THE LEARNING STYLES OF OPTOMETRY STUDENTS AT THE UNIVERSITY OF THE FREE STATE

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DECLARATION

I hereby declare that the work submitted here is the result of my own independent investigation. Where help was sought, it is acknowledged. I further declare that this work is submitted for the first time at this University/Faculty towards a Magister degree in Health Professions Education and that it has never been submitted to any other University/Faculty for the purpose of obtaining a degree.

…… ……

Ms E. Kempen **Date**

I hereby cede copyright of this product in favour of the University of the Free State.

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Ms E Kempen **Date**

DEDICATION

I dedicate this dissertation to my husband, Claus and my parents, Sybrand and Vidi.

Your love, encouragement and faith in me have made this dream a reality.

You are my greatest inspiration.

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- To my Heavenly Father with whom nothing is impossible.

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LIST OF ACRONYMS

AC	**Abstract conceptualisation**
AE	**Active experimentation**
CE	**Concrete experience**
CHE	**Council of Higher Education**
ELT	**Experiential Learning theory**
FoHS	**Faculty of Health Sciences**
HEI	**Higher Education Institution**
HPCSA	**Health Professions Council of South Africa**
LSI	**Learning Style Inventory**
NHI	**National Health Insurance**
NQF	**National Qualification Framework**
OECD	**Organisation for Economic Co-operation and Development**
RO	**Reflective observation**
RSA DoE	**Republic of South Africa Department of Education**
SAOA	**South African Optometry Association**
SAQA	**South African Qualification Authority**
SPICES	**Student-centred**
	Problem-based
	Integrated learning
	Community-based
	Electives
	Systematic
UFS	**University of the Free State**

SUMMARY

Key terms: learning styles; educational strategy; higher education, quantitative research; learning environment; curriculum enhancement; Kolb's Learning Style Inventory

In the research project reported here, a study was conducted with a view to providing direction to educators in the Department of Optometry at the University of the Free State (UFS), in order for them to create a learning environment that would motivate students to achieve excellence in the competencies and knowledge required to qualify as competent Optometrists. This study was initiated in response to the identification of a gap in the knowledge regarding the way undergraduate Optometry students at the UFS in 2014 perceived and processed knowledge, known as their learning styles.

Higher education in South Africa faces many challenges. The improvement of graduate production for economic, social, and cultural development highlights the need to revitalise the current educational strategies to minimise the wastage of talent and to prevent the failure of academic careers. According to both scholarly and popular literature, the use of learning styles as an educational strategy will become more important as it is seen as one of the success factors in higher education, contributing to the effectiveness of learning.

The aim of the study was to describe the learning styles of Optometry students at the UFS with a view to creating a better understanding of how students acquire learning and to enhance the learning environment accordingly. This was attained by the means of the following objectives, namely obtaining data to create a deeper understanding of the significance of learning styles in the curriculum framework of higher education institutions and identifying and describing the learning styles of the Optometry students at the UFS according to Kolb's Learning Style Inventory (LSI).

In the study use was made of a quantitative design. Data were gathered by means of a questionnaire survey (Kolb's LSI) among the registered undergraduate Optometry students at the UFS in 2014.

From the findings of the questionnaire survey, the conclusion was drawn that the undergraduate Optometry students of 2014 employed the four learning styles according to the following order of priority: (i) Converger; (ii) Assimilator; (iii) Accommodator; and (iv) Diverger. The findings also indicated that neither of the variables of age, gender, academic year, or ethnicity had any effect on the students' preference of learning style.

These findings, as well as the data collected from the literature survey, were incorporated in the formulation of recommendations for the enhancement of the four components of Kolb's learning cycle, as indicated in the aim of the study. Attention was given to the enhancement of the learning environment most suitable for the two most preferred learning styles. Depending on the learning outcomes and based on the knowledge of the preferred learning styles, the lecturer may choose to match or mismatch the learning styles of the students to the teaching method, or to apply a multi-style teaching approach.

With the learning styles of the undergraduate students identified, the Department of Optometry, through implementation of the recommendations, may create an optimal teaching and learning environment that will accommodate the diversity of this generation of undergraduate students in terms of different learning styles.

OPSOMMING

Sleutelterme: leerstyle; opvoedkundige benaderings; hoër onderwys; kwantitatiewe navorsing; leeromgewing; kurrikulumverbetering; Kolb se Leerstylinventaris

In die navorsingsprojek waaroor hier verslag gedoen word, is ’n studie uitgevoer met die doel om leiding aan onderriggewers in die Departement van Optometrie aan die Universiteit van die Vrystaat (UV) te verskaf, sodat hulle ’n leeromgewing kan skep wat studente motiveer om uitnemendheid te ontwikkel in die vaardighede en kennis benodig om as bevoegde oogkundiges te kwalifiseer. Die studie is geïnisieer in respons op ’n leemte wat geïdentifiseer is rakende die wyse waarop die 2014- voorgraadse Optometriestudente aan die UV kennis bekom en verwerk, bekend as studente se leerstyle.

Hoër onderwys in Suid-Afrika staar baie uitdagings in die gesig. Die dringendheid om die uitset van gegradueerdes te verbeter met die oog op ekonomiese, sosiale en kulturele ontwikkeling, beklemtoon die behoefte wat bestaan om die huidige opvoedkundige benaderings te vernuwe om die verkwisting van talent te verminder en die mislukking van akademiese loopbane te voorkom. Volgens beide vakgerigte en populêre literatuur sal die gebruik van leerstyle as 'n opvoedkundige strategie al belangriker word, aangesien dit beskou word as een van die suksesfaktore in hoër onderwys en dit bydra tot die effektiwiteit daarvan.

