strata in the School, and minimize variation between the strata. A validated instrument, the DREEM questionnaire, which is popular among health professions education researchers, was used to gather data from consenting students in representative programmes of the School namely, Medicine/Surgery, Pharmacy, and Physiotherapy. Both descriptive and inferential statistical analyses were carried out to make sense of the data. The investigator believes that these approaches would yield valid, reliable, objective, generalizable, and value-free data for the correct interpretation of the learning environment of the School of Medicine in Zambia, and expose areas that need priority attention. It used the issues identified to propose a strategy for improvement of the School.

CHAPTER 4

ANALYSIS, PRESENTATION, AND DESCRIPTION OF RESEARCH FINDINGS

4.1 INTRODUCTION

In chapter three, the research design, methods, data collection, and the processes of data analysis were presented, together with methods for descriptive and inferential statistical

analyses, and categorical interpretation of the scores. This chapter presents and describes details of data management and analysis, and the findings of the study. The first section of the chapter describes management and analysis of data, followed by the description of the demographic characteristics of the participants, the DREEM results for the School of Medicine, and the three participating programmes Medicine/Surgery, Pharmacy, and Physiotherapy. It ends with results of inferential statistical and psychometric analysis of the data.

4.2 DATA MANAGEMENT AND ANALYSIS

Questionnaires completed and returned from the different programmes and classes were sorted and rated using the rubric previously described in the methodology. The scores were entered into a Microsoft excel spreadsheet using a template created by the investigator. The total (global) scores and scores in each of the five subscales of the DREEM were computed for each participant using this spread sheet. The data were imported into SPSS software version 21 and edited with the data editor before further analysis.

Using the SPSS software, descriptive statistics were computed, including the means and standard deviations of total DREEM scores, scores within subscales, and scores on individual items. Frequency distributions, distribution histograms, Skewness, and Kurtosis were computed to confirm normal or near-normal Gaussian distribution, which is a prerequisite (one of the assumptions) for the use of inferential statistical analysis such as one-way analysis of variance (ANOVA). Other assumptions were confirmed by carrying out relevant statistical tests with the SPSS software.

4.3 PRESENTATION AND DESCRIPTION OF RESEARCH FINDINGS

The total number of students enrolled in the Bachelor of Medicine/Bachelor of Surgery programme was 632 at the time of study. A sample size of 240 was calculated for this programme based on the enrolment figure. Therefore, 240 questionnaires were distributed to selected participants out of which 239 were returned, giving a response rate of 99.6 %. Pharmacy programme enrolled 220 students at the time of the study. A sample size of 141 was calculated based on the figure. One hundred and forty-five (145)

questionnaires were distributed to the selected participants, but only 135 were returned, giving a response rate of 93.1 %. Physiotherapy enrolled 105 students and the sample size of 83 was calculated for this programme. Eighty-six (86) questionnaires were distributed out of which only 76 were completed and returned, giving a response rate of 88.37 % for Physiotherapy. Two (2) copies were not completed properly and were rejected, so that only 74 copies were analysed. For the entire study therefore, 471 copies of the questionnaire were distributed, and 450 were returned, giving a response rate of 95.54 %. Two (2) of these were rejected because they were not properly completed, leaving 448 suitable for data analysis.

4.3.1 Demographic characteristics of all study participants

In all, questionnaires from 448 participants were analysed in this study. Of these, 239 (53.3 %) were from the Medicine/Surgery programme, 135 (30.2 %) from Pharmacy, and 74 (16.5 %) from Physiotherapy. The male participants were 264 (58.9 %) while 184 (41.1 %) were females. The mean age of the participants was 25.5 (SD = 4.2). Their ages varied between 19 and 49 years. By residential status, 266 (59.4 %) resided in the campus (hostels), 91 (20.3 %) resided off-campus in privately rented accommodation; the remaining 91 (20.3 %) resided at home with their relatives. Most of the students, 406 (90.6 %), were single, 41 (9.2 %) were married, and one (0.2 %) was widowed. Table 4.1 provides a description of the study population, sampling frame, and samples drawn from each programme; table 4.2 and figures 4.1 and 4.3 summarise the demographics of the participants for the entire School of Medicine.

TABLE 4.1 DESCRIPTION OF THE STUDY POPULATION, SAMPLING FRAME, AND SAMPLES DRAWN FROM THE 3 PROGRAMMES IN THE SCHOOL OF MEDICINE

SN	Study population	Sampling frame	Number of participants
1	Students enrolled in Bachelor of Medicine/Bachelor of Surgery	Students in Year 3 to year 7	239

2	Students enrolled in Bachelor of Pharmacy	Students in year 3 to year 5	135
3	Students enrolled in Bachelor of Bachelor of Science in Physiotherapy	Students in year 2 to year 5	74
Total	All undergraduate students enrolled in the School of Medicine	Students in year 2 to year 7 of Medicine/Surgery, Pharmacy, and Physiotherapy programmes, as applicable	448

TABLE 4.2 DEMOGRAPHIC CHARACTERISTICS OF THE STUDY PARTICIPANTS FROM THE 3 PROGRAMMES (N = 448)

Variable	Category	Number	Percentage (%)
Programme:	Medicine/Surgery	239	53.3
	Pharmacy	135	30.2
	Physiotherapy	74	16.5
	Total	**448**	**100**

Gender:	Male	264	58.9
	Female	184	41.1
Residence:	In Campus	266	59.4
	Off Campus	91	20.3
	Home	91	20.3
Age (years):	**Mean**	**Standard Deviation**	*Range*
	25.5	SD = 4.2	19 – 49

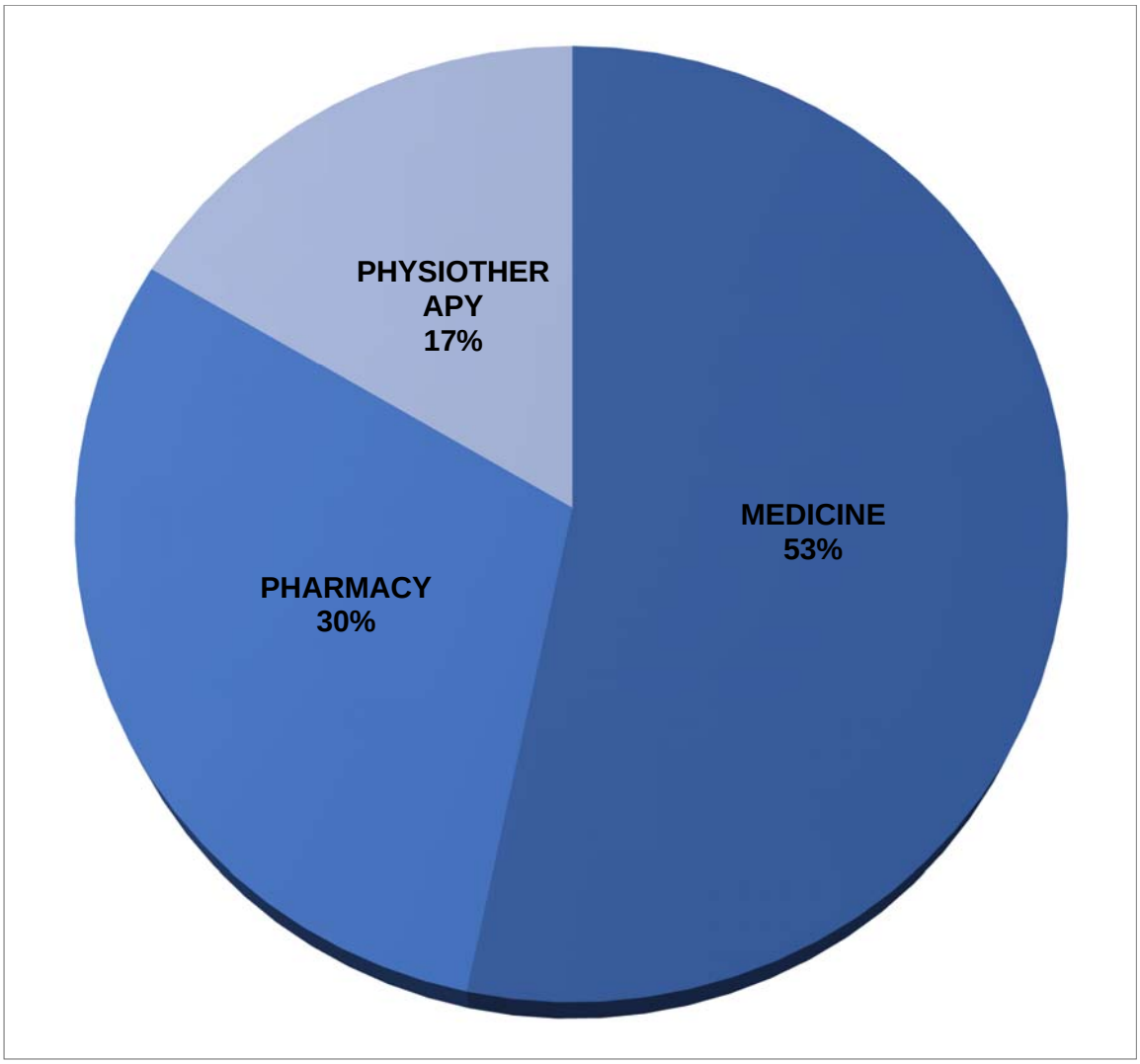


Figure 4.1 Proportion of participants from each programme

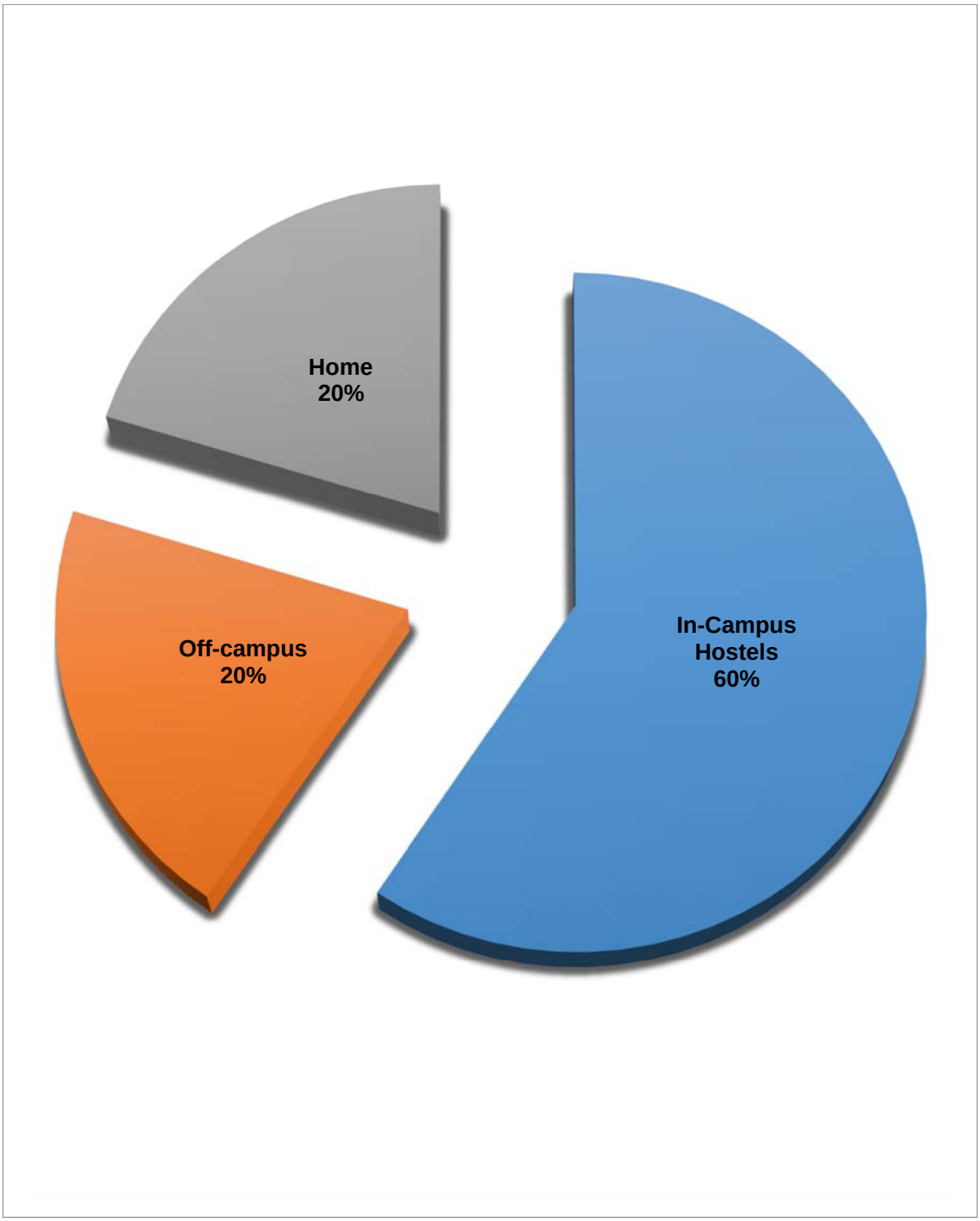


Figure 4.2 Residential statuses of study participants from the School of Medicine

4.3.1.1 Demographic characteristics of participants from Medicine/Surgery

Out of the 239 students that participated in the study from the MBChB programme, 50 (20.92 %) were from year 3, 65 (27.20 %) from year 4, 46 (19.25 %) from year 5, 32 (13.38 %) from year 6, and 46 (19.25 %) from year 7. By gender, 96 (40.17 %) were females, while 143 (59.83 %) were males. All of the participating students were Zambians by nationality, except one. The mean age was determined to be 24.6 years (SD=3.48) with a minimum of 19 and a maximum of 38. The students resident in campus were 168 (70.3 %), 47 (19.7 %) were living off campus in privately rented accommodations, while 24 (10 %) were living at home with relations. These data are presented in table 4.3 and figures 4.3 and 4.4.

TABLE 4.3 DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS FROM MEDICINE/SURGERY PROGRAMME (N = 239).

Variable	Category	Number	Percentage (%)
Level of study:	Year 3	50	20.92
	Year 4	65	27.20
	Year 5	46	19.25
	Year 6	32	13.38
	Year 7	46	19.25
	Total	239	100
Gender:			
	Male	143	59.83
	Female	96	40.17
Residence:			
	In Campus	168	70.3
	Off Campus	47	19.7
	Home	24	10
Age (years):			
	Mean	**Standard Deviation**	*Range*
	24.6	SD = 3.48	19 - 38

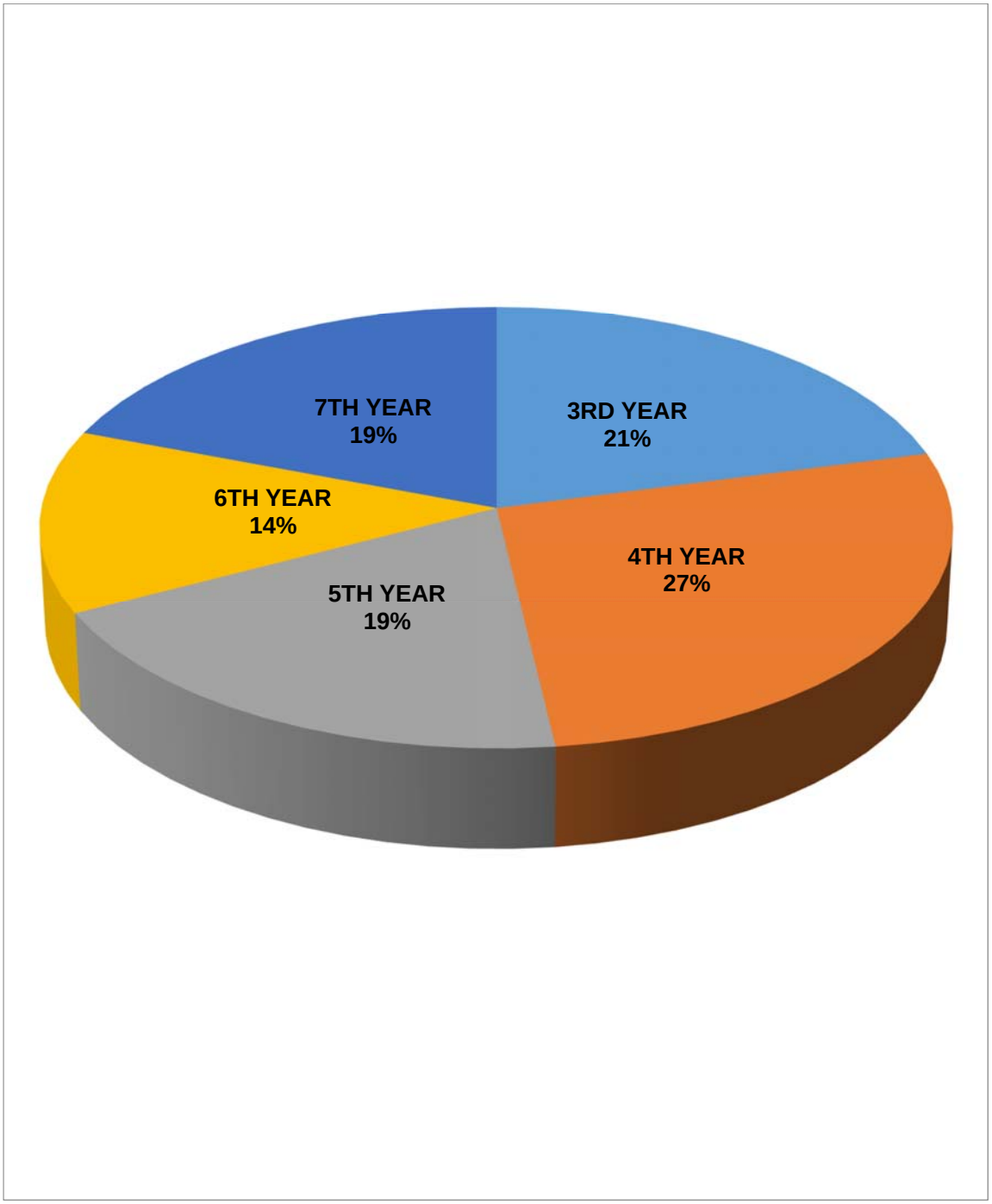


Figure 4.3 Characteristics of the study participants form Medicine/Surgery programme by year of study