Die doel van die studie was om die leerstyle van die 2014-Optometriestudente aan die UV te beskryf met die oog daarop om 'n beter begrip te kry van hoe studente leer en die leeromgewing dienooreenkomstig te verbeter. Dit is bereik deur middel van die volgende doelwitte, naamlik die verkryging van data om 'n beter begrip van die betekenis van leerstyle in die kurrikulumraamwerk van hoëronderwysinstellings te bewerkstellig, en die identifisering en beskrywing van die leerstyle van die Optometriestudente aan die UV aan die hand van Kolb se Leerstylinventaris (LSI).

In die studie is gebruik gemaak van 'n kwantitatiewe navorsingsontwerp. Data is ingesamel deur middel van 'n vraelysopname (Kolb's LSI) wat in 2014 deur die geregistreerde voorgraadse Optometriestudente aan die UV voltooi is.

Uit die resultate van die vraelysopname blyk dit dat die voorgraadse Optometriestudente wat gedurende 2014 aan die ondersoek deelgeneem het, die volgende vier leerstyle, in prioriteitsvolgorde, geïdentifiseer het: (i) Konvergeerder; (ii) Assimilator; (iii) Akkommodeerder; en (iv) Divergeerder. Die bevindinge het ook aangedui dat nie een van die veranderlikes van ouderdom, geslag, akademiese jaar en etnisiteit enige effek op die studente se voorkeurleerstyl gehad het nie.

Hierdie bevindinge, asook die data uit die literatuuropname, is geïnkorporeer in die formulering van aanbevelings vir die verbetering van die vier komponente van Kolb se leersiklus, soos aangedui in die doel van die studie. Aandag is gegee aan die verbetering van die leeromgewing vir die twee prioriteitsleerstyle. Afhangende van die leeruitkomste en gebaseer op die kennis van die voorkeurleerstyle, kan die dosent kies om die onderrigmetode by die leerstyl van die studente aan te pas, of om dit juis te laat verskil, of om 'n multistyl-onderrigbenadering te gebruik.

Met die leerstyle van die voorgraadse studente geïdentifiseer, kan die Departement van Optometrie, deur die implementering van die aanbevelings, 'n optimale onderrig- en leeromgewing skep wat die diversiteit van hierdie generasie van voorgraadse studente ten opsigte van verskillende leerstyle, kan akkommodeer.

THE LEARNING STYLES OF OPTOMETRY STUDENTS AT THE UNIVERSITY OF THE FREE STATE

CHAPTER 1

OVERVIEW OF THE STUDY

1.1 INTRODUCTION

In this research project, an in-depth study was done on the learning styles of the 2014 registered undergraduate Optometry students in the School of Allied Health Professions at the University of the Free State (UFS). This study made use of an adapted Kolb Learning Style Inventory (LSI) to identify the learning styles. The data were analysed and discussed accordingly.

Teaching and learning activities are constructed within a theoretical framework that guides the planning, development and implementation of an educational strategy. A need exists for the educational strategy to be based on current realities as there is clear evidence that there is a mismatch between the realities and the assumptions underlying the traditional structure and approaches (CHE 2013:17).

This study can serve as a directive for the identification of learning styles where both the facilitator of learning and the student can benefit (Romanelli, Bird & Ryan 2009:1). Fletcher, Potts and Ballinger (2008:383) state that "an understanding of the preferred learning style of an individual provides an insight in the teaching methods that are likely to be most effective for that individual".

The aim of Chapter 1 is to orientate the reader regarding the study. In the first sections a background is given of the research problem, followed by the problem statement including the research questions, the overall goal, aim and objectives of the study. Thereafter, the demarcation of the field and the foreseen significance and value of study are explained. This is followed by a brief overview of the research design and methods of investigation. The chapter is concluded by a lay-out of the subsequent chapters and a short, summative conclusion.

1.2 BACKGROUND TO THE RESEARCH PROBLEM

Higher education in South Africa faces many challenges. The improvement of graduate productions for economic, social and cultural development highlights the need to revitalise the current educational strategies to minimise the wastage of talent and to prevent the destruction of lives (CHE 2013:19).

Van Rensburg (2002:26) explains that the acknowledgement of students as individuals with differences has become more evident with the significant changes in higher education as students become more liberated. These individual differences can be expressed through learning styles. A deep learning approach can be adopted when learning styles are taken into consideration. This learning approach is characterised by the active search to create meaning of a concept as well as the questioning and reasoning of issues that relate to previous knowledge and personal experience.

The traditional strategy of the SPICES model (Dent & Harden 2009:12) in curriculum planning was teacher-centred, but the more innovative strategy is student-centred. In this approach the emphasis is placed on the student being responsible for the learning process; they are seen as co-producers of learning, and educators have to take the role as facilitators of learning (Barr & Tagg 1995:11; McCabe & O'Connor 2014:351). In a study done by Pheifer, Andrew, Green and Holley (2003:38) students reported that they had benefited from gaining information about learning styles, and the ability to complete tasks and reach goals on one's own aptitude was reported.

Through identifying the learning styles of students, a more student-centred approached can be adopted and lifelong learners, with the skill of self-learning, will be created (Gurpinar, Bati & Tetik 2011:307). One of the mission statements of the University of the Free State (UFS) is the establishment of transparent opportunities for lifelong learning (UFS 2013: Online). Gurpinar *et al.* (2011:309) proclaim that this outcome can be better achieved by students who are aware of their strengths and weaknesses in learning.

With the implementation of the National Health Insurance (NHI), the South African Optometry Association (SAOA) proposes that Optometry should be integrated in the mainstream health services alongside nursing, ophthalmology and other health care

professions. A big challenge for undergraduate training will come to pass as classes will increase in size and diversity (SAOA 2011:27). Awareness of learning styles will become a more important pedagogic concept as it is seen as one of the success factors in higher education (Romanelli *et al*. 2009:1) and contributes to the effectiveness thereof (Kazu 2009:87).