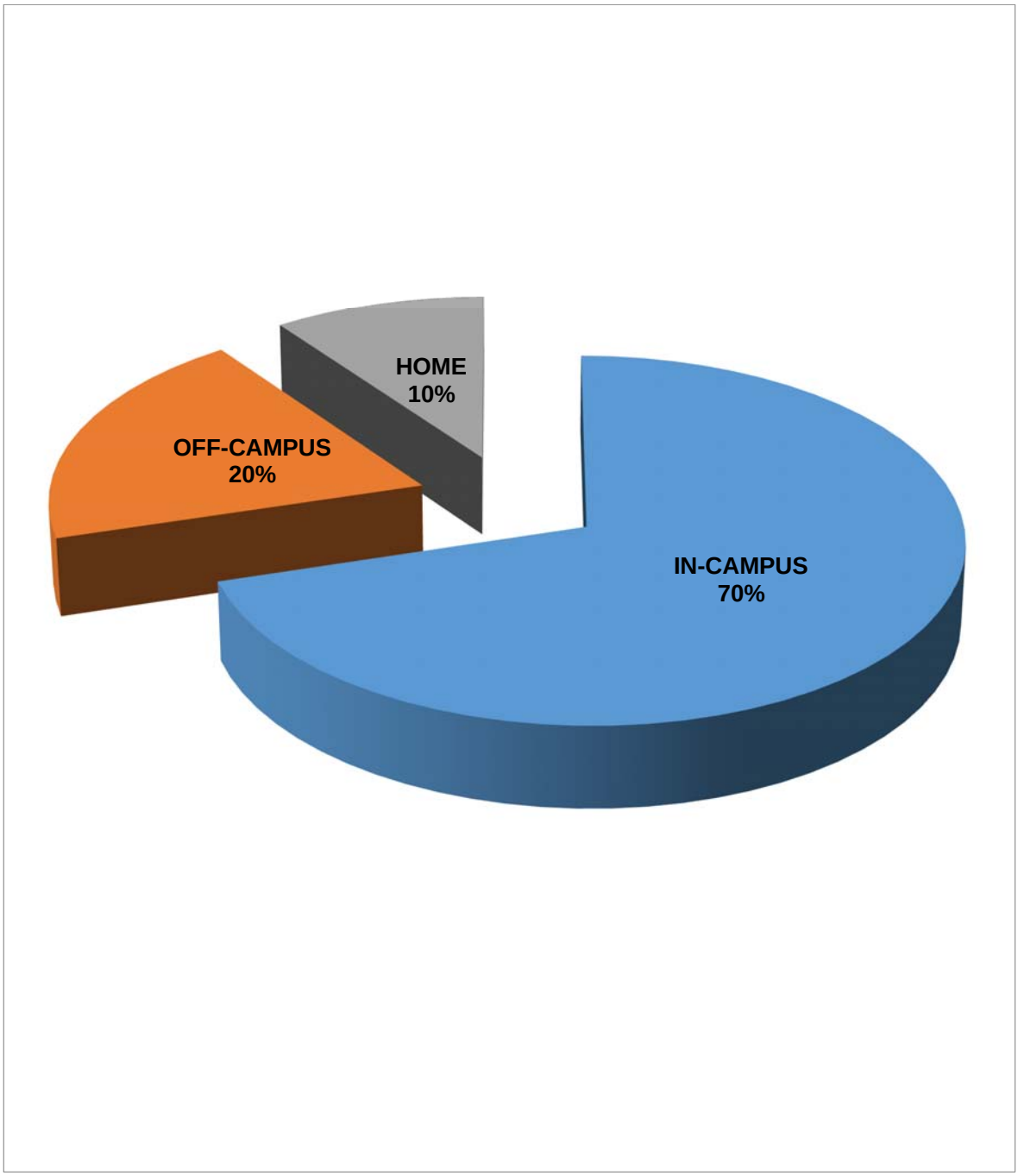


Figure 4.4 Residential statuses of the participants from medicine/surgery programme

4.3.1.2 Demographic characteristics of participants from Pharmacy

One hundred and thirty-five (135) students from the Pharmacy programme participated in the study. Of these, 42 (31.1 %) were year 3 students, 37 (27.4 %) were year 4, and 56 (41.5 %) were year 5 students. The mean age of the participants was 26.7 (SD = 4.04) years. Male participants were 85 (62.9 %) and 50 (37.1 %) were females. The majority, 108 (80.0 %) were single while 27 (20.0 %) were married. Sixty-five (65) i.e. 48.1 % live in the campus hostels, 22 (16.3 %) were living off campus in privately rented accommodation, and 48 (35.6 %) resided at home with relations. All the Pharmacy participants were Zambians. These data are presented in table 4.4, and figures 4.5 and 4.6.

TABLE 4.4 DEMOGRAPHIC CHARACTERISTICS OF THE 135 PARTICIPANTS FROM PHARMACY.

Variable	Category	Number	Percentage (%)
Level of study:			
	Year 3	42	31.1
	Year 4	37	27.4
	Year 5	56	41.5
	Total	135	100
Gender:			
	Male	85	62.9
	Female	50	37.1
Residence:			
	In Campus	65	48.1
	Off Campus	22	16.3
	Home	48	35.6
Age (years):			
	Mean	**Standard Deviation**	*Range*
	26.7	4.04	

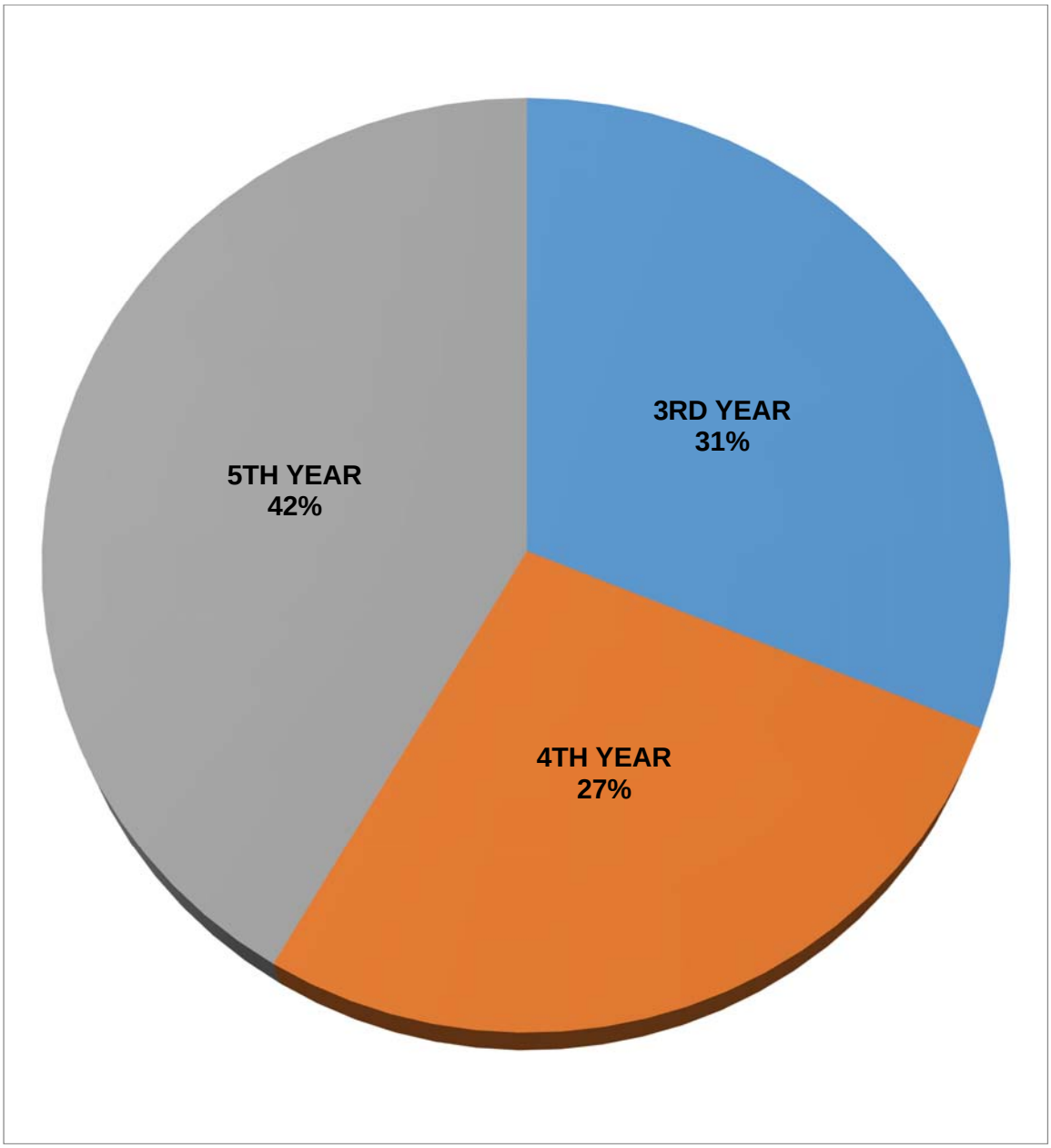


Figure 4.5 Characteristics of the pharmacy participants by level of study

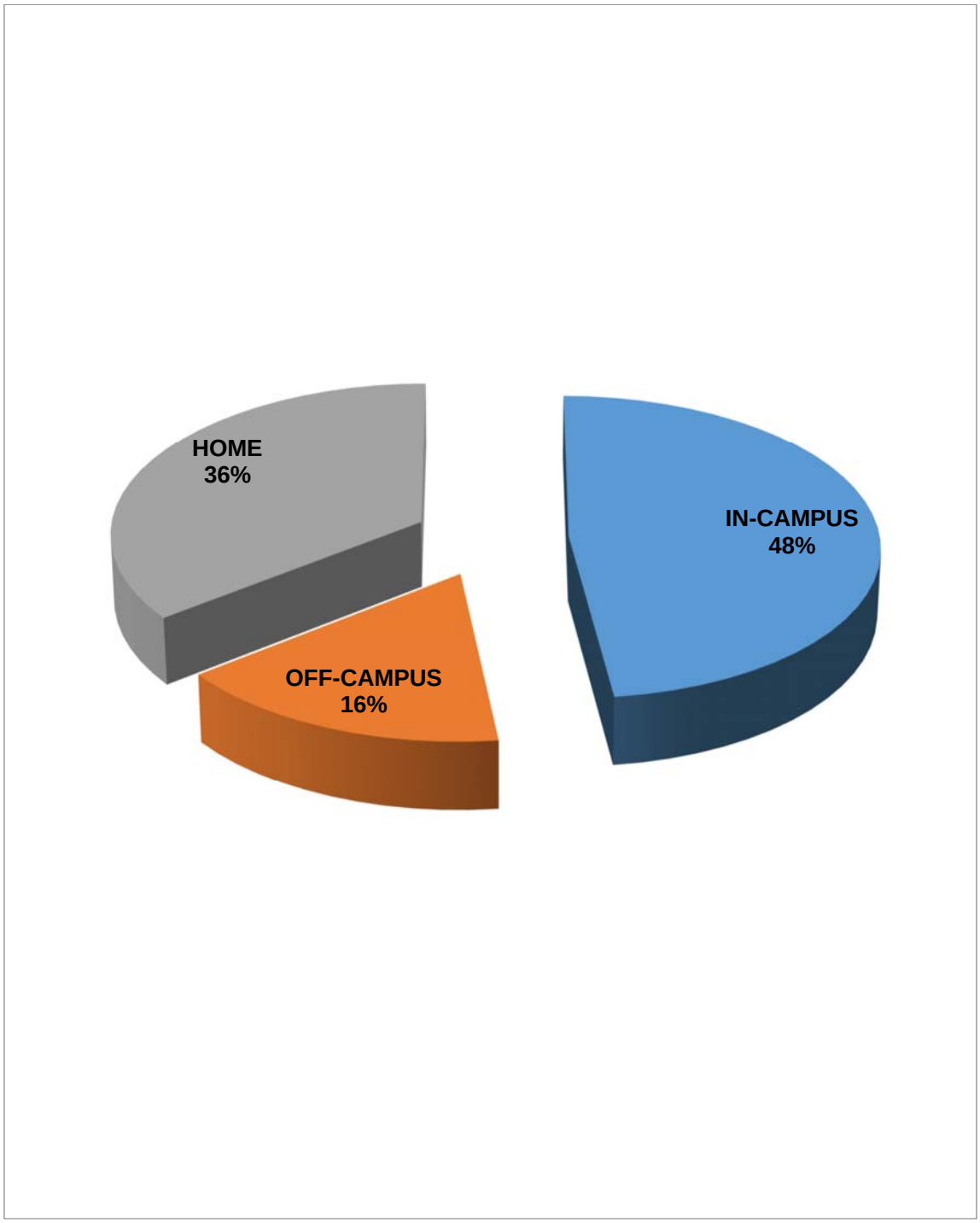


Figure 4.6 Residential statuses of the Pharmacy participants

4.3.1.3 Demographic characteristics of participants from Physiotherapy

Participants from the Bachelor of Science degree in Physiotherapy were 74. Of these, 10 were in year 2, 20 in year 3, 21 in year 4, and 23 in year 5. Thirty-eight were females and 36 were males. Mean age for this programme was 26.2 (SD=5.77); 59 were single, 14 were married and one was widowed. Those living in campus were 33, 22 were off campus in rented accommodations, and 19 were residing at home. Data are presented in table 4.5, and figures 4.7 and 4.8.

TABLE 4.5 DEMOGRAPHIC CHARACTERISTICS OF THE 74 PHYSIOTHERAPY PARTICIPANTS

Variable	Category	Number	Percentage (%)
Level of study:			
	2	10	13.5
	3	20	27.0
	4	21	28.4
	5	23	31.1
	Total	74	100
Gender:			
	Male	36	48.6
	Female	38	51.4
Residence:			
	In Campus	33	44.6
	Off Campus	22	29.7
	Home	19	25.7
Age (years):			
	Mean	**Standard Deviation**	*Range*
	26.2	5.77	21 – 49

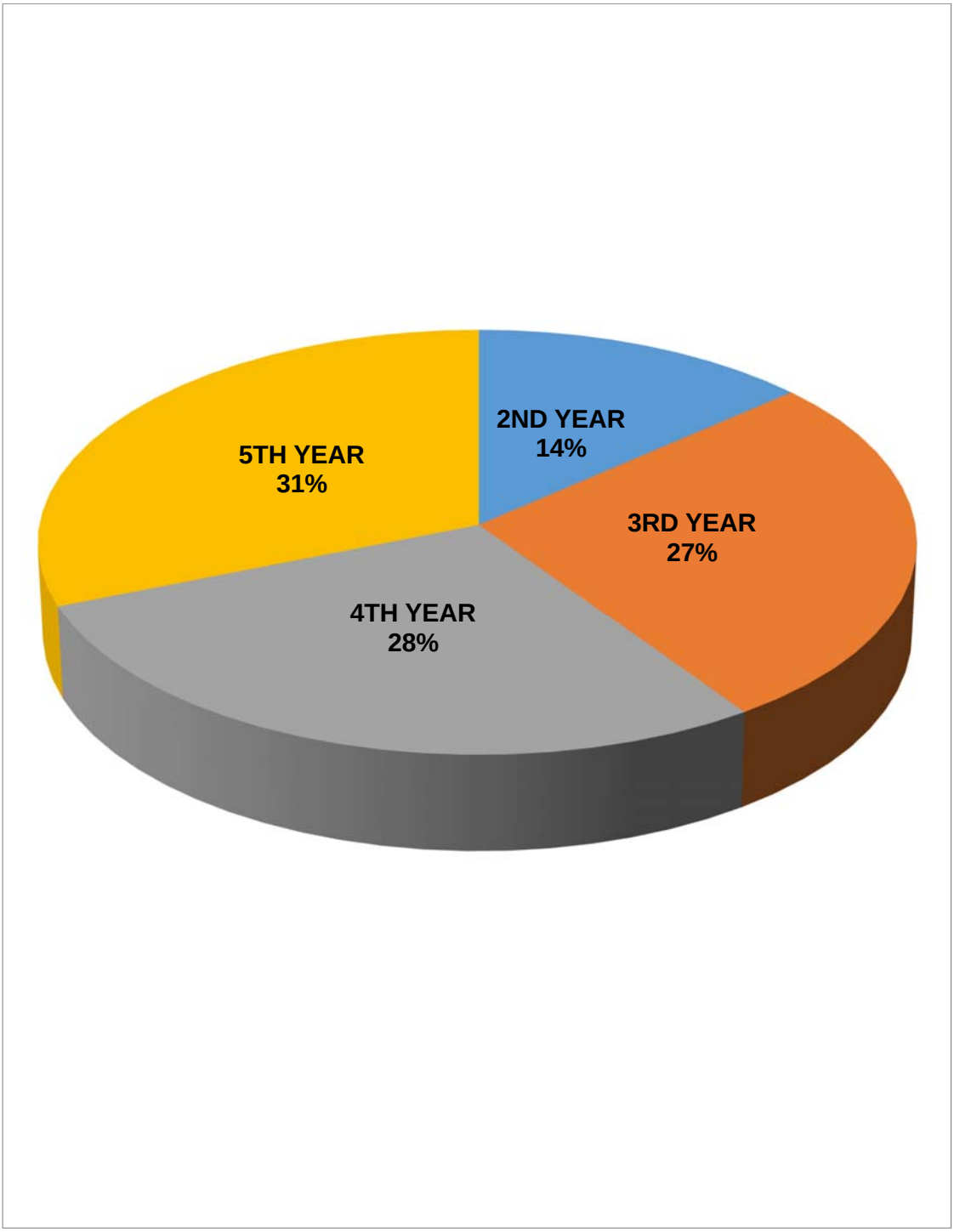


Figure 4.7 Characteristics of the Physiotherapy participants by level of study

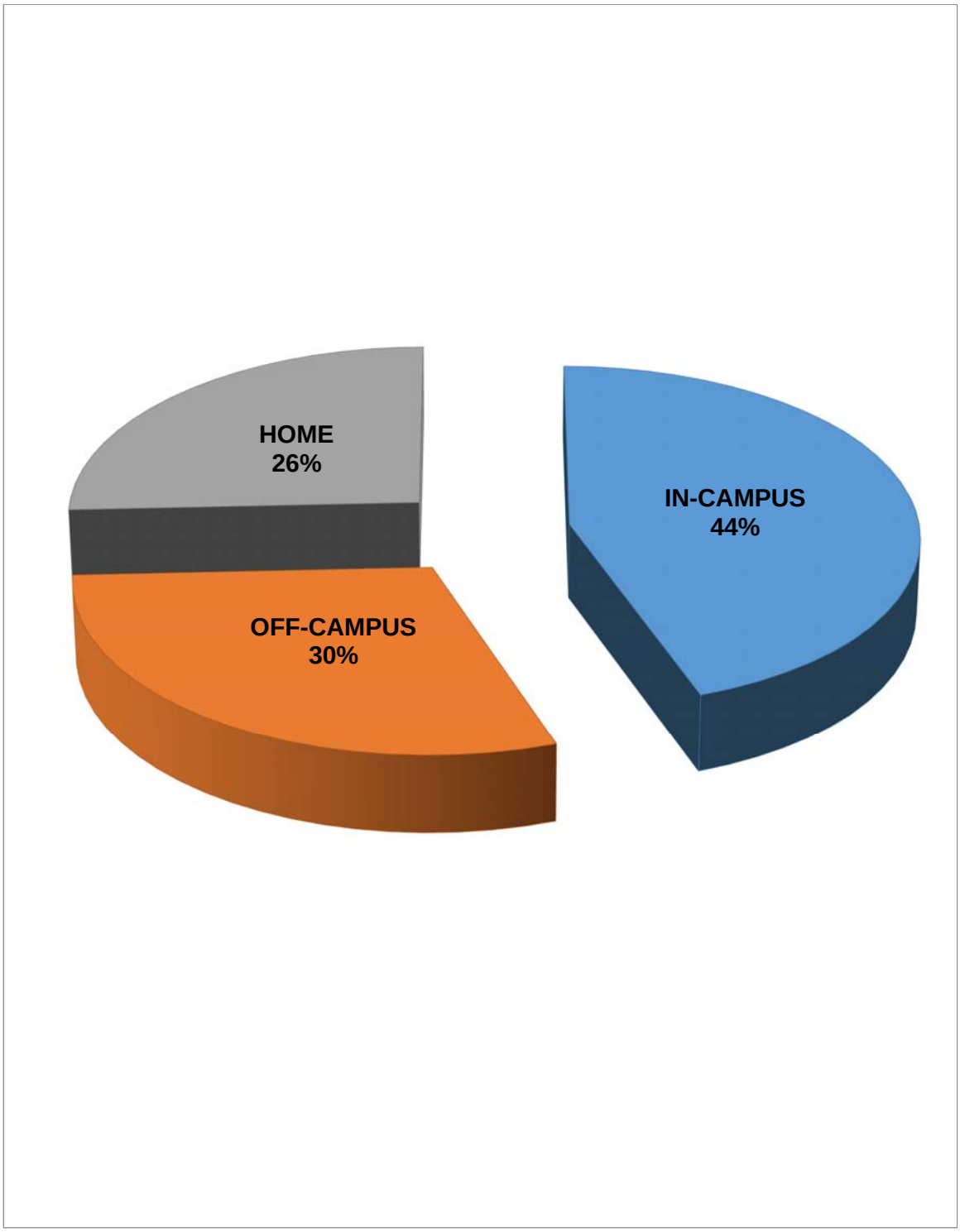


Figure 4.8 Residential statuses of the Physiotherapy participants

4.3.2 Analysis of the global DREEM scores for the School of Medicine

The maximum achievable global DREEM score is 200. The mean global score for the entire 448 participants was 119.30 (59.65 %; SD = 21.24), indicating a "**more positive than negative**" perception of the educational environment of the School. The distribution of the scores is Gaussian, with a slight negative skewness of -0.400, and Kurtosis value of 0.610. Skewness is a measure of asymmetry of the data about the mean, while kurtosis measures how peaked the distribution is. Based on a guideline by Kim (2013:52-53), formal normality tests using Kolmogorov-Smirnov test and Shapiro-Wilk test may be unreliable for a sample size of 448. Therefore, normality was assessed based on visual inspection of the distribution curve and by using skewness <2.0 and excess kurtosis <4.0 (Kim 2013:52-53). Table 4.6 presents the descriptive statistics for the scores while the histogram in figure 4.9 shows the distribution of global scores.

TABLE 4.6 DESCRIPTION OF TOTAL AND SUBSCALES DREEM SCORES FOR THE 3 PROGRAMMES FROM THE SCHOOL OF MEDICINE

	Mean (%)	SD	Skewness	Kurtosis	Rating category	Cronbach's alpha
Global Score (max 200)	119.30 (59.65)	21.24	-0.400	0.610	More positive than negative	0.899
SPL (max 48)	29.87 (62.08)	5.77	-0.531	0.684	A more positive perception	0.714
SPT (max 44)	26.29 (59.75)	5.44	-0.550	0.679	Moving in the right direction	0.720
ASP (max 32)	20.96 (65.50)	4.21	0.225	2.263	Feeling more on the positive side	0.528
SPA (max 48)	27.26 (56.79)	6.91	-0.405	0.274	A more positive attitude	0.769
SSP (max 28)	14.86 (53.07)	3.59	-0.083	-0.249	Not too bad	0.403

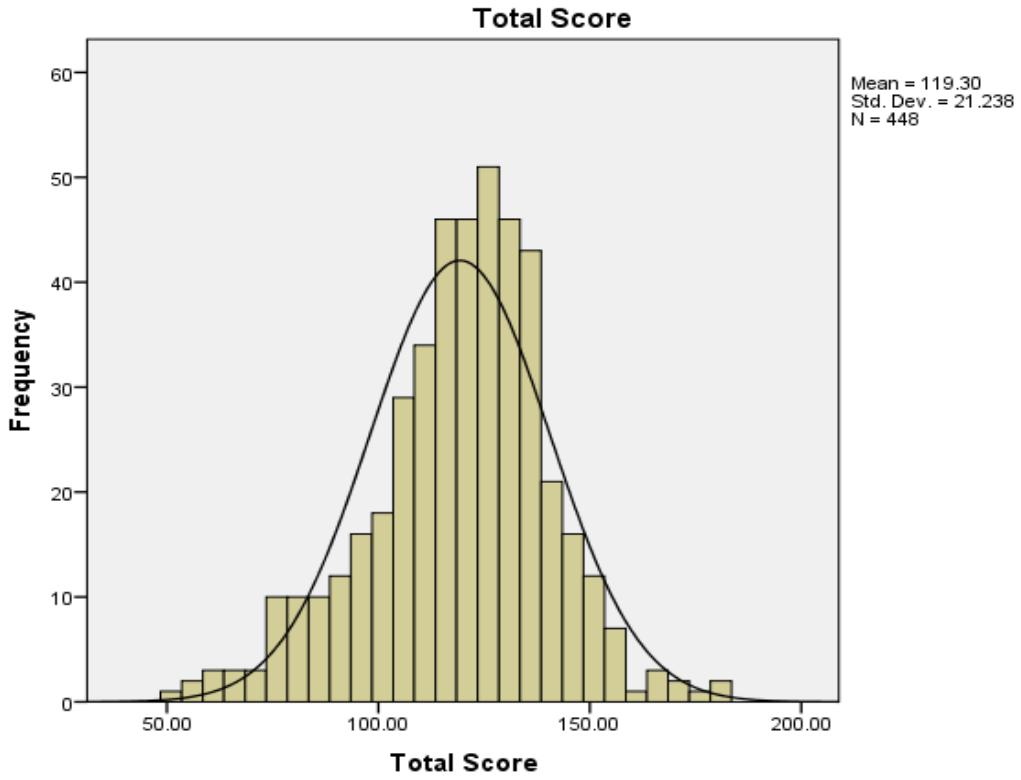


Figure 4.9 Distribution of global DREEM scores for all participants from the 3 programmes in the School of Medicine

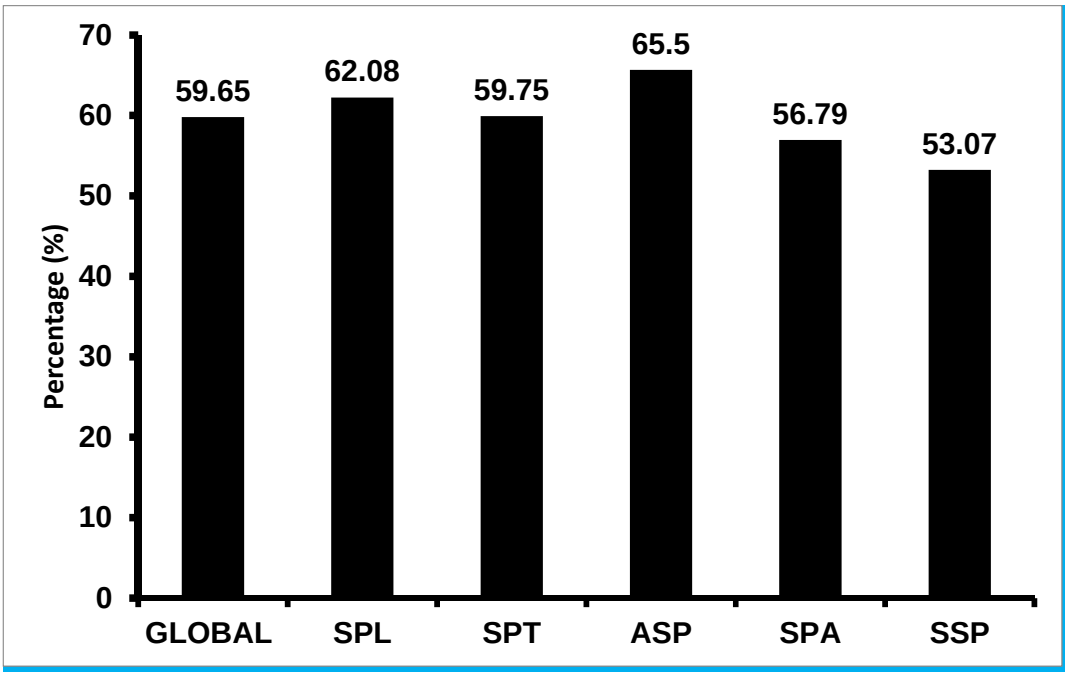


Figure 4.10 Global and subscale DREEM scores (%) for all participants from the 3 programmes in the School of Medicine

The sections that follow present a breakdown of the global perception of the educational environment by programmes.

4.3.2.1 Analysis of the global DREEM scores for Medicine/Surgery

The total (global) DREEM score for the Medicine/Surgery programme was 117 (58.55 %; SD = 22.8), indicating a "**more positive than negative**" educational environment. The distribution of the data is Gaussian with skewness value of -0.346 and kurtosis of 0.141 (table 4.7). Cronbach's alpha for the 50 items in this scale was 0.915. This value demonstrates good reliability for the study in this programme. Figure 4.10 shows the distribution curve.

The above value is comparable to other figures reported in literature for undergraduate medicine/surgery programmes in similar settings (Buhari et al 2014:141-5, Demiroren 2008:8). Although the numbers observed in this study are not impressively high, Buhari et al (2014:141), and Kohli & Dhaliwal (2013:5) from Nigeria and India, respectively, report numerical values that are even less than what this study observed. Belayachi and colleagues (2015:47) report an even more negative perception with a global value of 90.8 (45.4 %) from Rabat Faculty of Medicine and Pharmacy, Morocco.

TABLE 4.7 DESCRIPTIVE STATISTICS OF DREEM SCORES FOR MEDICINE & SURGERY PROGRAMME (N = 239)

	Mean (%)	SD	Skewness	Kurtosis	Rating category	Cronbach's alpha
Global Score (max 200)	117.10 (58.55)	22.84	-0.346	0.141	More positive than negative	0.915
SPL (max 48)	29.57 (61.60)	6.48	-0.478	0.199	A more positive perception	0.760
SPT (max 44)	25.82 (58.68)	5.83	-0.424	0.174	Moving in the right direction	0.74
ASP (max 32)	20.45 (63.9)	4.15	-0.165	-0.240	Feeling more on the positive side	0.634
SPA (max 48)	26.73 (55.68)	7.12	-0.330	-0.083	A more positive attitude	0.781
SSP (max 28)	14.62 (52.21)	3.67	-0.155	-0.428	Not too bad	0.438

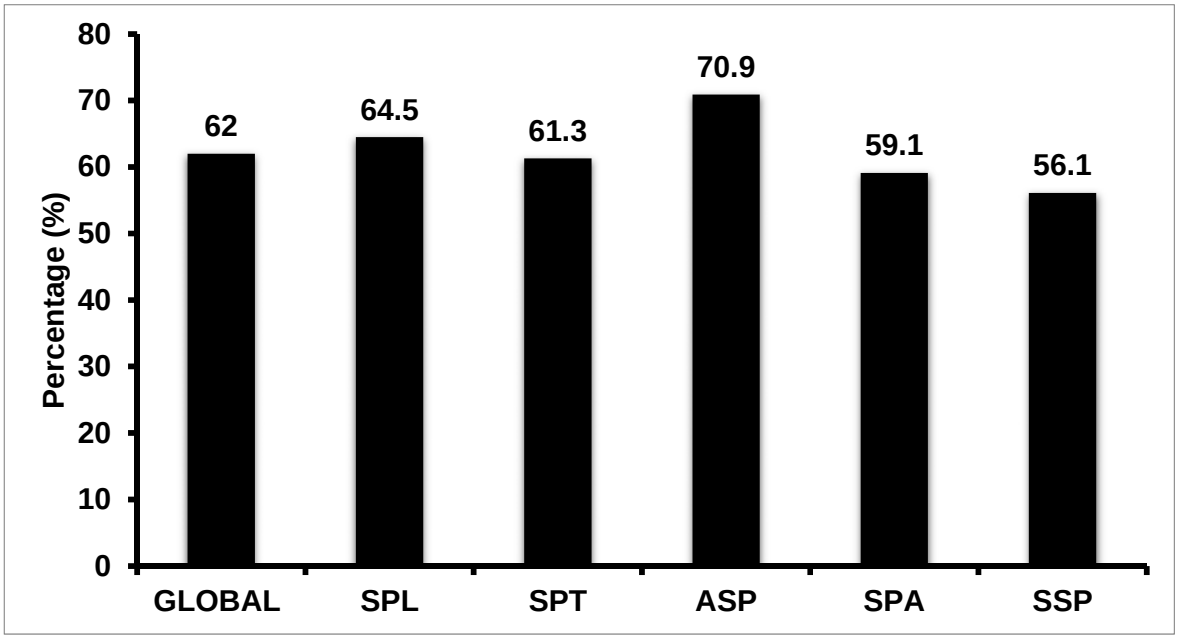


Figure 4.11 Global and Subscale scores for Medicine/Surgery participants

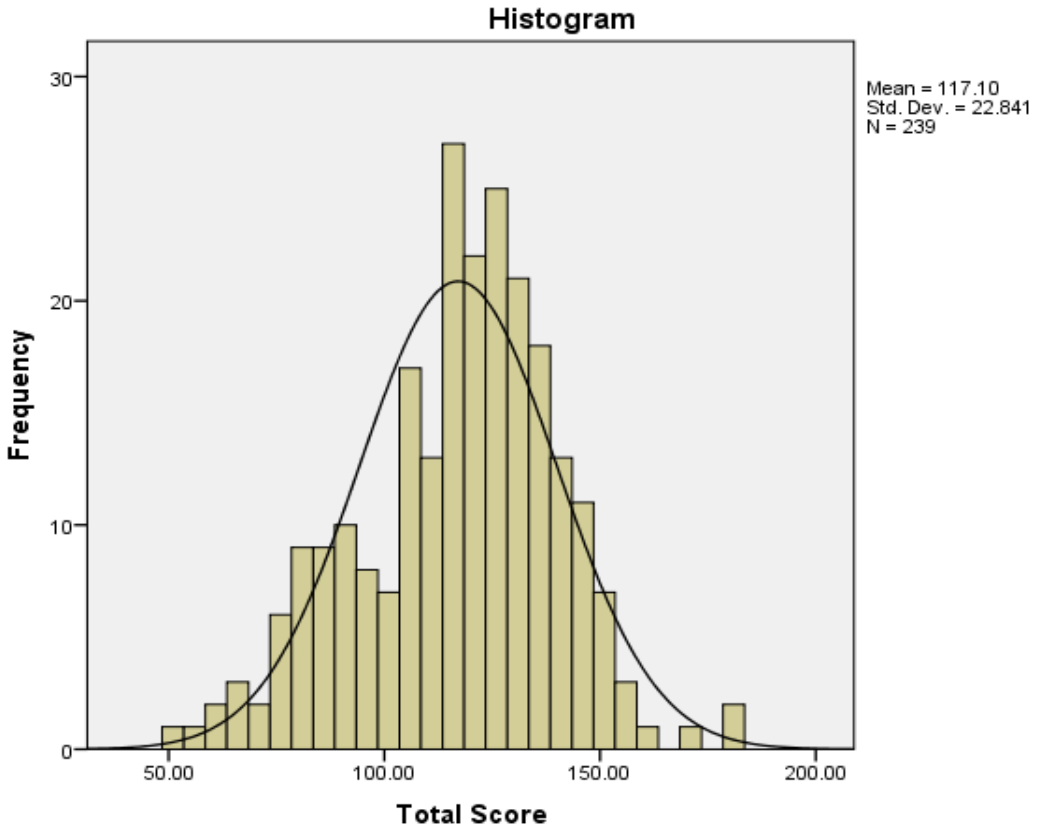


Figure 4.12 Distribution of global scores for the Medicine/Surgery programme.

TABLE 4.8 TOTAL AND SUBSCALE DREEM SCORES WITHIN THE MEDICINE/SURGERY CLASSES

	Classes	N	Mean	Std. Deviation
Total Score	3	50	121.9200	19.91291
	4	65	117.1692	20.24349
	5	46	121.1304	24.72930
	6	32	112.0000	21.24663
	7	46	111.2826	26.95648
	Total	**239**	**117.1004**	**22.84103**
Perception of Learning	3	50	30.8400	5.86362
	4	65	29.0615	6.17423
	5	46	31.0870	7.06109
	6	32	26.4688	5.91872
	7	46	28.6522	6.66072
	Total	**239**	**29.3975**	**6.47985**
Perception of Teachers	3	50	28.3400	4.90152
	4	65	26.0462	5.45273
	5	46	26.8043	6.11962
	6	32	23.5313	5.13046
	7	46	23.3478	6.11089
	Total	**239**	**25.8159**	**5.82515**
Academic Self-Perception	3	50	20.9200	4.09001
	4	65	20.7385	3.57193
	5	46	20.8261	4.52305
	6	32	20.4375	4.40628
	7	46	19.1522	4.31518
	Total	**239**	**20.4477**	**4.14906**
Perception of Atmosphere	3	50	26.9200	6.35623
	4	65	26.6000	6.73563
	5	46	28.2391	7.34600
	6	32	26.5313	6.60881
	7	46	25.3261	8.41706
	Total	**239**	**26.7280**	**7.11647**

	Classes	N	Mean	Std. Deviation
Social Self-Perception	3	50	14.9000	3.13798
	4	65	14.7231	3.82225
	5	46	14.1739	3.82567
	6	32	14.3125	3.80524
	7	46	14.8043	3.82750
	Total	**239**	**14.6151**	**3.66828**

TABLE 4.9 TURKEY'S TEST FOR MULTIPLE COMPARISON OF GLOBAL DREEM SCORES IN MEDICINE/SURGERY CLASSES

Dependent Variable	(I) Level	(J) Level	Mean Difference (I-J)	Sig.
Total Score Tukey HSD	3	4	4.75077	.798
		5	.78957	1.000
		6	9.92000	.301
		7	10.63739	.148
	4	3	-4.75077	.798
		5	-3.96120	.894
		6	5.16923	.828
		7	5.88662	.660
	5	3	-.78957	1.000
		4	3.96120	.894
		6	9.13043	.404
		7	9.84783	.229
	6	3	-9.92000	.301
		4	-5.16923	.828
		5	-9.13043	.404
		7	.71739	1.000
	7	3	-10.63739	.148
		4	-5.88662	.660
		5	-9.84783	.229
		6	-.71739	1.000

P is significant at 0.05

4.3.2.2 Analysis of the global DREEM scores for the Pharmacy programme

The table 4.10 shows the distribution of DREEM values for the Pharmacy programme. The global DREEM score was 120.2 (60.0 %), indicating "**more positive than negative**" educational environment. The distribution of values is Gaussian with skewness of -0.83 and Kurtosis of 1.45.

A global DREEM score of 120.2 is comparable to figures reported for similar undergraduate Pharmacy programmes in similar settings. Wong and colleagues (2015:15) observes a global score of 128 for Pharmacy students of Taylor's University in Malaysia. However, the same study reports a significantly higher global score of 145 for pharmacy students of Cardiff University, United Kingdom. The DREEM value of 120 probably indicates that the students are positive about the learning environment. However, a lot needed to improve in the learning environment and subscale and individual items analyses could probably provide more insight.