Learning styles can develop and change over time (Pheiffer *et al.* 2003:36) and should be incorporated within an educational strategy where a learner is able to choose and use the appropriate style of learning (Mainemelis, Boyatzis & Kolb, 2002:7). Eubank and Pitts (2011:72) compared the learning styles of Generation Y (born 1981 – 2000) optometry students with those of students from Generation X (born 1960 – 1980) at the Southern College of Optometry in Memphis. A demonstrable shift was found where Generation Y students preferred to rely on concrete experiences, own imagination and intuition rather than abstract conceptualisation. To enhance the learning experience for this generation of optometry students, educators need to be able to attend to students' needs and understand the variations in learners' styles and approaches (Vaughn & Baker 2001:610). Pheiffer *et al.* (2003:38) concluded that the use of learning styles could assist in the creation of a learner identity by making students more sensitive to the act of learning and to where to fit in as a learner in different contexts.

1.3 PROBLEM STATEMENT AND RESEARCH QUESTIONS

The problem that was addressed in this study was the inadequately examined concept of learning styles of students in the Department of Optometry at the UFS. The student body at the UFS represents all the population groups in South Africa. Along with the culture, ethnical and racial diversity, a variety of learning styles were adopted from previous academic institutions. By identifying their learning styles, educational strategies may be tailored and students' self-awareness of their role in their own learning may be enhanced.

The concept of learning styles emerged when it became evident that learning psychology and study methods of individuals should be taken into account when higher education institutions (HEI) started using integrated, interactive and active teaching strategies rather than traditional methods (Davis & Harden 1999:131).

The Department of Optometry at the UFS makes use of different educational strategies to enhance the learning experience in didactic and clinical education in order to provide our students with the skills set out by the Health Professions Act, 1974, pertaining to the profession of Optometry (HPCSA 2013:Online).

Vaughn and Baker (2001:610) claim that to be effective in medical teaching, which includes optometry, requires flexibility, energy and commitment amidst a busy background of clinical care, and to be successful the educator needs to address the needs of the learners and recognise the variations in learning styles. The challenge to teach students in the way in which they learn will provide a bigger educational impact and will prepare students better for the rigors of the profession they aspire to enter (Cegielski, Hazen & Rainer 2011:135).

In conclusion, although there is an ample amount of literature available on studies of learning styles in higher education (Penger, Tekavcic & Dimovski 2008:2), little research has been done regarding the learning styles of undergraduate Optometry students (Prajapati, Dunne, Bartlett & Cubbidge 2011:70). Although studies have been done on learning styles of students in South Africa, no study could be traced relating to the learning styles of Optometry students in South Africa.

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

1. What is the significance of learning styles in the curriculum framework of higher education institutions?
2. What are the learning styles of the current undergraduate Optometry students in the Faculty of Health Sciences at the University of the Free State?

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

1.4 OVERALL GOAL, AIM AND OBJECTIVES OF THE STUDY

The overall goal, aim and objectives of the study were as follows:

1.4.1 Overall goal of the study

The overall goal of this study was to enhance the learning environment and improve the learning of Optometry students. To achieve this goal the study was aimed at determining and describing their learning styles, as studies have shown that when students and academic staff are aware of these learning styles, teaching and learning may be enhanced.

1.4.2 Aim of the study

The aim of this study was to describe the learning styles of Optometry students at the UFS with a view to create a better understanding of how students acquire learning and to enhance the learning environment accordingly.

1.4.3 Objectives of the study

To achieve the above-mentioned aim, the following objectives were pursued:

1. To gain a deeper understanding of the significance of learning styles in the curriculum framework of higher education institutions. This objective addressed the first research question and was pursued by means of a literature study in order to provide a theoretical basis for this study.
2. To identify and describe the learning styles of Optometry students. This objective addressed the second research question and was pursued by means of a questionnaire, namely Kolb's Learning Style Inventory (LSI).

1.5 DEMARCATION OF THE FIELD AND THE SCOPE OF THE STUDY

The findings from this study are limited to the undergraduate Optometry students at the UFS.

The study fits in the field of Health Professions Education and is aimed at enhancing the teaching and learning environment by gaining an understanding of the learning styles of undergraduate Optometry students; therefore, the study can be classified as interdisciplinary as it spans across Health Professions Education and Optometry.

The researcher in this study is qualified as an optometrist, and obtained a degree in B.Optom., as well as a postgraduate diploma in Sports Vision from the University of Johannesburg. She has been involved in undergraduate training of health professionals at the Department of Optometry in the Faculty of Health Sciences (FoHS), UFS since 2012. The researcher's interest in learning styles fits in with her holistic approach to the development of a student as she realises the necessity to create an enhanced learning experience where the student can actively engage.

The participants in the study were all undergraduate Optometry students registered during 2014 in the FoHS, UFS, who completed a voluntary questionnaire (LSI) during a contact session.

The study was conducted in the Department of Optometry, UFS, between January 2013 and January 2015, with the empirical research phase from February to September 2014.

1.6 SIGNIFICANCE AND VALUE OF THE STUDY

No evidence could be found of studies done on the learning styles of Optometry students in South Africa. In order to address the diversity of learners' needs, learning styles must be identified and used in educational strategies (Vaugh & Baker 2001:610).

The value of this research can be found in the endeavour to improve the delivery of the Optometry curriculum at the UFS as well as in creating self-awareness among students of their preferred learning styles to assist them to become better learners.

The proposed study will contribute significantly to curriculum enhancement through the different educational strategies used. This study is not aimed at adjusting the teaching styles of lecturers, nor the learning styles of students, but with the knowledge of the different learning styles, the department will be able to enhance the delivery of the curriculum and provide a guide to meet individual needs.

1.7 RESEARCH DESIGN OF THE STUDY AND THE METHODS OF INVESTIGATION

In this section the design of the study and methods of investigation will be discussed:

1.7.1 Research design of the study

A quantitative, descriptive study was done.

Burns and Grove (1999:5) define quantitative research as a formal, objective, systematic process in which numerical data are utilised to obtain information. This is supported by McMillan and Schumacher (2001:15) who define quantitative research as research employing the presentation of statistical results in numbers.

The quantitative design followed in this study is described in more detail in Chapter 3, **Research Design and Methodology**.

1.7.2 Methods of investigation

The methods that were used in this research to address the research questions included a literature survey and a questionnaire. These will be further elucidated below.

By examination of the literature available, the significance of learning styles in the curriculum framework of higher education institutions was defined and described. The literature survey was used to put the researcher's effort into perspective, situating the topic in a larger knowledge pool, creating a foundation based on existing, related knowledge (De Vos, Strydom, Fouche & Delport 2011:135).

The questionnaire survey identified the learning styles as described by Kolb. The LSI that was used in this study was a 10-item self-assessment instrument that is derived from Kolb's learning style inventory (LSI 2013: Online). Participants were asked to rank order words which best described the characteristics of their learning style.

The results of the literature study and questionnaire survey can be used to provide information and make recommendations to academic staff in the Department of Optometry to enhance the delivery of the curriculum and provide a guide to meet individual needs.

The detailed description of population, sampling methods, data collection and techniques, data analysis and reporting, and ethical considerations is provided in Chapter 3, **Research Design and Methodology.**

A schematic overview of this study is given in Figure 1.1.

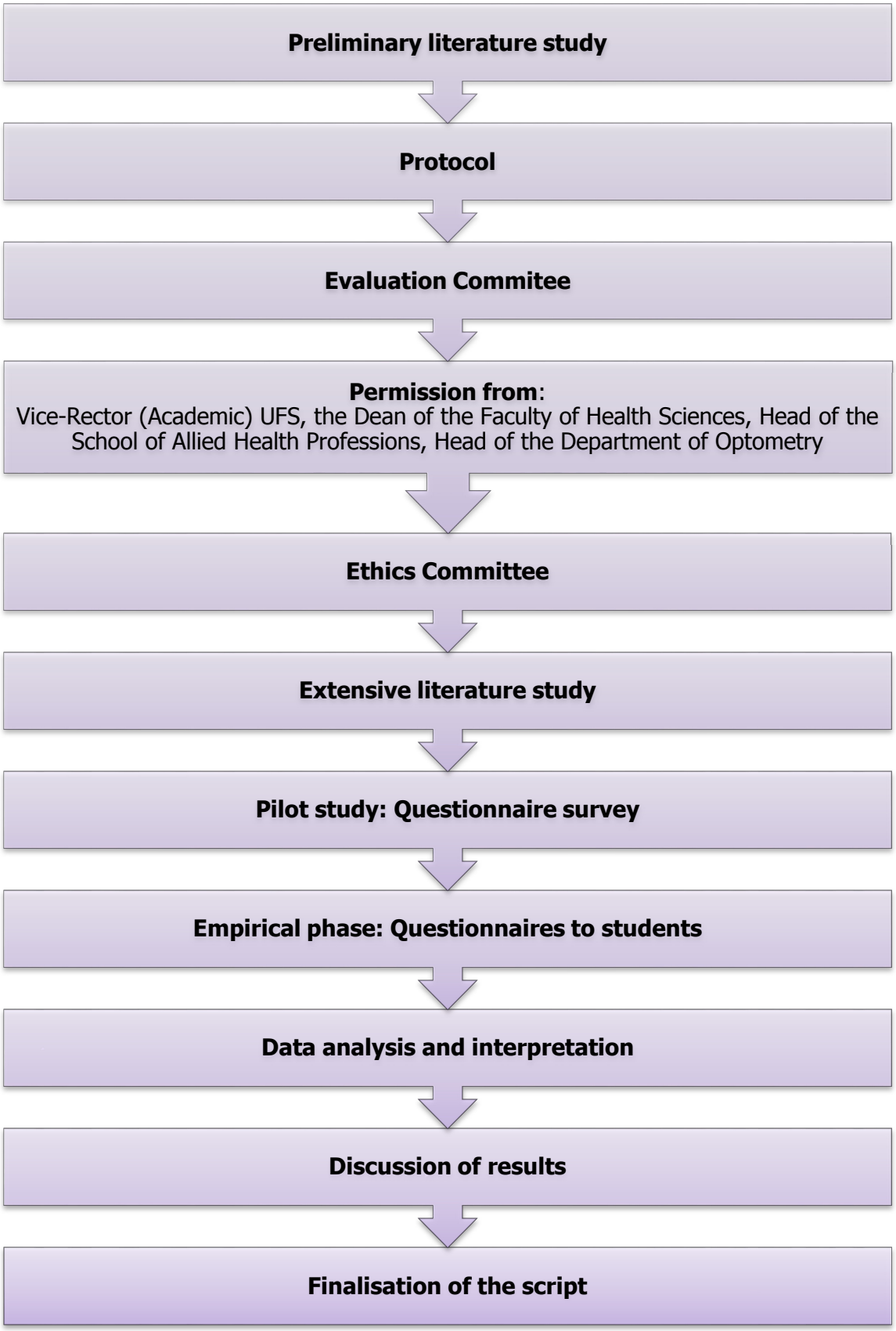

Figure 1.1: A SCHEMATIC OVERVIEW OF THE RESEARCH
[Compiled by the researcher for the purpose of this research project]

1.8 IMPLEMENTATION OF THE FINDINGS

The research findings will be submitted in the form of manuscripts for articles to academic journals with a view to publication, as the researcher hopes to make a contribution to curriculum development in Health Professions Education. The research findings will be conveyed to the academic staff at the Department of Optometry as well as the Faculty of Health Sciences. It will also be presented at national and international conferences.