TABLE 4.10 DESCRIPTIVE STATISTICS OF DREEM SCORES FOR PHARMACY (N = 135)

	Mean (%)	**SD**	**Skewness**	**Kurtosis**	**Rating category**	**Cronbach's alpha**
Global Score (max 200)	120.2 (60.1)	16.10	-0.83	1.45	More positive than negative	0.843
SPL (max 48)	30.1 (60.1)	4.15	-0.90	2.60	A more positive perception	0.484
SPT (max 44)	26.8 (62.7)	4.40	-1.09	2.48	Moving in the right direction	0.644
ASP (max 32)	20.9 (65.3)	3.60	-0.42	1.54	Feeling more on the positive side	0.555
SPA (max 48)	27.6 (57.5)	6.02	-0.65	0.64	A more positive attitude	0.710
SSP (max 28)	14.8 (52.9)	3.42	0.21	-0.26	Not too bad	0.384

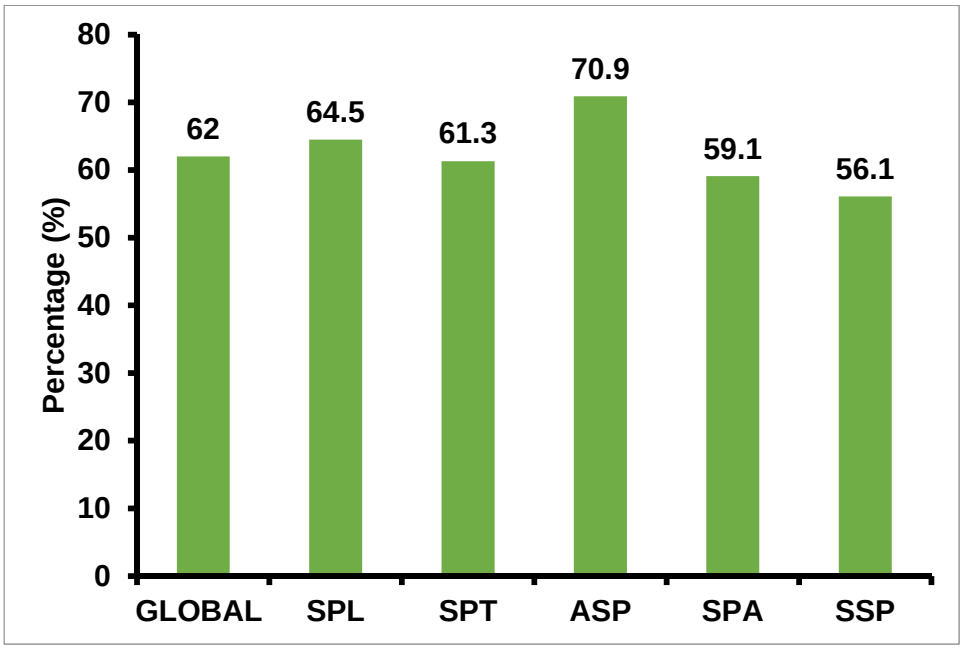


Figure 4.13 Global and Subscale DREEM scores for Pharmacy participants

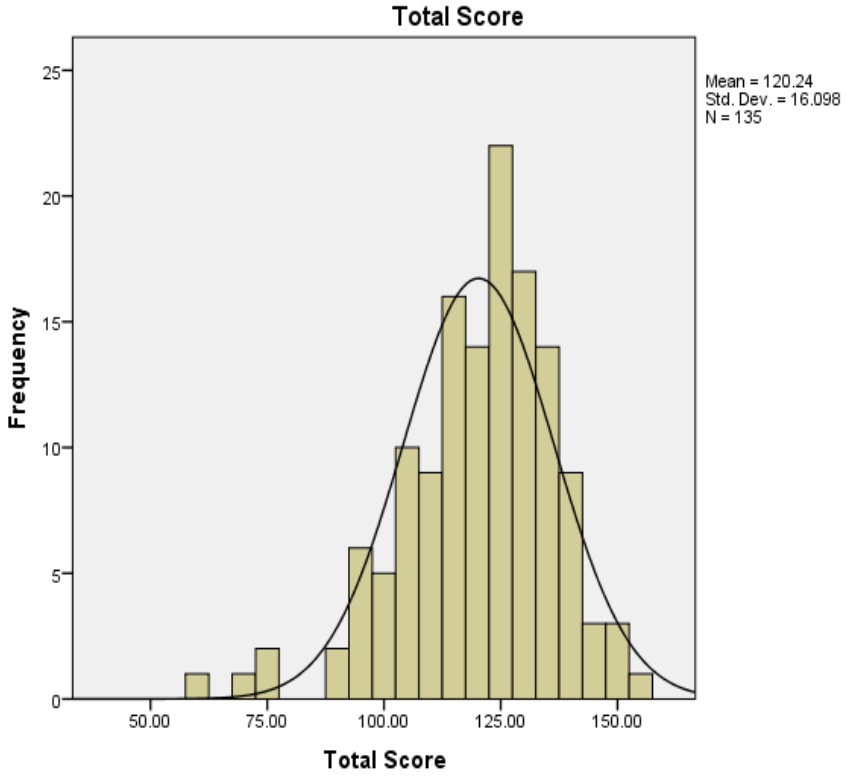


Figure 4.14 Distribution of global DREEM scores for the Pharmacy programme.

4.3.2.3 Analysis of the global DREEM scores for Physiotherapy

The global DREEM score for Physiotherapy was 124.7 (62.4 %). This indicates "**more positive than negative**" educational environment. Skewness value of -0.22 and kurtosis of 0.6 suggest that the distribution of global data was Gaussian. However, Kolmogorov-Smirnov and Shapiro-Wilk test of normality (Ghasemi & Zahediasl 2012:486) were conducted and they gave p values of 0.200 and 0.577, respectively, confirming acceptable Gaussian distribution. Figure 4.15 shows the total and subscale DREEM scores for the programme, while figures 4.16 and 4.17 show the distribution histogram for the global DREEM scores and the normal Q-Q plot for test of normality, respectively.

The global DREEM score of 124.7 compares favourably with other DREEM studies in Physiotherapy in Africa. Odole and colleagues (Odole, Oyewole, & Ogunmola 2014:83) reports a global DREEM score of 132 from the University of Ibadan, Nigeria, while Veasuvalingan and Arzuman (2014:e30) reports 132.84 from Malaysian Physiotherapy students. However, Olawale (2014:2) reports a higher score of 158.69 when the DREEM was used to assess the educational environment of Physiotherapy students undertaking nursing skills courses in the University of Lagos, Nigeria.

TABLE 4.11 DESCRIPTIVE STATISTICS OF SCORES FOR PHYSIOTHERAPY (N = 74)

	Mean (%)	SD	Skewness	Kurtosis	Rating category	Cronbach's alpha
Global Score (max 200)	124.7 (62.0)	23.2	-0.22	0.60	More positive than negative	0.896
SPL (max 48)	30.97 (64.5)	5.79	-0.13	-0.47	A more positive perception	0.735
SPT (max 44)	26.96 (61.3)	5.80	-0.33	0.61	Moving in the right direction	0.753
ASP (max 32)	22.70 (70.9)	5.03	1.03	4.65	Feeling more on the positive side	0.219
SPA (max 48)	28.35 (59.1)	7.63	-0.38	0.78	A more positive attitude	0.820
SSP (max 28)	15.7 (56.1)	3.57	-0.29	0.61	Not too bad	0.316

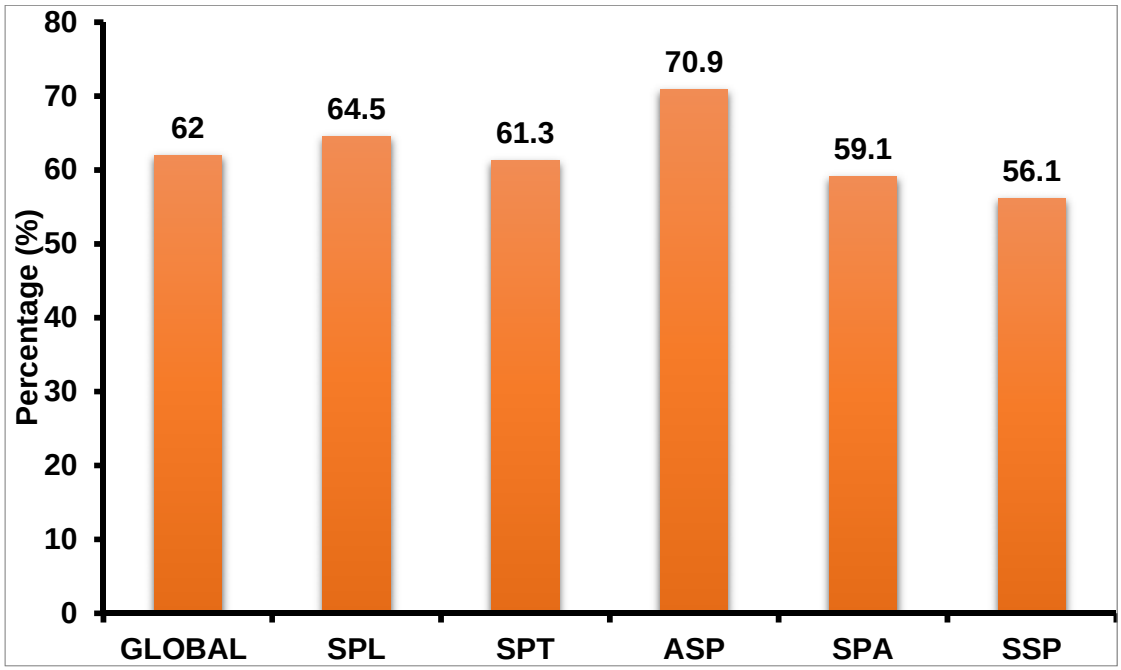


Figure 4.15 Global and Subscale DREEM scores for Physiotherapy participants

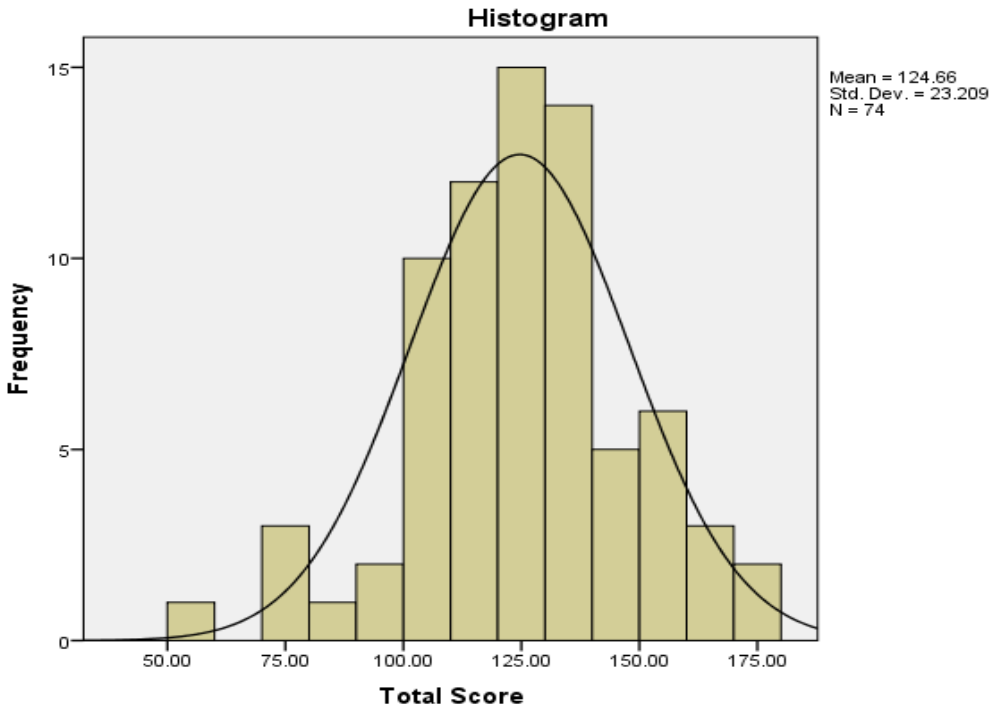


Figure 4.16 Distribution histogram of global DREEM scores for Physiotherapy

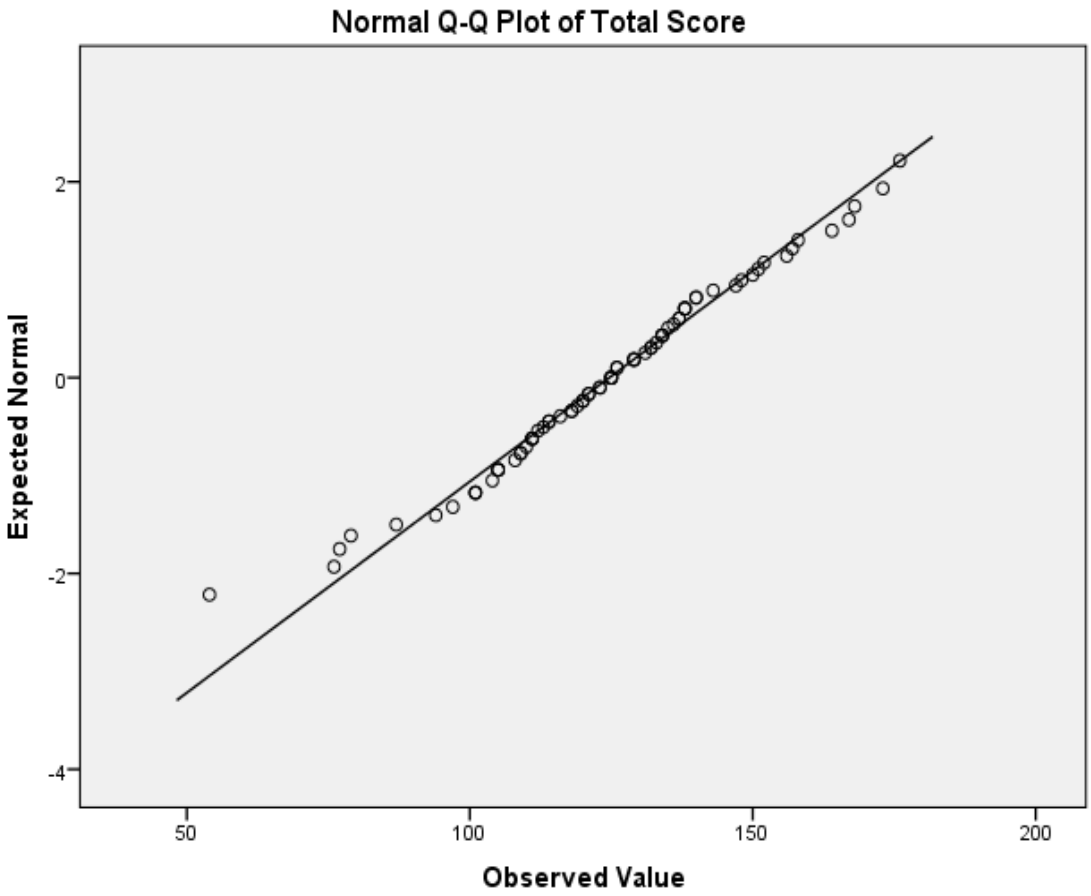


Figure 4.17 Normal Q-Q plot for global DREEM scores from Physiotherapy

4.3.2.4 Test of hypothesis 1

This hypothesis as stated in chapter 1 is: "The perception of the educational environment in the School of Medicine by undergraduate students is more positive than negative." From this the null hypothesis (H_o) would be that the educational environment in the School is not more positive than negative. To test this for a categorical variable, a one sample binomial test was conducted on the total (global) test scores for the 448 participants with probabilities of 0.5 using SPSS. This returned a p value of 0.002 with a decision to "reject the null hypothesis."

4.3.2.5 Comparison of the global DREEM scores between programmes: test of hypothesis 2

Hypothesis 2 states that "The perceptions are the same across different disciplines," in other words, there is no significant difference in perception between programmes. This null hypothesis was verified by comparison of the mean global DREEM scores between the three programmes. Table 4.10 presents a summary of global mean scores for the three programmes.

TABLE 4.12 SUMMARY OF GLOBAL SCORES FOR THE 3 PARTICIPATING PROGRAMMES

Programme	N	Mean	SD
Medicine	239	117.1	22.84
Pharmacy	135	120.2	16.10
Physiotherapy	74	124.7	23.21

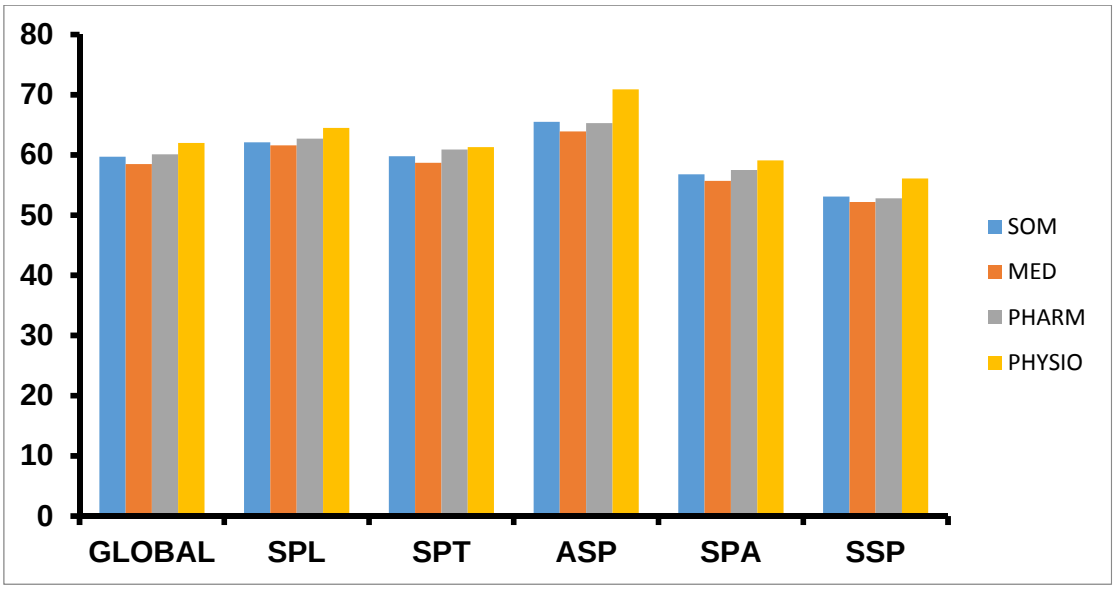


Figure 4.18 Comparative scores for the School of Medicine and the programmes

One-way analysis of variance (ANOVA) and Post Hoc tests were carried out to determine if there were significant differences in the global DREEM scores between Medicine/Surgery, Pharmacy and Physiotherapy (Nadeem, Iqbal, Yousaf, Daud, & Younis 2014:64). These tests assume homoscedasticity of the variances of the data sets. To verify this assumption, Levene's test (Ali, McHarg, Kay, Moles, Tredwin, Coombes & Heffernan 2012:102-109; Luciani, Cerritelli, Waters & Zegarra-Parodi 2014:28-37) was also performed which returned a statistic of 8.045 and $p < 0.05$. This shows that the variances were not homogenous, so an alternative statistical test was required. Moreover, comparison of sample means for datasets require equal sample sizes. Therefore, 74 samples were randomly extracted from each of Medicine/Surgery and Pharmacy datasets with the SPSS software, to match the sample size of Physiotherapy, which was 74. Thereafter, Welch's ANOVA using Games-Howell test (Varni, Bendo, Nurko, Shulman, Self, Franciosi, Saps, & Pohl 2015:87) was performed to assess equality of means for datasets with heterogeneous variances. The results show no significant differences between the programmes in the global perception of the learning environments in the School. These data are presented in tables 4.11 and 4.12.

TABLE 4.13 DESCRIPTIVE STATISTICS FOR THE HARMONISED DATA WITH EQUAL SAMPLE SIZES.

	Programme	N	Mean	SD
Total Score	Medicine	74	120.6	21.14
	Pharmacy	74	119.4	17.90
	Physiotherapy	74	124.7	23.2
	Total	222	121.5	20.89

TABLE 4.14 MULTIPLE COMPARISON OF GLOBAL MEAN SCORES BY GAMES-HOWELL TEST.

Dependent variable	(I) Profession	(J) Profession	Mean Difference (I-J)	Standard Error	Significance (P value)
Total Score	Medicine	Pharmacy	1.243	3.22	0.921
		Physiotherapy	-4.068	3.65	0.507
	Pharmacy	Medicine	-1.243	3.22	0.921
		Physiotherapy	-5.311	3.41	0.267
	Physiotherapy	Medicine	4.068	3.65	0.507
		Pharmacy	5.311	3.41	0.267

P<0.05 is significant.

4.3.2.6 Conclusion on analysis global DREEM scores

The global perception of the students of the educational environment in the School of Medicine at the University of Zambia was "more positive than negative," with a mean overall global score of 119.30 (59.65 %). This perception is consistent across the programmes that participated in the study, and it is comparable to observations in other health professions schools in African and Asian countries. Studies in medical schools in Western countries report somewhat higher values.