1.9 ARRANGEMENT OF THE REPORT

This research report has been arranged as follows:

In this chapter, Chapter 1, **Orientation to the study**, a brief introduction to and background of the study were provided, and the problem, including the research questions, was stated. The overall goal, aim and objectives were given and the research design and methods that were employed were briefly discussed to give the reader an overview of what is contained in the report. It further demarcated the field of the study and the envisaged significance and value of the outcome for Health Sciences Education. This was followed by a brief description of the research design and methods of investigation used. Figure 1.1 (*cf.* 1.7.2 Methods of Investigation) was provided as a schematic overview of the study, followed by a brief discussion of the implementation of the findings. Thereafter the arrangement of the report was described, followed by some concluding remarks.

The significance of learning styles in the curriculum framework of higher education institutions will be discussed in Chapter 2, **The significance of learning styles in the curriculum framework of higher education institutions**. Attention will be given to the South African context. This chapter will serve as the theoretical framework for the study.

In Chapter 3, **Research design and methodology**, the research design and the methods applied will be described in detail. The data collecting methods and data analysis will be discussed.

Chapter 4, **Results and discussion of findings of the questionnaire survey**, is devoted to a report on and discussion of the results and findings of the questionnaire survey - the data collecting method employed in the study.

The final outcome of the study will be provided, contextualised in health profession education, and discussed in full in Chapter 5, **A discussion on the learning styles as described by Kolb and used by the Optometry students in the Faculty of Health Sciences at the University of the Free State.**

In Chapter 6, **Conclusion, recommendations and limitations of the study**, an overview of the study, the conclusion reached, recommendations and the limitations of the study will be brought to the reader.

1.10 CLARIFICATION OF TERMS

The following common terms are differentiated to prevent interchangeable use in later sections. The term learning style reflects the manner in which a student prefers to acquire learning (Kazu 2009:86). Learning strategies can be defined as the approaches that an educator may take to actively involve students in the learning process (Meador 2014: Online), while an educational method are means or ways that are used to teach material to students (White and Manfred 2010: Online).

1.11 CONCLUSION

Chapter 1 was aimed at orienting the reader to the study regarding the learning styles of Optometry students at the University of the Free State. It provided an overview of the research that was undertaken as a whole.

The next Chapter, Chapter 2, entitled **The significance of learning styles in the curriculum framework of higher education institutions**, will be a report on the study of relevant literature.

CHAPTER 2

THE SIGNIFICANCE OF LEARNING STYLES IN THE CURRICULUM FRAMEWORK OF HIGHER EDUCATION INSTITUTIONS

2.1 INTRODUCTION

Learning results from what the student does and thinks and only from what the student does and thinks. The teacher can advance learning only by influencing what the student does to learn

Herbert A. Simon

(Ambrose, Bridges, DiPietro, Lovett & Norman (2010:191).

From the quote above it is evident that effective teaching starts with the consideration of how students learn. The idea that people learn differently is not a new concept as it already existed 2500 years ago when the learning method was classified as passive versus active and emotional versus thoughtful. Van Rensburg (2002:42) provides similarities that can be found with modern views as the study of learning styles can be identified as cognitive styles, psychological types and consistent patterns in individuals.

Educational institutions should constantly be aware of the updating and change, improvement and development of the educational environment. By adopting learning styles as an educational strategy, educators are able to adapt their teaching style to improve and enhance the environment for effective learning.

In this chapter, the definition of learning styles, as well as the factors influencing learning styles, will be explicated to create an understanding of the concept of a learning style. Kolb's Learning Style as well as the theories behind learning styles as an effective pedagogy will be discussed. The importance of learning styles in the South African National Transformed Educational system will be highlighted and will conclude with the impact on Optometric education.

Figure 2.1 provides a conceptual framework for this chapter:

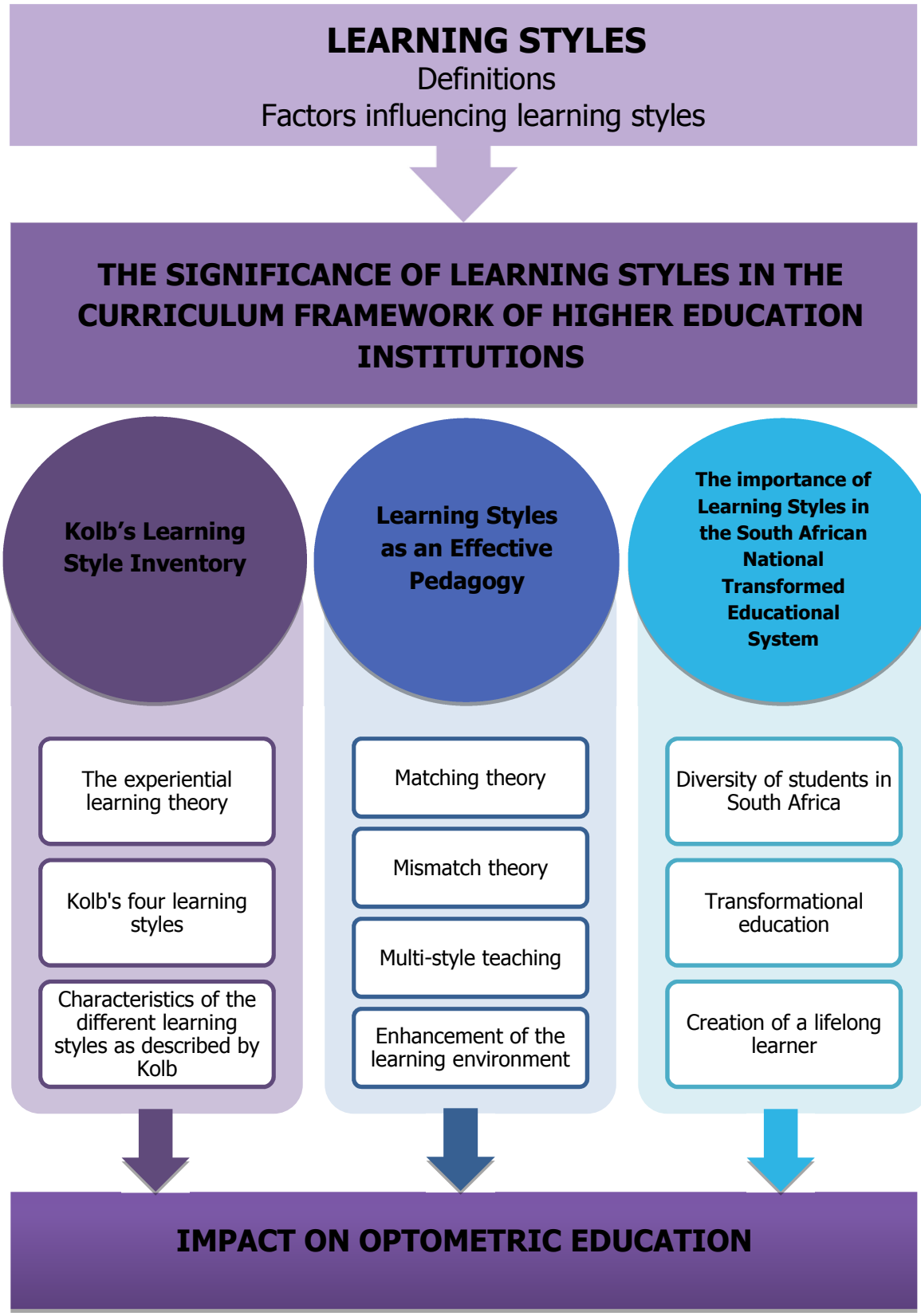

FIGURE 2.1: A DIAGRAMMATIC OVERVIEW OF THE CONCEPTUAL FRAMEWORK THAT WILL BE DISCUSSED
[Compiled by the Researcher]

2.2 LEARNING STYLES

Not all students learn, or are able to learn, in the same way. The different ways of learning are called learning styles.

2.2.1 Learning style definitions

The literature provides countless definitions of learning styles (De Vita 2001:166; Van Rensburg 2002:46). The definition that describes a learning style with all the encompassing properties, and which is still seen as the benchmark definition, is provided by Keefe (1979), according to whom:

"*Learning styles are characteristic cognitive, affective, and psychological behaviours that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment.*"
(in De Vita 2001:166; Kazu 2009:86; Penger *et al.* 2008:4).

Taking this definition of learning styles into consideration, Kazu (2009:90) states that education can influence the cognitive components due to the fact that it acts as the internal control that runs knowledge. The affective and psychological components have an effect on the individual's preference to different educational and teaching strategies.

The criteria which surfaced from investigation of the various definitions of learning styles by Van Rensburg (2002:51) are:

- Learning styles are individual differences.
- Learning styles are unique ways of perceiving information.
- Learning styles are processes of organising information and learning experiences.
- Learning styles can be consistent or changeable, depending on the situation.
- Learning styles are approaches to learning or ways of engaging in learning.
- Learning styles involve attitude towards the learning situation and material.
- Learning styles demonstrate cognitive processes.
- Learning styles determine the way of problem-solving.
- Learning styles are ways of processing information.

Robotham (1999:3) identified the lack of agreement regarding the nature of learning styles and the uncertainty about its stable characteristics. This is confirmed by Penger *et al.* (2008:4), who state that the key differences among the various theories of learning styles is the extent to which the characteristics are thought to be established or permanent. Some theorists consider these characteristics to be embedded in fixed genetic traits, while others describe the method of gaining experience as well as the environment and curriculum design as factors influencing a learning style.

Due to this overlap in the definitions of learning styles and the uncertainty regarding the behaviours that create and build a learning style, Curry (1983) as summarised by Chapman and Calhoun (2006:577) proposed a unifying three-level hypothesis.