4.3.3 Analysis of DREEM scores within subscales

Tables 4.6, 4.7, 4.8, and 4.9 respectively, present the scores in the five (5) subscales of the DREEM questionnaire for the School of Medicine, Medicine/Surgery, Pharmacy, and Physiotherapy programmes. Under the subscale of **perception of learning**, the mean score for the School was 29.9 (SD = 5.77) out of 48. This interprets as "*more positive perception*." The same "*more positive perception*" was observed for Medicine with a score of 29.6 (SD = 6.48), Pharmacy with a score of 30.1 (SD=4.15), and Physiotherapy with a score of 31.0 (SD=5.79). In the subscale of **perception of lecturers/teachers,** School of Medicine recorded a mean score of 26.3 (SD=5.44) out of 44, which is interpreted as "*moving in the right direction*." This rating is consistent across the programmes with Medicine achieving a score of 25.82 (SD = 5.83), Pharmacy a score of 26.8 (SD=4.40), and Physiotherapy a score of 27.0 (SD=5.80). For **academic self-perception**, the School had a mean score of 21.0 (SD=4.21) out of a maximum of 32. This categorizes as "*Feeling*

more on the positive side." This category is shared by Medicine, Pharmacy and Physiotherapy with mean scores of 20.5 (SD=4.15), 20.9 (SD=3.60), and 22.7 (SD=5.03), respectively. Students' **perception of atmosphere** recorded the following scores for the School of Medicine, and the Medicine, Pharmacy and Physiotherapy programmes respectively: 27.3 (SD=6.91), 26.7 (SD=7.12), 27.6 (SD=6.02), and 28.4 (SD=7.63) out of 48. These scores are all rated in the category of "*a more positive attitude*." Under the last subscale, **social self-perception**, the School had a score of 14.86 (SD=3.59), Medicine 14.6 (SD=3.67), Pharmacy 14.8 (SD=3.42), and Physiotherapy 15.7 (SD=3.57). All these categorise the learning environment as "*Not too bad."* These scores within the subscales are comparable to results from the few studies carried out in African and Indian medical schools (Abraham et al 2008:20; Buhari et al 2014:141). Consistently, results in the subscale of social self-perception show ambivalence indicating the presence of significant social problems across the programmes. Buhari and colleagues (2013:141) report similar observations in the University of Ilorin, Nigeria.

Comparison of the mean scores across programmes by the Welch's ANOVA using Games-Howell test described above demonstrated significant differences in mean scores in the subscale of academic self-perception as shown in table 4.15. There were no differences in scores in other subscales. The mean score for Physiotherapy in the subscale of academic self-perception (22.7) was significantly higher than that of Medicine (20.5; p=0.019) and Pharmacy (20.9; p=0.034). However, these did not change the overall categorical rating.

TABLE 4.15 MULTIPLE COMPARISON OF MEAN SCORES IN SUBSCALES BY GAMES-HOWELL TEST.

Dependent Variable		Profession (I)	Profession (J)	Mean Difference (I-J)	Standard Error	Significance (P value)
Perception of Learning	Games-Howell	Medicine	Pharmacy	.89189	.89491	.580
			Physiotherapy	-.17568	.97979	.982
		Pharmacy	Medicine	-.89189	.89491	.580
			Physiotherapy	-1.06757	.86397	.434
		Physiotherapy	Medicine	.17568	.97979	.982
			Pharmacy	1.06757	.86397	.434
Perception of Teachers	Games-Howell	Medicine	Pharmacy	.31081	.81647	.923
			Physiotherapy	-.25676	.92503	.958
		Pharmacy	Medicine	-.31081	.81647	.923
			Physiotherapy	-.56757	.84799	.782
		Physiotherapy	Medicine	.25676	.92503	.958
			Pharmacy	.56757	.84799	.782
Academic self-perception	Games-Howell	Medicine	Pharmacy	-.12162	.66127	.982
			Physiotherapy	-2.02703*	.74069	.019*
		Pharmacy	Medicine	.12162	.66127	.982
			Physiotherapy	-1.90541*	.75575	.034*
		Physiotherapy	Medicine	2.02703*	.74069	.019*
			Pharmacy	1.90541*	.75575	.034*
Perception of Atmosphere	Games-Howell	Medicine	Pharmacy	.35135	1.02768	.938
			Physiotherapy	-.52703	1.12752	.887
		Pharmacy	Medicine	-.35135	1.02768	.938
			Physiotherapy	-.87838	1.16497	.732
		Physiotherapy	Medicine	.52703	1.12752	.887
			Pharmacy	.87838	1.16497	.732
Social self-perception	Games-Howell	Medicine	Pharmacy	-.18919	.57247	.942
			Physiotherapy	-1.10811	.58731	.146
		Pharmacy	Medicine	.18919	.57247	.942
			Physiotherapy	-.91892	.57177	.246
		Physiotherapy	Medicine	1.10811	.58731	.146
			Pharmacy	.91892	.57177	.246

P<0.05 is significant.

4.3.3.1 Summary of analysis of DREEM scores within subscales

Subscale analysis showed that the overall students' perception of learning was "more positive," and this perception was consistent across all the three participating disciplines. Students' perception of lecturers and programme organizers was rated as "moving in the right direction" overall and by all the three participating programmes. No significant differences in the mean scores were noted. The same situation was observed in the subscales of academic self-perception, perception of atmosphere, and social self-perception, with the exception that the mean score of Physiotherapy for academic self-perception was significantly higher than those of Medicine and Pharmacy. The findings are similar with observations in other African medical schools.

4.3.4 Analysis of scores on individual DREEM items

No item had a mean score greater than 3.5. The highest scoring item in the questionnaire was item 10 – "I am confident about passing this year," with a mean score of 3.33. Only four (4) of the 50 items recorded mean scores ≥ 3.0. Forty (40) of the 50 items had mean scores between 2.0 and 3.0. This probably indicates that many areas of the learning environment of the School need enhancement. Particular areas of concern in the School are six (6) items with scores < 2.0, which are flagged in bold within the subscales listed in table 4.16.

TABLE 4.16 MEAN SCORES ON INDIVIDUAL ITEMS ARRANGED IN SUBSCALES.

1. Students' perception of learning (SPL)			
Item #	**Statement**	**Mean scores**	**SD**
1	I am encouraged to participate in teaching sessions	2.9018	.91676
7	The teaching is often stimulating	2.3125	.96267
13	The teaching is learner centred	2.1741	1.06229
16	The teaching helps to develop my competence	2.9375	.80303
20	The teaching is well focused	2.4978	.89492
22	The teaching helps to develop my confidence	2.8482	.90200
24	The teaching time is put to good use	2.4509	1.03725
25	*The teaching over emphasizes factual learning*	**1.6250**	.96354
38	I am clear about the learning objectives of the programme	2.6049	.98883
44	The teaching encourages me to be an active learner	2.6272	.96788
47	Long term learning is emphasized over short term learning	2.5268	1.07616
48	*The teaching is too teacher centred*	2.4174	1.02207
2. Students' perception of Lecturers/Teachers (SPT)			
2	The teachers are knowledgeable	3.1674	.73647
6	The teachers espouse a patient centred approach to consulting	2.2567	.92138
8	*The teachers ridicule the learners*	2.1429	1.01097
9	*The teachers are authoritarian*	**1.7188***	1.04546
18	The teachers have effective communication skills	2.4799	.96912
29	The teachers are good at providing feedback to students	2.0603	1.04418
32	The teachers provide constructive criticism here	2.3371	.96017
Item #	**Statement**	**Mean scores**	**SD**

37	The teachers give clear examples	2.6272	.89085
39	*The teachers get angry in teaching sessions*	2.3259	1.14343
40	The teachers are well prepared for their teaching sessions	2.6719	.88331
50	*The students irritate the teachers*	2.5067	.95770
3. Students' academic self-perception (ASP)			
5	Learning strategies which worked for me before continue to work for me now	2.1138	1.02671
10	I am confident about passing this year	3.3326	.80747
21	I feel I am being well prepared for my profession	2.8214	.89457
26	*Last year's work has been a good preparation for this year's work*	2.5804	1.85679
27	*I am able to memorize all I need*	**1.6853**	1.08953
31	*I have learned a lot about empathy in my profession*	2.7031	.96646
41	My problem solving skills are being well developed here	2.6473	.85436
45	Much of what I have to learn seems relevant to a career in healthcare	3.0759	.85061
4. Students' perception of atmosphere (SPA)			
11	The atmosphere is relaxed during teaching	2.0268	1.10082
12	The course is well timetabled	2.0156	1.20113
17	*Cheating is a problem in this course*	2.0469	1.27969
23	The atmosphere is relaxed during lectures	2.1897	1.04793
30	There are opportunities for me to develop interpersonal skills	2.7277	.93500
33	*I feel comfortable in teaching sessions socially*	2.4509	.97957
34	The atmosphere is relaxed during seminars/tutorials	2.3058	.98433
35	*I find the experience disappointing*	2.5871	1.11187
36	I am able to concentrate well	2.4665	.94063
42	The enjoyment outweighs the stress of studying medicine	**1.8147**	1.18116
43	The atmosphere motivates me as a learner	2.2165	1.10115
49	I feel able to ask the questions I want	2.4152	1.06896
5. Student' social self-perception (SSP)			
Item #	**Statement**	**Mean scores**	**SD**
3	There is a good support system for students who get stressed	**1.1585**	.93377
4	*I am too tired to enjoy this course*	2.2679	1.08049

Item #	Statement	Mean scores	SD
14	I am rarely bored on this course	2.0156	1.10611
15	I have good friends in this course	3.0335	.73045
19	My social life is good	2.6451	1.12782
28	I seldom feel lonely	2.1674	1.21368
46	My accommodation is pleasant	**1.5826**	1.38782
***Scores in bold are problem areas**			

Under the subscale of perception of learning, item 25 – "**The teaching over emphasizes factual learning**," received a mean score of 1.63, and indicates a problem area that should be addressed. Item 9 – "**The teachers are authoritarian***,"* under the subscale of perception of teachers, had a score of 1.72, and is marked as a problem area under this subscale. One other item, 29 – "The teachers are good at providing feedback to students" showed ambivalence with a score of 2.06, and need attention as well. One problem was recorded in the subscale of academic self-perception in item 27 – "**I am able to memorize all I need**" with a mean score of 1.69, and is highlighted as such. The subscale of perception of atmosphere had one problem area in item 42 – "**The enjoyment outweighs the stress of studying**" with a mean score of 1.81. Three (3) items showed ambivalence, 11 – "The atmosphere is relaxed during teaching" with a mean score of 2.03, item 12 – "The course is well timetabled," with a mean score of 2.02, and item 17 "Cheating is a problem in this School," with a mean score of 2.05. These areas need attention. The last subscale, social self-perception, had two problem areas in item 3 – "**There is a good support system for students who get stressed**" with a mean score of 1.16, and item 46 – "**My accommodation is pleasant**" with a mean score of 1.58. This last subscale had one ambivalent item which need addressing, item 14 – "I am rarely bored on this course," with a mean score of 2.02. It is noteworthy that the subscale of Social Self-perception with the least number of items had a disproportionately higher number of problem areas, suggesting that the social life of the students needed appropriate attention. Table 4.17, is a summary of the individual problem areas in the School of Medicine.

TABLE 4.17 THE SIX (6) ITEMS WITH MEAN SCORE LESS THAN 2.0 IN SCHOOL OF MEDICINE.

Item #	35 Item statement	Mean score	Std. Dev.	Subscale
3	There is a good support system for learners who get stressed	1.1585	.93377	Social self-perception
9	The teachers are authoritarian	1.7188	1.04546	Perception of teachers
25	The teaching over emphasizes factual learning	1.6250	.96354	Perception of learning
27	I am able to memorise all I need	1.6853	1.08953	Academic self-Perception
42	The enjoyment outweighs the stress of the course	1.8147	1.18116	Perception of atmosphere
46	My accommodation is pleasant	1.5826	1.38782	Social self-perception

4.3.5 Analysis of scores on individual DREEM items within programmes

The mean scores on individual items within the Medicine/Surgery, Pharmacy, and Physiotherapy programmes were also analysed. Within medicine/Surgery, 8 problem areas with mean scores less than 2.00 were identified; one item showed ambivalence with scores of 2.00. The Pharmacy programme also had eight problem areas with two items demonstrating ambivalence, while Physiotherapy had seven problem areas. The items showing concern and their subscales are shown in tables 4.18 to 4.20.

TABLE 4.18 DREEM ITEMS SHOWING CONCERN IN MEDICINE/SURGERY PROGRAMME

Programme	Item #	Item statement	Mean score	Std. Dev.	Subscale
Medicine/Surgery	**3**	There is a good support system for learners who get stressed	1.07	0.96	Social self-perception
	9	The teachers are authoritarian	1.61	1.02	Perception of teachers
	11	The atmosphere is relaxed during teaching	1.94	1.16	Perception of Atmosphere
	17*	Cheating is a problem in this course	2.00	1.23	Perception of Atmosphere
	25	The teaching over emphasizes factual learning	1.63	0.95	Perception of learning
	27	I am able to memorise all I need	1.52	1.04	Academic self-Perception
	29	The teachers are good at providing feedback to students	1.89	1.12	Perception of Teachers
	42	The enjoyment outweighs the stress of the course	1.90	1.20	Perception of atmosphere
	46	My accommodation is pleasant	1.46	1.37	Social self-perception

*item showing ambivalence

TABLE 4.19 DREEM ITEMS SHOWING CONCERN WITHIN PHARMACY PROGRAMME

Programme	Item #	Item statement	Mean score	Std. Dev.	Subscale
Pharmacy	**3**	There is a good support system for learners who get stressed	1.17	0.88	Social self-perception
	9*	The teachers are authoritarian	2.00	1.20	Perception of teachers
	12	The course is well timetabled	1.73	1.16	Perception of Atmosphere
	13	The teaching is learner centred	1.91	1.00	Perception of learning
	14	I am rarely bored on this course	1.91	1.06	Social self-perception
`	**17***	Cheating is a problem in this course	2.00	1.20	Perception of Atmosphere
	25	The teaching over emphasizes factual learning	1.61	0.95	Perception of learning
	27	I am able to memorise all I need	1.80	1.10	Academic self-Perception
	42	The enjoyment outweighs the stress of the course	1.62	1.11	Perception of atmosphere
	46	My accommodation is pleasant	1.73	1.40	Social self-perception

TABLE 4.20 DREEM ITEMS SHOWING CONCERN IN PHYSIOTHERAPY

Programme	Item #	Item statement	Mean score	Std. Dev.	Subscale
Physiotherapy	**3**	There is a good support system for learners who get stressed	1.42	.92	Social self-perception
	9	The teachers are authoritarian	1.61	1.10	Perception of teachers
	12	The course is well timetabled	1.86	1.14	Perception of Atmosphere
	14	I am rarely bored on this course	1.82	1.10	
	25	The teaching over emphasizes factual learning	1.65	1.03	Perception of learning
	42	The enjoyment outweighs the stress of the course	1.88	1.24	Perception of atmosphere
	46	My accommodation is pleasant	1.72	1.41	Social self-perception

4.3.6 Correlation between scores on individual items from the programmes

Pearson correlation analysis showed positive linear correlation between mean scores on individual items from the three programmes, with correlation coefficients ranging from 0.869 to 0.897, and p values less than 0.01. Table 4.21 presents the correlation analysis, while figures 4.19, 4.20, and 4.21 show the linear regression curves. The R^2 values vary from 0.755 to 0.804. These demonstrate that all the students that participated in the study were unanimous about their views on the range of issues addressed in this study. This strengthens the validity of the findings.

TABLE 4.21 CORRELATION BETWEEN MEAN SCORES ON INDIVIDUAL ITEMS

Programmes		Medicine	Pharmacy	Physiotherapy
Medicine	Pearson Correlation	1	**.897****	**.869****
	Sig. (2-tailed)		.000	.000
	Sum of Squares and Cross-products	9.649	8.490	8.912
	Covariance	.197	.173	.182
	N	50	50	50
Pharmacy	Pearson Correlation	**.897****	1	**.890****
	Sig. (2-tailed)	.000		.000
	Sum of Squares and Cross-products	8.490	9.289	8.957
	Covariance	.173	.190	.183
	N	50	50	50
Physiotherapy	Pearson Correlation	**.869****	**.890****	1
	Sig. (2-tailed)	.000	.000	
	Sum of Squares and Cross-products	8.912	8.957	10.905
	Covariance	.182	.183	.223
	N	50	50	50

**. Correlation is significant at the 0.01 level (2-tailed).

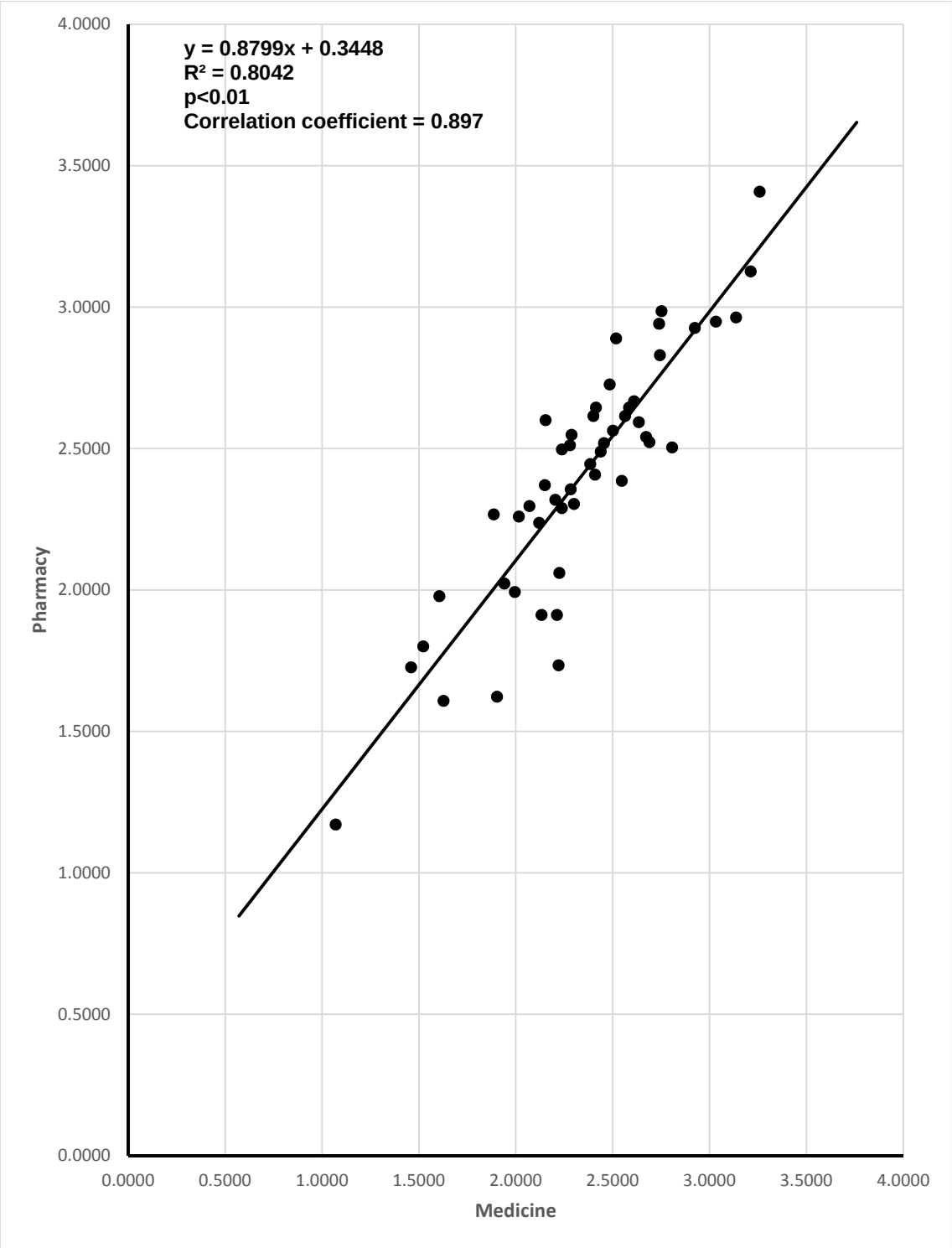


Figure 4.19 Correlation between scores from Pharmacy and Medicine programmes.

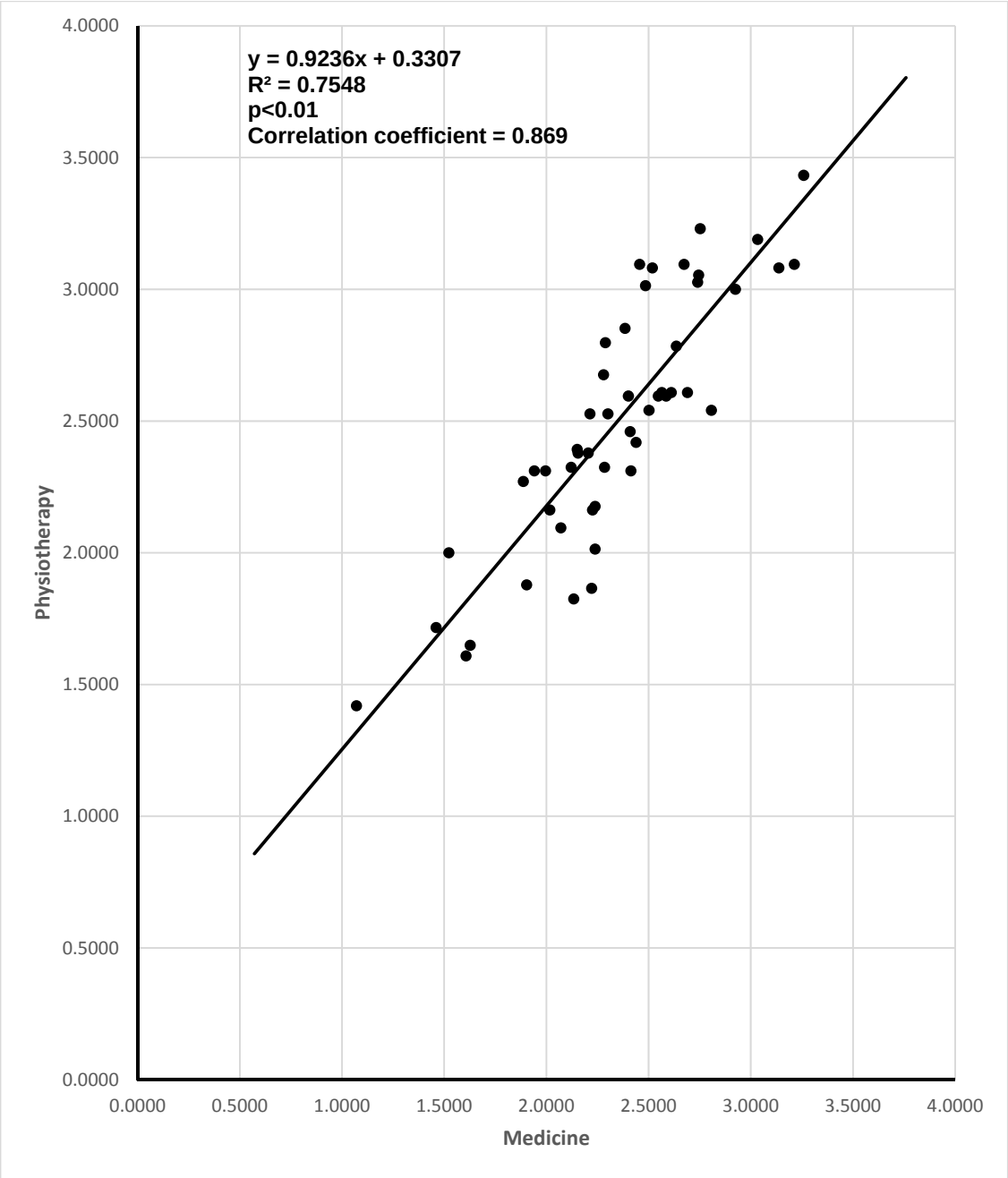


Figure 4.20 Correlation between scores from Physiotherapy and Medicine programmes.

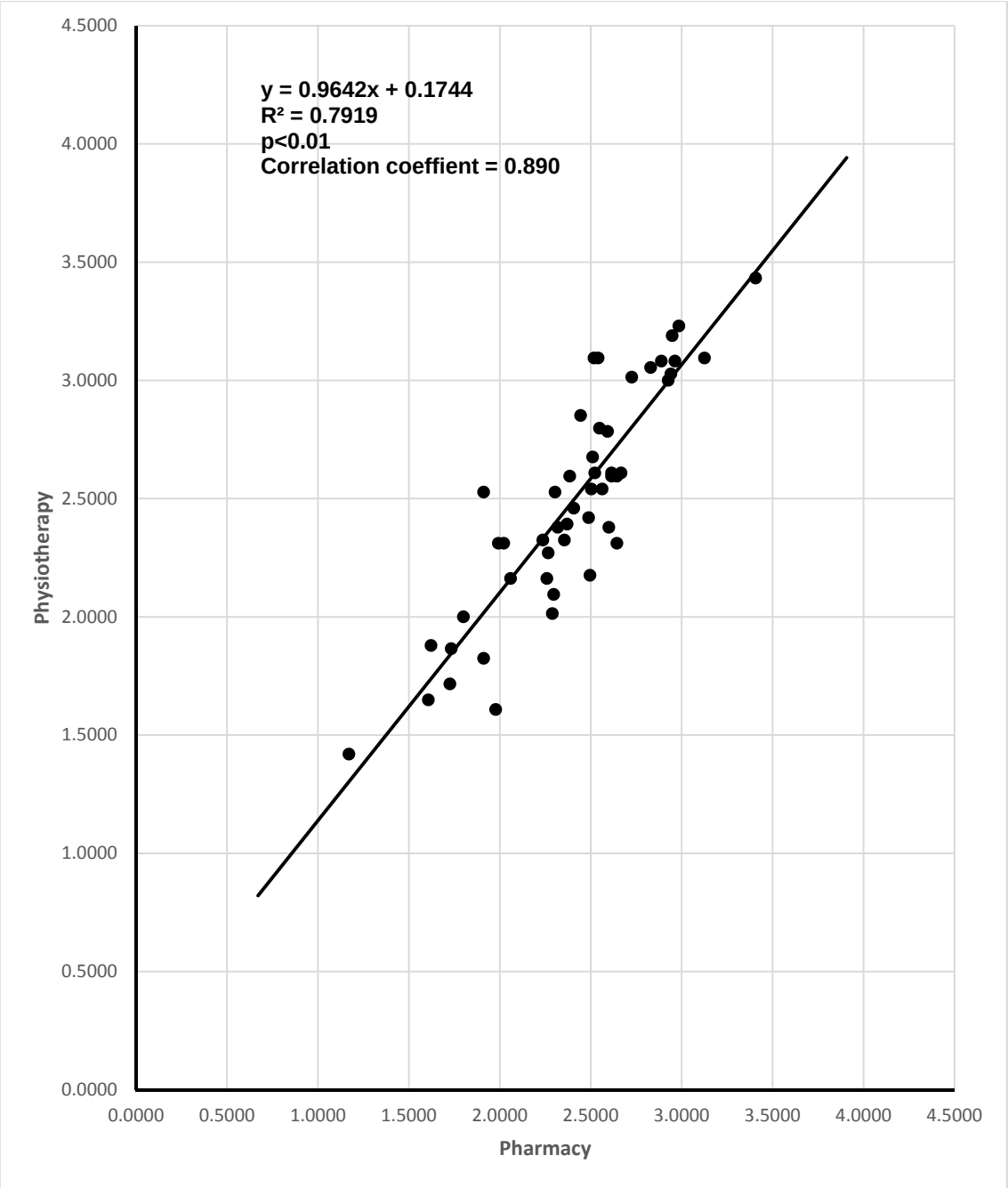


Figure 4.21 Correlation between scores from Physiotherapy and Pharmacy programmes.

4.3.7 Summary of analysis of individual DREEM item scores

Individual item scores analysis showed that the participants were confident of their ability to do well in the programmes. Thus item 10 scored highly with a mean >3.0. With the exception of a few, every aspect of the learning environment assessed with the DREEM questionnaire needed enhancement, scoring between 2.1 and 3.0. School-wide, six areas need particular attention. Within the programmes, Medicine/Surgery had nine problem areas, Pharmacy 10, and Physiotherapy 7. Common areas of concern across the programmes are item 3 – "there is a good support system for learners who get stressed," item 9 – "the teachers are authoritarian," item 25 – "the teaching over emphasizes factual learning," item 42 – "the enjoyment outweighs the stress of the course," and item 46 – "my accommodation is pleasant." Pearson correlation analysis revealed the unanimity in the perceptions of the students from the different programmes.

4.3.8 Validity and reliability

4.3.8.1 Construct validity

The positive linear correlation between scores on the DREEM items in the three programmes support the construct validity of the items in the dataset. To verify the construct validity of the items further, a confirmatory factor analysis was conducted. Principal component analysis (PCA), with verimax rotation and Kaiser Normalization, was employed. Kaiser-Meyer-Olkin measure of sampling adequacy gave a value of 0.892 (acceptable values ≥0.7), while Bartlett's test of sphericity gave a significance (p value) of <0.001 (acceptable values ≤0.05), indicating the suitability of the dataset for the analysis (table 4.22).

TABLE 4.22 KMO AND BARTLETT'S TESTS RESULTS FOR THE PARTICIPANTS

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.892
Bartlett's Test of Sphericity	Approx. Chi-Square	6112.343
	df	1225
	Sig.	.000

TABLE 4.23 CONFIRMATORY FACTOR ANALYSIS OF THE DREEM DISPLAYING MAXIMUM FACTOR LOADINGS FOR EACH ITEM.

Item #	Factors				
	I	II	III	IV	V
Perception of Learning					
1	.614				
7	.396				
13	.456				
16	.393				
20	.523				
22	.426				
24	.480				
25	.319				
38	.585				
44	.511				
47	.305				
48	.307				
Perception of lecturers					
2		.454			
6		.595			
8		.695			
9		.606			
18		.411			
29		.384			
32		.401			
37		.627			
39		.592			
40		.577			
50		.294			
Academic self-perception					
5			.370		
10			.435		
21			.543		
26			.228		
27			.284		
31			.451		
41			.507		
45			.515		
Perception of Atmosphere					
11				.430	
12				.460	
17				.236	
23				.393	
30				.443	
33				.530	
34				.406	
35				.375	
36				.423	
42				.626	
43				.515	
49				.440	

	Factors				
	I	II	III	IV	V
Social self-perception					
3					.442
4					.403
14					.213
15					.476
19					.453
28					.395
46					.290

Fifteen (15) factors had Eigenvalues greater than 1.0. However, the 5-factor structure proposed by the authors of the tool accounted for 34 % of the variance. Table 4.21 presents the confirmatory factor results for the 5-factor structure of the DREEM. The maximum factor loadings varied from 0.213 to 0.695.

4.3.8.2 Reliability

The reliability of survey instruments could be assess by determination of its internal consistency using Cronbach's alpha, by determining test-retest reliability and calculation of correlation coefficient, or by using alternative form reliability. Cronbach's coefficient alpha is the most commonly used index to measure reliability of survey data (Tavakol & Dennick 2011:53). Bland and Altman (1997:572) recommends alpha values of 0.7 or more for non-clinical survey studies. Jakobsson et al (Jakobsson, Danielsen, and Edgren 2011:e267) suggests that alpha values below 0.6 might be indication of high heteroscedasticity. In this study, Cronbach's alpha was calculated as a measure of internal consistency of the instrument among the study participants. Cronbach's alpha for the 50 items global DREEM scores was calculated to be 0.899, indicating significant internal consistency. Cronbach's alpha determined for the Medicine/Surgery, Pharmacy, and Physiotherapy programmes were 0.915, 0.843, and 0.896, respectively. These values demonstrate strong internal consistencies and reliability of the instrument in the study. The values are comparable to previous reports from similar studies (Jawaid, Raheel, Ahmed & Aijaz. 2013:417; Nadeem, Iqbal, Yousaf, Daud & Younis 2014:298-303). Conventionally, alpha values are also calculated for subscales. Therefore, alpha values were calculated for the subscales and the results are presented in table 4.6. Subscale coefficients for subscales in the three programmes, Medicine, Pharmacy, and Physiotherapy are presented in tables 4.7, 4.8 and 4.9, respectively. Consistently, alpha

values for the subscale of academic self-perception and social self-perception for the School and the three programmes were low, indicating poor internal consistency in these subscales. Yussof (2012:314) reports similar finding. The low alpha coefficients in the subscales may be because of the smaller number of items in these subscales; academic self-percept and social self-perception have 8 and 7 items respective, compared to the other three which have 12 and 11. Gliem and Gliem (2003:87) reports "the size of alpha is determined by the inter-item correlation and the number of items in the scale." However, Yussof (2012:314) suggests that the low values may be due to some items in these subsections that do not correlate with one another, and should have been placed in other subscales.

4.3.9 What the students say

Responses to the open-ended question on what the students would like to do to improve the learning environments of their programmes were analysed by inductive coding to identify themes followed by deductive coding using the themes so identified. The results are presented as proportions. The study identified four thematic areas the students would want to change including learning resources, teachers and teaching quality, curriculum, and social welfare. Figure 4.22 shows the proportion of respondents expressing concern on issues in the respective thematic areas. Concerns with curricula centre mainly on restructuring the programmes and rescheduling timetables and assessments. This particular theme tops the list with 60 per cent of the respondents wishing to change things in this domain. Improving learning resources was next in importance with 32.5 % of the respondents interested in changing things in this area. Issues raised include poor condition of classrooms, inadequate laboratory facilities, library and internet resources, etc. Teachers and teaching quality were also of significant concern to the students; 35 % wanted changes. Issues raised included authoritarian attitude, poor teaching quality, lack of feedback and student engagement, and poor level of mentoring. Students' social welfare were of concern to 37.5 % of respondents, raising issues like support for stressed students, provision of counselling services, and very importantly, improving accommodation facilities.

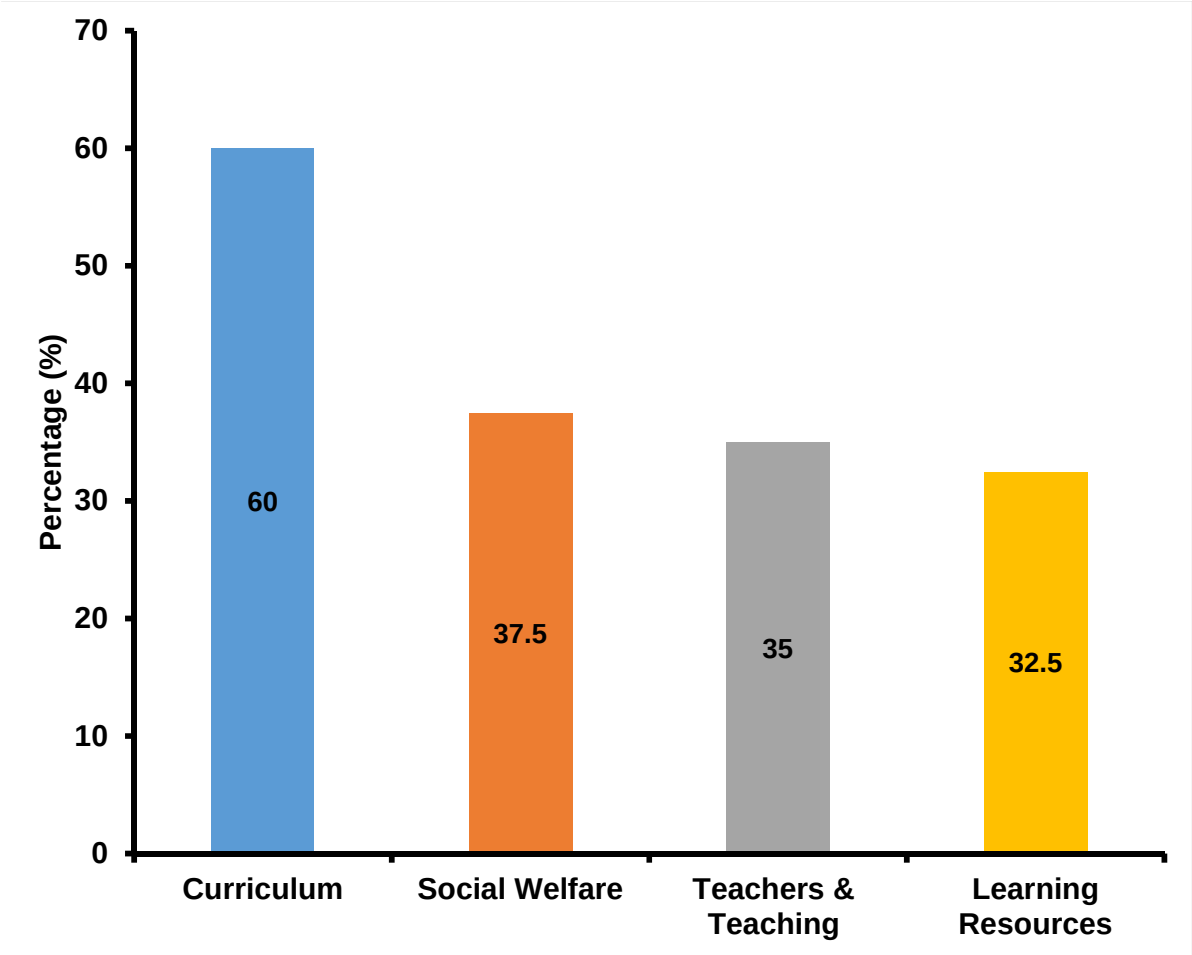


Figure 4.22 Proportion of participants responding in each theme

4.4 CONCLUSSION

Four hundred and forty-eight (448) questionnaires from three programmes were rated and analysed. The overall perception of the students was that the learning environment in the School of Medicine, University of Zambia, was more positive than negative. The students were unanimous on their view about the range of issues that this study addressed. With a global DREEM score of 59.7 %, a lot needs to change in the School's learning environment. The study identified specific problem areas within the subscales. Psychometric analysis demonstrated good validity and reliability of the data obtained using the DREEM questionnaire.

CHAPTER 5

DISCUSSION AND RECOMMENDATION OF STRATEGIES FOR IMPROVEMENT

5.1 INTRODUCTION

The study inquired about the educational environment of undergraduate health sciences students at the Ridgeway Campus of the University of Zambia with a view to understanding the phenomena characterizing the environment. More specifically, it explored the constituents of these phenomena from the viewpoints of medical, pharmacy, and physiotherapy students, the programmes selected to represent the six academic programmes of the School. Premised on Lizzio, Wilson, and Simons' theory (Lizzio, et al 2002:27-52), which states that students' perception of the learning environment is intricately correlated with their approaches to learning and the learning outcomes, the study utilized deductive logic and a descriptive, quantitative, non-experimental survey with the DREEM questionnaire, to obtain participants' views on learning, teaching, and teachers' qualities, academic atmosphere of the programmes, and self-perceived academic ability and the social environment of their learning. Though this approach may be considered empirical, it is a necessary initial step that offers opportunity for theory development when these findings are interpreted in the context of producing a framework for developing a strategy which can be used to enhance learning environments of Sub-Sharan African medical schools.

The first section of this chapter discusses the main findings of the study from the macro-level (global and sub-scale analysis), dealing with general perspectives on the learning environment, to the micro-level (item by item analysis), dealing with specific areas of concern. The second section addressed strategic management of learning environments of medical schools and recommends strategies for further improvement of the educational environment of the School based on the findings.

5.2 DISCUSSION

5.2.1 General Issues

The study recorded an impressive response rate of 95.5 % overall, that is comparable to other reports (Al-Kabbaa, Ahmad, Saeed, Abdalla, Mustafa 2012:69; Zawawi, & Elzubeir 2012:s25). Baruch (1999:421) and Baruch and Holtom (2008:1139) in studies of response rates in academic journals, report that the average response rates for survey studies in academic journals are 55.6 % and 52.7 %, respectively. The high response rate in this study demonstrates the interest shown by the students in the study, and the commitment of the research assistants to following up the participants.