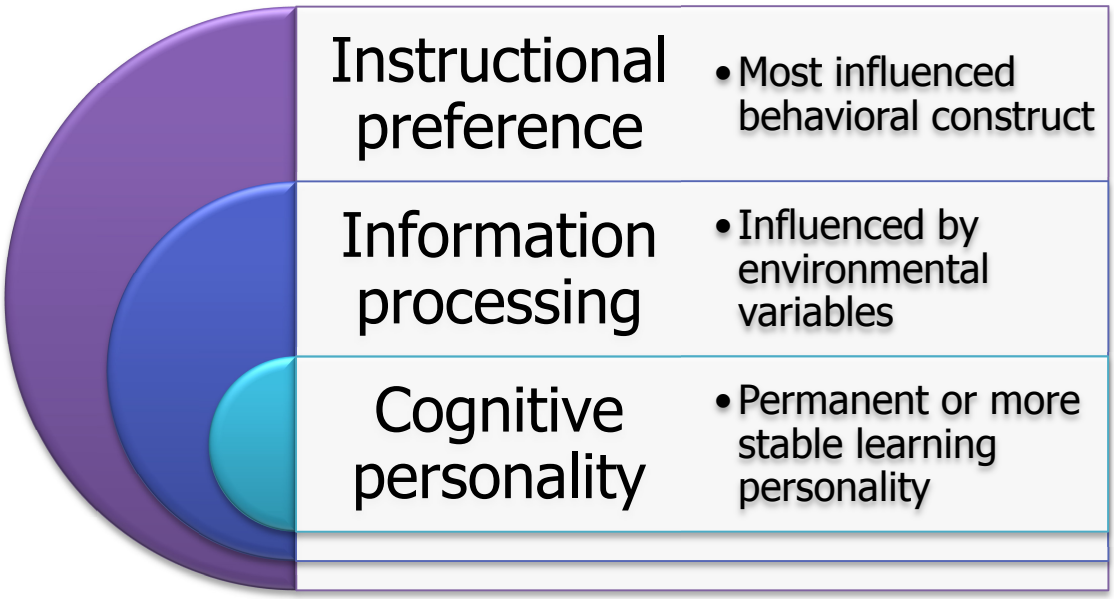

FIGURE 2.2: BUILDING BLOCKS OF CURRY'S THREE-LEVEL HYPOTHESIS
[Compiled by the Researcher]

As illustrated in Figure 2.2 the core level can be described as the cognitive personality and is thought to be the most permanent or stable building block of a learning style. This level expresses personal characteristics such as introversion versus extroversion. Students absorb knowledge at this level, independent from the learning environment. The middle level relates to how students absorb and process information utilising their senses and their short- and long-term memory. In this building block the focus is more on the individual's preferences regarding how to acquire information. Information processing can be adapted by environmental variables such as experience, and therefore is described as less stable.

The outer ring of the hypothesis depicts how students prefer to learn and who prefers a particular instructional approach, and is seen as the social interaction level. The instructional model is seen as the direct assessment of how students prefer to learn and includes the preference for structure, working at a particular pace, and relationships with peers as well as educators (Van Rensburg 2002:8). Lectures, individual study, and small-group study are the instructional methods that are recommended (Chapman & Calhoun 2006:577). According to Vawda (2005:21), a fourth level can be added, which focuses on features such as light and temperature, motivation and persistence, individual or group preference, as well as left or right brain preference.

Curry's three-level hypothesis correlates with the three groups of factors discussed by Robotham (1999:1) that have an influence on how a student develops and refines a learning style in response to unconscious personal interventions, conscious interventions by the learners themselves, and the third level, interventions by an external agent.

A learning style is referred to as the individual's chosen method of perceiving and processing information. Learning styles are shaped by genetic characteristics, past experiences, and expectations of the social environment (Gurpinar *et al.* 2011:307). According to Kolb and Kolb (2005a:6), early educational experiences outline a student's learning style by establishing positive approaches to a specific set of learning skill and by teaching students how to learn. Kazu (2009:85) explains that a learning style is related to an individual's characteristics and preferences, and reflects how the student prefers to perceive the environment, interact with the environment, and react to and experience the learning process. A student's approach to attain knowledge is more dependent on situational factors, such as the style of assessment, rather than personal factors, as these are likely to stay stable over a period of time (McChlery & Visser 2009:300).

A learning style can be thought of as the formulation of preconceptions, such as previous experiences, cognitive ability, and personality, by an individual engaged in the activity of learning (Cegielski *et al.* 2011:135). Pheiffer *et al.* (2003:37) advocate that the identification of a learning style must act as a medium for development, and not be accepted as fixed characteristics of the learner.

Kaplan and Kies (1995:30) state that a learning style is an inborn characteristic that can change and develop during the life of an individual through experiences. This correlates with the referral to a balanced learner, made by Pheiffer *et al.* (2003:36), who explain that the student's learning style develops and changes during the student's educational and professional careers. Kolb and Kolb (2005b:195) state that, due to hereditary equipment, particular life experiences, and demands of the present environment, a preferred way of learning develops.

A conclusion that may be drawn from the literature is that the preference of a specific learning style may change over time, and this might be due to the personal maturing of a student. Taking Keefe's definition (cf.2.2.1), as well as the information-processing model described in Curry's hypothesis (cf. figure 2.2), into consideration, it is clear that there will be different factors influencing a student's learning style, as the way in which (how) he/she perceives, organises and processes information is shaped by his/her previous experiences and personality (Prajapati *et al.* 2011:70). These factors will be discussed in the following section.

2.2.2 Factors influencing learning styles

There are many reasons why some students prefer to learn in specific ways at specific times and others prefer other ways of learning. These reasons are the results of specific factors which have an influence on students, and therefore on their way of learning.

2.2.2.1 *Personality*

The first of these factors is personality. Kazu (2009:85) states that an individual's preferences are central in a specific style and that personality, perception, ability and intelligence affect motivation and attitudes in a learning environment, and influence a learning style. Kolb and Kolb (2005a:6) argue that although personality has a small, persistent influence in almost every situation, learning styles are more influenced by the increasingly specific environmental demands of education specialisation, career, work and task skills.

2.2.2.2 *Academic discipline*

Learning contexts vary across and within disciplines, and different academic fields provide different learning environments. Research has shown that students studying for science-based degrees become more analytical and less creative, while the opposite is true for art students, as the educational process brings out the gap in capabilities between the groups of students (Montgomety & Groat 1998:4). This correlates with the findings of Kolb and Kolb (2005b:201), who compared the learning styles of management school students and art school students, and found vast differences. Robotham (1999:5) found evidence that learning styles could change during the course of studies, as students adapted their learning styles according to the requirements of the learning task.