A total DREEM score of 119.3 observed in this study compares favourably with reports from similar studies in undergraduate healthcare degree programmes elsewhere (Belayachi, Razine, Boufars, Saadi, Madani, Chaouir & Abouqal. 2015:47; Mohsena, Debsarma & Haque. 2016:1; Vaughan et al 2014:99). For example, Demiroren et al (Demiroren, Palaoglu, Kemahli, Ozyurda & Ayhan 2008:8) records a global DREEM score of 117.63 among undergraduate medical students of the Faculty of Medicine, University of Ankara in Turkey. Buhari et al (2014:141-5) with global score 108.4, and Abraham et al (Abraham, Ramnarayan, Vinod & Torke 2008:20) with a total score of 117.50, report similar results from studies at the University of Ilorin, Nigeria, and at the Melaka Manipal Medical College India, respectively. However, some studies record higher global scores. For example, Shankar et al (Shankar, Bharti, Ramireddy, Balasubramanium & Nuguri 2014:9) reports a score of 151.3 in a study of American and Canadian students in medicine and surgery programme at the Xavier University School of Medicine, Aruba. Al-Nagger et al (Al-Naggar, Abdulghani, Osman, Al-Kubaisy, Daher, Nor Aripin, Assabri, Al-Hidabi, Ibrahim, & Al-Rofaai 2014:177–184) reports a global score of 125.3 from students of the Management and Sciences University Medical School, Malaysia. The null hypothesis (hypothesis1) which implied that the learning environment is not more positive than negative was rejected. However, the observed global DREEM score of 119.3 (59.65 %) probably indicates that the students were barely satisfied with the learning environment of the School, and much needed to be done to improve the School's learning environment. Furthermore, the global DREEM scores where not significantly different between programmes and the null hypothesis (hypothesis 2) was accepted in this instance. This probably implies that the issues addressed were well understood and that

the students shared the same concerns about their learning conditions. This differs from Sunkad et al (Sunkad, Javali, Shivapur & Wantamutte 2015:37) which shows differences in perceptions among various health care professional programmes.

Some previous studies report that learners perception of their learning environment tend to decline as they advance in their studies (Moreno, & Sánchez 2009:112; Riquelme, Oporto, Oporto, Méndez, Viviani, Salech, Chianale, Till 2004:32). This observation has been attributed to several factors that include those beyond educational delivery (Palmgren 2016:76; Rotthoff, Ostapczuk, De Bruin, Decking, Schneider & Ritz-Timme 2011: e624-e636). Some of these factors have been identified as student maturity over time, increasing autonomy, declining enthusiasm, and more critical behaviour. However, the findings of the present study did not support this theory, and no such decline in perception with advancing levels of study was observed, an observation congruent with Buhari et al (2014:141). Perhaps, this could be attributed to the sample characteristics in that most of the participants already had an average of two years university education at the University of Zambia main campus before joining the Ridgeway Campus of the University.

Subscale scores from this study were also comparable to values reported by similar studies in other African Universities and universities from other developing countries. The subscales of academic self-perception (65.5 %) and perception of learning (62.1 %) were the most positively rated subscales, whereas the subscale of social self-perception (53.1 %) was the most poorly rated subscale, similar to previous reports (Buhari et al 2014:141; Odole et al 2014:86; Riquelme et al 2009:112). This suggests that the social climate of the programmes is in need of enhancement. Some of the specific issues in this subscale were identified and are discussed further under specific issues.

5.2.2 Specific Issues

The study identified six specific issues through item by item analysis. These issues include lack of a good support system for students who get stressed (item number 3), authoritarian attitude of the teachers (item number 9), overemphasis on factual learning (item number 25), inability to memorize (item number 27), inability to cope with the stress of studying (item number 42), and unpleasant accommodation (item number 46). These specific issues were confirmed by the students' responses to the open-ended question,

which also revealed another issue not captured by the DREEM questionnaire, lack of adequate physical infrastructures such as good classrooms, adequate laboratory spaces, and good library. The issues identified are similar but not identical to other reports in literature. For example, Odole et al (2014:86) reports problems on six items which included four identified in this study: limited support for stressed students, authoritarian attitude of teachers, overemphasis on factual learning, and inability to cope with stress. Also, Riquelme et al (2009:112) reports 8 areas of concern among Chilean medical students, which included four identified in the present study as follows: limited support for stressed students, overemphasis on factual learning, inability to memorize, and poor accommodation. Al-Hazimi et al (Al-Hazimi, Zaini, Al-Hyiani, Hassan, Gunaid, Ponnamperuma, Karunathilake, Roff, McAleer & Davis 2004:196-198) reports on issues identified in four medical schools including King Abdul Aziz University, Saudi Arabia, Umm Al-Qura University, University, Saudi Arabia, Sana'a University, Yemen, and Dundee University, UK. Of the several issues reported, five were common to the findings of the present study, excepting poor accommodation. Furthermore, Palgren (2016:77-78), in a study of Swedish Physiotherapy and Chiropractic students, records three issues which were common to the present observation: lack of a good support system for students who get stressed, authoritarian attitude of the teachers, and overemphasis on factual learning. From the foregoing discussion, it appears that these three items tend to be poorly rated in medical schools globally, and more specifically those in developing countries (Al-Hazimi et al 2004:196-198, Palgren 2016:77-78).

5.2.2.1 Lack of support for stressed students

Edgren et al (Edgren, Haffling, Jakobsson, McAleer, & Danielsen 2010:e233-e238) observes that lack of a good support system for stressed students appears to be a general problem in medical and health sciences education. Medical and health professions education can be very stressful, and this can impinge on the academic and professional performance of learners (Madhyastha, Latha, & Kamath 2014:315-326; Sreeramareddy, Shankar, Binu, Mukhopadhyay, Ray, & Menezes 2007:1; Wolf 1994:8). Although some level of stress may have positive effects, dysfunctional stress could lead to psychological and physical morbidity (Dyrbye, Thomas, & Shanafelt 2005:1613; Mosley, Perrin, Neral, Dubbert, Grothues, & Pinto 1994:765). Clinical manifestations of these could be feelings of fear, incompetence, anger, and guilt (Dyrbye et al 2005:1613). Stressors of medical and health sciences students include academic related stressors, intrapersonal and

interpersonal related stressor, teaching and learning stressor, social related stressor, drive and desire related stressor, and group activities related stressor (Othman, Farooqui, Yusoff, Adawiyah 2013: 249-257, Yusoff, Rahim, & Yaacob 2010:1). Reports show that the strategies adopted by a student to cope with stress determine the ultimate influence of stress on the student (Dyrbye et al 2005:1613; Mosley et al 1994:765). These strategies, otherwise known as coping, refer to the behavioural and cognitive efforts employed to manage stress. Coping strategies adopted by medical students are categorized as "engagement" or "disengagement." Disengagement strategies include withdrawal, alcohol and drug use, problem avoidance, self-criticism, and wishful thinking, and these reportedly produce negative outcomes (Dyrbye et al 2005:1613). Strategies that use active engagement include positive re-assessment, problem solving, expression of emotion, and dependence on social support, and these lead to successful adaptation (Dyrbye et al 2005:1614). In the light of these, Mosley et al (1994:765) suggests that training the students in engagement coping strategies may be a useful supportive approach for stress management.

5.2.2.2 Teachers are authoritarian

An equally important issue noted in this study is authoritarian posture of the lecturers. This observation was common in all the programmes that participated in the study. As discussed above, this is a pervading issue in medical and healthcare professional education with most published articles from developed and more so in developing countries, reporting low rating (Bassaw, Roff, McAleer, Roopnarinesingh, De Lisle, Teelucksingh & Gopaul 2003:522-526; Roff, McAleer, Ifere, & Bhattacharya 2001:378). It is noteworthy that a conceptual definition of what connotes authoritarianism from the viewpoint of the students is not clear.

The constructivist philosophy of teaching and learning places the learner at the centre of teaching and learning (Dennick 2016:200), but its successful implementation in the classroom depends on the belief and self-perception of the teacher (Ellis 2016:66). However, this does not remove the authority from the teacher, who is considered the more able peer and should provide scaffolding for the learners, according to Vygotsky's theory (Reigosa & Jiménez-Aleixandre 2007:307–329; Van de Pol, Volman, & Beishuizen 2010:271). Notwithstanding the aforesaid, the widespread observation of authoritarianism calls to question the effectiveness of decades-long innovations in medical and health

sciences education whose aims include making medical education learner-centred and self-directed. Perhaps more pragmatic pedagogical innovations are still needed in medical education because it appears that current practices still leave some worth to be desired. Central to this is more research and continuous faculty reorientation in teaching effectiveness and constructivist ideology, but not a one-off certification programme whose effectiveness tends to fade with time.

5.2.2.3 Teaching overemphasizes factual learning

The next issue observed in this study that is common in medical and health sciences education is factual overload. While factual learning is not bad in itself, it becomes problematic if the facts are segregated from the clinical contexts and applications of the facts. Anne Ditcher (2001:24-25) and Caroline Kreber (2003:57) note that students' perception of heavy workload and inappropriate assessment methods correlate strongly with surface approaches to learning. According to Ditcher (2001:25), two main approaches to learning have been identified, namely surface and deep approaches. Whereas surface approach focuses on learning unrelated facts or discrete pieces of knowledge with no attempt at integration, deep approaches look for underlying connections, structure, and meaning, and relatedness to practical application. This is learning in context. Whereas problem-based learning has been suggested and implemented in many medical and healthcare professional educational programmes as a means of reducing factual overemphasis and promote learning in context (Ipoto & Kwizera 2005:388), Berkson (1993:s79-s88) argues that PBL may be subject to monotony and factual overload like other instructional methods.

The correlates of this observation in this very study include the students' "inability to memorise" study materials (item number 25), and the voiced concerns over what the students refer to as "irrelevant courses and topics" in their programmes. It also has to do with structuring of the academic curricula of the programmes. Special attention should be paid to this, and more frequent review of curriculum delivery could help to improve educational delivery in the School.

5.2.2.4 Unpleasant accommodation

Lastly, the issue of unpleasant residential accommodation noted in this study, though not unique to the School of Medicine, is not a global problem in medical schools. This issue cuts across all the disciplines in this study, and appears to be pandemic within the University of Zambia as a recent study shows (unpublished findings reported during mid-term review of University of Zambia strategic plan in July 2016). Amole (2009:76-85) examines students' satisfaction in four Nigerian universities and concludes that the correlates of satisfaction are many and include social densities in the hostels, kitchenette, bathroom, storage facilities, and configuration of the halls. Imperatively therefore, an understanding of what makes students' accommodations unpleasant should be considered. This in itself could be a worthwhile study; similar studies have already been conducted in some higher educational institutions (Amole 2009:76-85, Muslim, Karim, Abdullah 2012: 601-614; Mogenet & Rioux 2014:303-20; Toyin Sawyerr, Yusof 2013:306-22). Interestingly, the issues of residential accommodation are already being addressed as many hostel blocks with up to date facilities are currently and actively under construction at convenient locations within or near the School. Closely related to, and compounding this issue, are the expressed concerns over classroom physical environments and laboratory spaces within the programmes.

5.3 RECOMMENDING STRATEGIES FOR IMPROVEMENT

In order to realize optimal enhancement of the learning environment of the School of Medicine in the University of Zambia, the issues discussed in the preceding section of this chapter need pragmatic approaches to address them. The first strategic plan for the School of Medicine came into effect in 2012 and covered January 2012 to December 2016. The plan dealt mainly with managerial and administrative issues related to the external and internal environments of the School. The students' learning environment (which is an important part of the internal environment of the School) received no attention. As part of the success stories of the 2012 strategic plan, the School has transitioned into four new schools, namely, the new School of Medicine, primarily concerned with medicine and surgery programme, the School of Public Health, the School of Nursing, and the School of Health Sciences, catering for Pharmacy, Physiotherapy, and Biomedical Sciences. These transitions take effect from January 2017. As these new schools aspire to take the stage in January 2017, the findings of this study come at the right time, and programmes that are concerned will have much to gain by incorporating the outcomes of this study in their strategic plans.

Postema and Markhan (Postema & Markham 2001) and Kettunen (2008:322) report that customer satisfaction (in this case students' satisfaction) is an important consideration in the strategic management of any higher educational institution. Stukalina (2012:84-98) also emphasizes the necessity to link student satisfaction with services in order to create a student-centred learning environment. More succinctly, Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) (2015:14) reiterates the need for institutions to provide adequate learning resources and student support services, and to ensure their accessibility to students in consideration of the changing educational landscape toward student-centred, self-directed, flexible learning modalities. With this in mind, and given the background of the expected take-off of the new schools, it has become necessary to develop strategies to improve the educational environments of undergraduate programmes in the schools. This issue is very important at this time, because the era when the existing School of Medicine enjoyed monopoly of offering medical and health sciences education in Zambia has gone. The new schools now has to compete with other newly established Universities for the best students, for academic staff, for funding from the state and industry, and for international academic and business partners.

The vision statement of the School of Medicine 2013-2016 strategic plan reads "A leader in Tertiary Health, Education, Care and Research in the Region by 2030," while the mission statement reads "To provide excellent tertiary education and training in health sciences in order to address current and emerging health needs" (University of Zambia School of Medicine, 2012:23). These lofty vision and mission statements were accompanied by eight strategic objectives, some of which have imperatives for the improvement of the educational environment of the School's programmes. The thesis proposes evidence-based strategies that could be used for enhancing the learning environments of undergraduate programmes, and hopes that these would blend with the 2017 – 2021 strategic plans of the new schools carved from the School of Medicine, and the 2018 to 2022 strategic plan of the University of Zambia. Based on the finding of the study, four strategic issues have been raised in the following areas: social support, teaching and mentoring, accommodation, and physical infrastructures. Objectives, strategic targets, strategic options, as well as key performance indicators are outlined on the table 5.1. The thesis further recommends that these strategies be validated in future by seeking the input of the principal officers of the School.

TABLE 5.1 PROPOSED STRATEGIES FOR IMPROVEMENT

	STRATEGIC ISSUE	OBJECTIVE	STRATEGIC OPTIONS	STRATEGIC TARGETS	PERFORMANCE INDICATORS
1	**Inadequate social support system:** Social support system for stressed students is perceived as inadequate	1.1 To upgrade counselling services available to students in the SOM	1. Engage more counsellors in the students' centre (Al-Dubai, Al-Naggar, Alshagga, & Rampal 2011:57–64) 2. Train student-counsellors and enhance peer counselling and mentoring (Glaser, Hall, Halperin 2006:4-19; Pereira 1997)	Recruit one (1) qualified counsellor for each programme by the end of 2017. Each class to have at least 2 trained peer mentors and counsellors by end of 2023	1. Number of students receiving counselling; 2. Number of student-counsellor actively supporting their peers;
		1.2 To train students in stress coping strategies	3. Introduce stress management training for students (Shiralkar, Harris, Eddins-Folensbee, Coverdale 2013:158-64) 4. Provide recreation and relaxation centres at convenient sites in the School (Misra & McKean 2000)	Each student to have training in stress coping strategies before entering the clinical years	Number of students adopting positive coping strategies
		1.3 To train or retrain faculty on mentoring and student support skills	5. Introduce faculty development programme on mentoring and counselling skills (Feldman, Steinauer, Khalili, Huang, Kahn, Lee, Creasman, & Brown 2012:362-367)	All teaching staff to have at least 1 relevant CPD training each year.	Number of staff with good student support skills
2	**Substandard teaching and mentoring:** Lecturers' attitudes are perceived as	1. To develop participatory classroom environments	1. Faculty development in effective teaching methods that	Each programme to fully transit to student-centred	Level of student participation in class activities and decisions

	authoritarian, and teaching as overemphasizing factual learning; concerns about lack of feedback and student engagement		promotes self-directed learning (Steinert, Mann, Anderson, Barnett, Centeno, Naismith, Prideaux, Spencer, Tullo, & Viggiano 2016:769-786); 2. Faculty exchange programmes with partner international universities;	teaching by 2021	
		2. To provide student-centred self-directed learning programmes	1. Faculty development in curriculum development and implementation (Grbach 2011:58 - 9).	Curricula reviewed every 2 years with a focus on student-centeredness	Number of programmes fully implementing learner-centred teaching
3	**Unpleasant accommodation:** Off-campus and on-campus accommodation rated as unpleasant	1. Determine the causes of dissatisfaction with residential accommodation	Undertake a survey to determine causes of dissatisfaction with residential accommodation (Muslim, Karim, Abdullah 2012: 601-614)	Establish causes of dissatisfaction by 2019	Survey report
		2. Expand residential facilities available to students	1. Build more hostels	Double the number residential spaces by 2022	Number of new hostel facilities available to students
			2. Engage venture capitalists and entrepreneurs to construct and run hostel facilities		
			3. Rent private buildings and use them as hostels for students		
4	**Inadequate physical facilities:** Classrooms, laboratories, and library facilities	1. To provide more teaching and learning facilities	1. Engage with stakeholders for funding to accomplish the project	Build a state of the art teaching and learning centre in the School by 2025	A state of the science teaching and learning centre in the Ridgeway Campus

	reported as inadequate				

CHAPTER 6

CONCLUSIONS AND LIMITATIONS

6.1 INTRODUCTION

This study set out to identify the issues within the learning environments of undergraduate health sciences students studying at the Ridgeway Campus of the University of Zambia. The aim was to provide a framework for proposing a strategy that would enhance the learning environments of the school. The theoretical basis for this work is Lizzio's theory stating that students' approaches to learning and the learning outcomes depend on perception of their educational environment (Lizzio et al 2002:27). Creating a student-centred self-directed learning environment that has competitive advantage for the School of Medicine at the University of Zambia requires proper articulation of the issues and challenges within the learning context of the School. To this end, the DREEM questionnaire was used to analyse the environments of the programmes quantitatively. The outcome of this analysis was used to propose a strategy for improvement.

6.2 STUDY DESIGN AND METHODS

A quantitative, observational, non-experimental design was used to gather undergraduate students' views on aspects of their learning environment. Three of the six programmes of the School were randomly selected, stratified, and systematically sampled. Demographic data were gathered, and responses to the 50 items of the DREEM questionnaire were collected, sorted, rated, and analysed. The global scores and scores within subscales were compared. Item by item analysis provided information on the underlying issues of the learning environment of the programmes.

6.3 SUMMARY OF FINDINGS

This study tested two hypotheses. The first stated that "the perception of the educational environment is more positive than negative." The global DREEM score (119.3, 59.7%)

and the scores within the subscales (53-66%) in this study imply that the students rate their learning environment as “more positive than negative.” These observations were comparable to those from medical schools in other developing countries. The second hypothesis stated that the “The perceptions are the same across different disciplines.” Comparison of the DREEM scores by ANOVA showed that there was no significant difference in the global DREEM scores across the three disciplines studied. Thus the null hypothesis was accepted in this case.

The subscale of social self-perception was the least positively rated in the study. Six specific issues were observed, including inadequacy of support for stressed students, teaching overemphasizing factual learning, lecturers being authoritarian, unpleasant accommodation for students, inability to memorise, and inability to cope with the stress of education. Three of these issues were recognised as global issues in health professions education in developing countries, namely inadequacy of support for stressed students, teaching overemphasizing factual learning, and lecturers being authoritarian.

6.4 SUMMARY OF RECOMMENDED STRATEGIES

Based on these issues, strategic objectives, targets, and strategic options were recommended including enhancing the social support system available to students, training students in stress management strategies, training of students as peer counsellors, retraining and reorientation of teaching staff, further studies to understand what constitutes unpleasantness in students’ accommodation, providing more hostel facilities, and construction of a standard learning centre in the Campus.

6.5 CONCLUSION

The three objectives of this study were fully realised. Objective number 1 is to “Analyse the learning environment of undergraduate medical and health sciences student in the medical school of Zambia.” The learning environment of undergraduate students of this School was analysed in detail through the students’ lenses. The phenomena that define the learning environments of the programmes were x-rayed and articulated. Whereas the students exhibited significant level of self-confidence in their ability to succeed, four major issues challenge teaching and learning in the School including lack of social support for stressed students, authoritarianism by lecturers, factual overload, and unpleasant

accommodation. To fulfil objective number 2 which is to “Compare the perceptions of the learning environment by the above students,” the perceptions of the participating programmes were compared statistically by ANOVA and found to be statistically similar. The global perceptions were not significantly different at $p < 0.05$. Specific issues were similar across the programmes, and additional programme specific issues were documented. Objective number 3 was to “Develop strategies to enhance or reform the learning environment of undergraduate medical and health sciences students in UNZA-SOM.” Strategies to enhance the learning environment were proposed from literature using the issues as a framework. Four specific strategic issues were identified, and strategic options were proposed.

6.6 LIMITATIONS OF THE STUDY

The major limitation of the study is that it is primarily quantitative in design. Though this design offers objectivity and easy generalizability of the findings, a mixed methods design incorporating significant qualitative component would have the added advantage of more detailed exploration of the issues addressed in this study. Another limitation of the study is that only students’ viewpoints were analysed. Further study exploring the viewpoints of other internal stakeholders such as academic and non-academic staff would possibly provide additional information on the state of the educational environment of the School. Furthermore, this study focused on the School of Medicine, University of Zambia. Though this is the premier medical school in the country, and admits more students than the newly established schools, extension of the study to these other schools will probably enhance the generalizability of the findings.

6.7 CONTRIBUTIONS OF THE STUDY

This study contributes to the body of literature on the educational environments of medical and health sciences programmes. The findings confirm, and in some aspects extend, current understanding of the issues and challenges impinging on medical and health professions education globally and in Southern Africa in particular. Some findings have implications for theory and practice and are further discussed below.

6.7.1 Implications for theory

The thesis hypothesizes that inadequate support for stressed students, factual overload, and authoritarianism in the classroom, are widespread issues in medical and health sciences educational institutions in developing countries. These issues call to question the effectiveness of the much touted innovations in medical education that have occurred in the last two decades. The thesis further argues that rather than new innovations, faculty reorientation might be the way to go in addressing these issues in the medical schools located in developing countries.

6.7.2 Implications for practice

The strategies proposed in this thesis could be incorporated in medical schools' strategic plans. The implementation could go a long way to enhance the learning environments of healthcare educational programmes thereby leading to better learning outcomes, and better equipped healthcare professionals. Medical schools should consider including analysis of students learning environments as part of strategic planning.

Medical and health sciences education could be very stressful. Periodic assessment of stress among students using validated scales could be a valuable strategy to assist students.

6.8 CONCLUDING REMARKS

This thesis is about problem-solving and provides opportunity for repositioning medical and health sciences education at the University of Zambia to competitive advantage. Its logic concurs with the pragmatist paradigm which states: ***"the mandate of science is not to find truth or reality … but to facilitate human problem-solving" (Powell 2001:884).***

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ANNEXURES

ANNEXE A: INFORMATION SHEET.

Study Title: Analysis of undergraduate students' learning environments in a medical school in Zambia

I, Professor Christian Ezeala, of the Department of Pharmacy at the School of Medicine, University of Zambia, am conducting a research to determine and analyse undergraduate students' perception of their learning environments in the School of Medicine. You are

invited to participate in this study because you are considered a key stakeholder and your opinion matters. There will be approximately 310 participants in total out of which a fraction will be drawn from your class.

Although this project is not funded, it has received ethical approval from the Department of Health Studies of the University of South Africa, and authorization from UNZABREC and the Dean's Office, School of Medicine, University of Zambia. If you agree to participate, you will be required to complete a biographic questionnaire containing 7 items, and a DREEM questionnaire containing 51 items. It will take 15 to 20 minutes to complete both questionnaires.

There are no anticipated risks from participating in the study. And, although there is no direct benefit to participants, the information to be gathered could lead to better understanding of the strengths and weaknesses of the UNZA-SOM learning environment. This information could be useful for quality development of the learning environment.

Your participation is voluntary. You may refuse to participate, and you can withdraw at any time without any consequences. The completed questionnaire shall be kept confidential and only accessible to the investigator. Storage shall be for a maximum of 5 years in line with University regulations and international conventions. The signed consent form shall be stored separately from the questionnaire. To protect your privacy, please DO NOT write your name or computer number on the questionnaires.

If you have any questions, please call Prof Ezeala on or email: christianezeala@yahoo.com.au, or contact UNZABREC at their Ridgeway Campus office.

Thanks for your cooperation and participation.

…….....

Professor Christian Ezeala, PhD

ANNEXE B: CONSENT FORM

Study Title: Analysis of undergraduate students' learning environments in a medical school in Zambia

By signing below, I declare that I understand the information provided in the information sheet and that I voluntarily consent to participate in the study without duress.

…… ……..

Sign of Participant Date

ANNEXE C: DUNDEE READY EDUCATION ENVIRONMENT MEASURE (DREEM) QUESTIONNAIRE

(Modified from McAleer S & Roff, S. 2001. A practical guide to using the Dundee Ready Education Environment Measure (DREEM). AMEE Medical Education Guide, no. 23, 29-33.)

Please respond to the following 51 items as completely and as truthfully as you can. Kindly indicate whether you "Strongly Agree," "Agree," are "Unsure," "Disagree" or "Strongly Disagree" with the statements in the items below. Note that some items are negative statements, so carefully select your appropriate response.

Tick (X) IN the appropriate box.

Question/Item Statement	***Strongly Agree***	***Agree***	***Uncertain***	***Disagree***	***Strongly Disagree***	
1. I am encouraged to participate during teaching sessions						
2. The teachers are knowledgeable						
3. There is a good support system for learners who get stressed						
4. I am too tired to enjoy the course						
5. Learning strategies which worked for me before continue to work for me now						
6. The teachers espouse a student centred approach to teaching						
7. The teaching is often stimulating						
8. The teachers ridicule the learners						
9. The teachers are authoritarian						
10. I am confident about my passing this year						
11. The atmosphere is relaxed during teaching						
12. This course is well timetabled						
13. The teaching is learner/student centred						
14. I am rarely bored on this course						
15. I have good friends on this course						
16. The teaching helps to develop my competence						
17. Cheating is a problem on this course						
18. The teachers have good communication skills with patients						
19. My social life is good						
20. The teaching is well focused						
21. I feel I am being well prepared for my profession						

22. The teaching helps to develop my confidence						
23. The atmosphere is relaxed during lectures						
24. The teaching time is put to good use						
25. The teaching over emphasizes factual learning						
26. Last year's work has been a good preparation for this year's work						
27. I am able to memorise all I need						
28. I seldom feel lonely						
29. The teachers are good at providing feedback to learners						
30. There are opportunities for me to develop interpersonal skills						
31. I have learnt a lot about empathy in my profession						
32. The teachers provide constructive criticism here						
33. I feel comfortable in teaching sessions socially						
34. The atmosphere is relaxed during seminars / tutorials						
35. I find the experience disappointing						
36. I am able to concentrate well						
37. The teachers give clear examples						
38. I am clear about the learning objectives of the course						
39. The teachers get angry in teaching sessions						
40. The teachers are well prepared for their teaching sessions						
41. My problem solving skills are being well developed here						
42. The enjoyment outweighs the stress of the course						

43. The atmosphere motivates me as a learner						
44. The teaching encourages me to be an active learner						
45. Much of what I have to learn seems relevant to a career in healthcare						
46. My accommodation is pleasant						
47. Long term learning is emphasized over short term learning						
48. The teaching is too teacher centred						
49. I feel able to ask the questions I want						
50. The students irritate the teachers						

51. If you could change three things about the School of Medical, UNZA, what would they be?

I. ……
……

II. ……
……

III. ……
……

ANNEXE D: DEMOGRAPHIC QUESTIONNAIRE

Analysis of the undergraduate students' learning environment in a medical school in Zambia

Kindly provide the following demographic information to the items listed below.

1. Programme of study
    a. Medicine/Surgery

b. Pharmacy
c. Environmental Health Sciences
d. Biomedical Science
e. Nursing
f. Physiotherapy
g. Other

2. Year of study

a. 1st year
b. 2nd year
c. 3rd year
d. 4th year
e. 5th year
f. 6th year
g. 7th year

3. Age: …….

4. Gender:

a. Male
b. Female

5. Nationality:
a. Zambian
b. Non-Zambian
6. Residential status
a. In campus
b. Off campus (boarding)
c. Off campus (home)

7. Marital status
a. Married
b. Single
c. Divorced
d. Widowed
e. Separated

ANNEXE E: A PRACTICAL GUIDE TO USING THE DUNDEE READY EDUCATION ENVIRONMENT MEASURE (DREEM)

The DREEM

The DREEM contains 50 statements relating to a range of topics directly relevant to education climate (Appendix 1). The inventory can be administered by postal survey or face to face in the teaching session's room. Students are asked to read each statement carefully and to respond using a 5 point Likert-type scale ranging from strongly agree to strongly disagree. It is important that each student applies the items to their own current learning situation and response to all 50.

Scoring the DREEM

Items should be scored: 4 for Strongly Agree (SA), 3 for Agree (A), 2 for Uncertain (U), 1 for Disagree (D) and 0 for Strongly Disagree (SD)

However, 9 of the 50 items (numbers 4, 8, 9, 17, 25, 35, 39, 48 and 50) are negative statements and should be scored 0 for SA, 1 for A, 2 for U, 3 for D and 4 for SD. The 50-item DREEM has a maximum score of 200 indicating the ideal educational environment as perceived by the student. A score of 0 is the minimum and would be a very worrying result for any medical educator.

The following is an approximate guide to interpreting the overall score:

0-50 Very Poor

51-100 Plenty of Problems

101-150 More Positive than Negative

151-200 Excellent

Interpret a score of 100 as an environment which is viewed with considerable ambivalence by the students and as such needs to be improved.

As well as the total DREEM score there are five subscales:

Students' perceptions of learning, students' perceptions of course organisers, students' academic self-perceptions, students' perceptions of atmosphere, students' social self-perception.

An approximate guide to interpreting the subscales is shown below.

Students' Perception of Learning

0-12 Very Poor

13-24 Teaching is viewed negatively
25-36 A more positive perception
37-48 Teaching highly thought of

Students' Perception of Course organisers

0-11 Abysmal
12-22 In need of some retraining
23-33 Moving in the right direction
34-44 Model course organisers

Students' Academic Self Perceptions

0-8 Feelings of total failure
9-16 Many negative aspects
17-24 Feeling more on the positive side
25-32 Confident

Students' Perception of Atmosphere

0-12 A terrible environment
13-24 There are many issues which need changing
25-36 A more positive attitude
37-48 A good feeling overall

Students' Social Self Perceptions

0-7 Miserable
8-14 Not a nice place
15-21 Not too bad
22-28 Very good socially

The DREEM can also be used to pinpoint more specific strengths and weaknesses within the educational climate. To do this one needs to look at the responses to individual items. Items that have a mean score of 3.5 or over are real positive points. Any item with a mean of 2 or less should be examined more closely as they indicate problem areas. Items with a mean between 2 and 3 are aspects of the climate that could be enhanced.

ANNEXE F: LETTER TO DR McALEER REQUESTING PERMISSION TO USE THE DREEM

48256358 <48256358@mylife.unisa.ac.za>

06/20/15 at 3:18 PM

To: j.p.g.mcaleer@dundee.ac.uk

CC: christian40ezeala@yahoo.com

Message body

Dear Sean,

Greetings to you. I am a DLit et Phil student of the University of South Africa and faculty member of the School of Medicine, University of Zambia. I am proposing a research project in medical education that looks at the learning environment of the School of Medicine at the University of Zambia as part of the DLit et Phil degree. I propose to use the DREEM questionnaire which you co-authored with Sue Roff in 1997. I would be grateful if granted freedom to use this tool without copyright issues since it is for academic purposes only. A written permission is required by UNISA in this regard.

I count on your goodwill as I thank you in advance for your cooperation.

Yours sincerely,

Professor Christian Ezeala, PhD

University of Zambia

ANNEXE G LETTER GRANTING PERMISSION TO USE THE DREEM

To:
48256358 <48256358@mylife.unisa.ac.za>;
...
2015-06-22
From:
John McAleer (Staff) <j.p.g.mcaleer@dundee.ac.uk>
Sent:Mon 2015-06-22 03:05 PM
To:
48256358 <48256358@mylife.unisa.ac.za>;

You forwarded this message on 2015-07-25 10:04 AM

Dear Christian
Thank you for being in touch. Of course we would be happy for you to use the DREEM. Permission granted and good luck with the study.

Best Wishes
Sean

Dr Sean McAleer
Programme Director
Centre for Medical Education
University of Dundee

ANNEXE H UNISA ETHICAL CLEARANCE CERTIFICATE

UNISA university of south africa

UNIVERSITY OF SOUTH AFRICA
Health Studies Higher Degrees Committee
College of Human Sciences
ETHICAL CLEARANCE CERTIFICATE

REC-012714-039

HSHDC/437/2015

Date: 7 October 2015 Student No: 4825-635-8

Project Title: Analysis of the undergraduate students' learning environment in a medical school in Zambia.

Researcher: Christian Chinyere Ezeala

Degree: D Litt et Phil Code: DPCHS04

Supervisor: Prof MM Moleki
Qualification: D Litt et Phil
Joint Supervisor: -

DECISION OF COMMITTEE

Approved √ **Conditionally Approved** ☐

Prof L Roets
CHAIRPERSON: HEALTH STUDIES HIGHER DEGREES COMMITTEE

For **Prof MM Moleki**
ACADEMIC CHAIRPERSON: DEPARTMENT OF HEALTH STUDIES

PLEASE QUOTE THE PROJECT NUMBER IN ALL ENQUIRES

ANNEXE I: ETHICAL WAIVER BY UNIVERSITY OF ZAMBIA BIOMEDICAL RESEARCH ETHICS COMMITTEE

THE UNIVERSITY OF ZAMBIA

BIOMEDICAL RESEARCH ETHICS COMMITTEE

Telephone: 260-1-256067
Telegrams: UNZA, LUSAKA
Telex: UNZALU ZA 44370
Fax: + 260-1-250753
E-mail: unzarec@unza.zm

Ridgeway Campus
P.O. Box 50110
Lusaka, Zambia

Assurance No. FWA00000338
IRB00001131 of IORG0000774

15th February, 2016.

Your Ref: 004-02-16.

Prof. Christian C. Ezeala,
University of Zambia,
School of Medicine,
Department of Physiological Sciences,
P.O Box 50110,
Lusaka.

Dear Prof. Ezeala,

RE: SUBMITTED RESEARCH PROPOSAL: **"ANALYSIS OF THE UNDERGRADUATE STUDENTS' LEARNING ENVIRONMENT IN A MEDICAL SCHOOL IN ZAMBIA" (REF. No. 004-02-16)**

Your application for a waiver of ethics review for the aforementioned protocol was reviewed. The waiver is hereby granted. The approval was conducted in line with the University of Zambia Biomedical Research Ethics Committee guidelines on granting waiver of Ethics review.

CONDITIONS:

- The waiver is based strictly on your submitted proposal. Should there be need for you to modify or make changes to the proposal; you will need to seek clearance from the Biomedical Research Ethics Committee.
- This waiver does not release you from the obligation of ensuring confidentiality.
- If you need any clarifications please consult this office.
- **Ensure that a final copy of the results is submitted to this Committee.**

Yours sincerely,

M.C Maimbolwa PhD
CHAIRPERSON

Date of approval: 15th February, 2016. **Date of expiry:** 14th February, 2017.

ANNEXE J: INVESTIGATOR'S LETTER TO THE DEAN

Department of Pharmacy

School of Medicine,

University of Zambia

February 25th, 2016.

The Dean

School of Medicine

University of Zambia

Dear Dean,

RE: LETTER OF AUTHORITY TO CONDUCT A SURVEY AMONG UNDERGRADUATE STUDENTS IN THE SCHOOL OF MEDICINE

I have now received a waiver from the UNZABREC to proceed with the study titled "Analysis of undergraduate students' learning environment in a medical school in Zambia," which is required for the degree of D Litt et Phil of the University of South Africa (UNISA). I will be grateful if you issue a letter of authority for the study to proceed.

Yours sincerely,

Professor Christian Ezeala, PhD, CSci, CBiol
Assoc. Professor of Pharmacology

ANNEXE K: UNZA-SOM DEAN'S PERMISSION LETTER

THE UNIVERSITY OF ZAMBIA
SCHOOL OF MEDICINE

Office of the Dean

Internal Memorandum

FROM **Dean, School of Medicine**

TO: **Professor Christian Ezeala**

DATE: 29th February 2016

SUBJECT: **Permission to Conduct a Survey**

Thank you for your memo requesting authority to conduct a Survey among undergraduate students in the School of Medicine. Authority is granted.

We wish to congratulate you for formulating this study and wish you well as you conduct the study. We look forward to your results with anticipation as we would like to expedite the processes of getting the evidence into practice.

Please proceed as planned.

Dr. Fastone M. Goma

c.c. The Assistant Dean (Research)

ANNEXE L: SUBSCALES OF THE DREEM QUESTIONNAIRE

Subscale 1. Students' Perception of Learning (SPL)	
Item #	**Statement**
1	I am encouraged to participate in teaching sessions
7	The teaching is often stimulating
13	The teaching is learner centred
16	The teaching helps to develop my competence
20	The teaching is well focused
22	The teaching helps to develop my confidence
24	The teaching time is put to good use
25	*The teaching over emphasizes factual learning*
38	I am clear about the learning objectives of the programme
44	The teaching encourages me to be an active learner
47	Long term learning is emphasized over short term learning
48	*The teaching is too teacher centred*
Subscale 2. Students' Perception of Teachers (SPT)	
2	The teachers are knowledgeable
6	The teachers espouse a patient centred approach to consulting
8	*The teachers ridicule the learners*
9	*The teachers are authoritarian*
18	The teachers have effective communication skills
29	The teachers are good at providing feedback to students
32	The teachers provide constructive criticism here
37	The teachers give clear examples
39	*The teachers get angry in teaching sessions*
40	The teachers are well prepared for their teaching sessions
50	*The students irritate the teachers*

Subscale 3. Students' Academic Self-Perception (ASP)	
5	Learning strategies which worked for me before continue to work for me now
10	I am confident about passing this year
21	I feel I am being well prepared for my profession
26	Last year's work has been a good preparation for this year's work
27	I am able to memorize all I need
31	I have learned a lot about empathy in my profession
41	My problem solving skills are being well developed here
45	Much of what I have to learn seems relevant to a career in healthcare
Subscale 4. Students' Perception of Atmosphere (SPA)	
11	The atmosphere is relaxed during teaching
12	The course is well timetabled
17	*Cheating is a problem in this course*
23	The atmosphere is relaxed during lectures
30	There are opportunities for me to develop interpersonal skills
33	I feel comfortable in teaching sessions socially
34	The atmosphere is relaxed during seminars/tutorials
35	*I find the experience disappointing*
36	I am able to concentrate well
42	The enjoyment outweighs the stress of studying medicine
43	The atmosphere motivates me as a learner
49	I feel able to ask the questions I want
Subscale 5. Students' Social Self-Perception (SSP)	
3	There is a good support system for students who get stressed
4	*I am too tired to enjoy this course*
14	I am rarely bored on this course
15	I have good friends in this course
19	My social life is good
28	I seldom feel lonely
46	My accommodation is pleasant

(Adapted from McAleer & Roff 2001:29)