Kolb and Kolb (2005a:6) maintain that specialisation in a specific education field becomes more focused in higher education and influences individuals' orientation towards learning. They also explain that a professional career choice involves a specific, specialised learning environment where a learning style is shaped by behaviours acquired in professional training and normative pressure to be a skilled professional. This view is confirmed by Manee, Nadar and Jahrami (2013:255), who explain that due to the academic and practical training, as well as the socialisation into the qualified health profession responsibility, students' learning evolves.

Felder and Soloman (1999:Online) warn that a learning style profile should be used as an indication of strengths, tendencies and habits of learning that might lead to difficulty in academic settings, and not as the student's suitability for a specific field of study or profession.

2.2.2.3 *Gender*

With regard to gender, McChlery and Visser (2009:300) found that learning style preferences between male and female students were not significantly different. Mainemelis *et al.* (2002:12), on the other hand, found some noteworthy differences in terms of gender. They concluded that females had a tendency to learn more when they could reflect on an observation made or an experience, while males preferred abstract conceptualisation.

In a study by Manee *et al.* (2013:256) on a group of physiotherapy students, it was found that the males preferred a learning style which would allow them to be problem-solvers and decision–makers, while the female students preferred or tended to create an understanding of a wide range of information and putting that into a concise, logical form.

Females are likely to adopt a learning style according to which they can work together, listen, and express empathy, whereas males prefer a learning style which provides them opportunities to express their views and take on the role of an expert (Montgomery and Groat 1998:2). Manee *et al.* (2013:256) conclude that males are more achievement-orientated and externally focused, while females are socially and performance-orientated, and tend to be more introspective and self-critical.

2.2.2.4 *Culture*

Culture is seen as a key agent of socialisation and has an influence on the development of learning styles. Environmental perceptions, which are influenced by culture, establish the mode in which information is processed and organised (Romanelli *et al.* 2009:3). De Vita (2001:173) provided a correlation between culture and learning styles. This correlation is validated by McChlery and Visser (2009:300) who state that nationality can be seen as a factor in the differences found in learning styles among students. In contrast, Gurpinar *et al*. (2011:308) found no statistically significant differences between demographic characteristics and learning styles.

2.2.2.5 *Generation*

Eubank and Pitts (2011:72) compared the learning styles of Generation Y (born 1981 – 2000) optometry students, with students from Generation X (born 1960 – 1980) at the Southern College of Optometry in Memphis. The dominant learning style was identical in both generations, but a demonstrable shift was found where Generation Y students preferred to rely on a concrete experience, own imagination and intuition rather than on abstract conceptualisation.

The current generation of students is described as more technological advanced. Romanelli *et al*. (2009:3) explains that the technological age may also have an

influence on learning styles as younger students are more familiar with improved visual aids, and the development in technology has made visual images more pervasive.

In order to create an understanding of a learning style, these influential factors have to be taken into consideration as students themselves are diverse in personality, gender, age, culture, academic discipline and stage of education.

2.3 KOLB'S LEARNING STYLE INVENTORY

Several models and measures of learning styles are described in the literature (Romanelli *et al.* 2009:2). Kolb's learning style inventory (LSI) is one instrument used to assess and identify a preferred learning style. Kolb's LSI has been identified as the most influential learning style model and the most popular to be administered to health sciences' students (*cf.* 3.3.2.1). The LSI will be explicated in the following section.

2.3.1 The Experiential Learning Theory

Kolb's LSI (Kolb & Kolb 2005a:8) is different from other learning style and personality tests as it is based on development with the view that learning based on experience is a fundamental part of how humans learn and develop.

Experiential learning is often misinterpreted as a set of equipment and techniques to provide students with experiences from which they can learn. The Experiential Learning Theory (ELT) is a philosophy of education derived from work done by Dewey, Lewin and Piaget (Kolb & Kolb 2005b:193). Piaget's theory supports learning through discovery and experience rather than memorising. This is in contrast with some secondary educational systems which focus on didactic approaches that have an outlook on learning as being a rehearsal of facts (Robotham 1999:8). Dewey's theory of experience (1938) as reviewed by Vawda (2005:23) views experience as a cycle of trying that begins with the detection of a predicament, then formulates and applies a solution that leads to an experience that will have consequences which can confirm or reject the solution. Lewin's cycle suggested four stages of learning: concrete experience; personal reflection; linking with previous knowledge and exploring new ways of adjusting (Manee *et al.* 2013:255).

The cognitive, emotional and the physical aspects of students are taken into consideration in experiential learning. To achieve this holistic approach to acquiring knowledge and skills, activity, reflection and application can be applied to engage the student's mind and/or body through observation, simulation and participation (Vawda 2005:25).

Experiential learning provides the student with the opportunity to directly apply the information in order to be self-efficient and learns from the experience (Manolis, Burns, Assudani & Chinta 2012:45). Ambrose *et al.* (2010:47) discuss a principle of influential learning and performance and state that influential learning and performance are not just about what is known, but also about how the knowledge is organised. They explain that people naturally make associations based on examples they have experienced in the world, and the way in which they organise their knowledge tends to differ as a function of experiences.

Experiential learning is found to be effective by increasing the students' awareness of their own knowledge, applying it to actual situations and the ability to understand, control and manipulate their own cognitive processes to become self-directed learners (Manolis *et al.* 2012:45). For students to develop mastery, Ambrose *et al.* (2010:120) explain that when students obtain a set of competent skills, combining and integrating these skills are needed to develop greater confidence and independence. An understanding will be developed of the conditions and contexts in which they can apply what they have learned. These elements of mastery need to be trained and enforced through practice.

The ELT is built on six proposals as described by Kolb and Kolb (2005a:2):

1. Learning is best conceived as a process where students are given the opportunity to engage in the learning process and not in terms of outcomes.
2. All learning is relearning and seen as a continuous process grounded in experience. The current philosophy and ideas students have must be extracted to be examined in order to integrate them with more developed ideas.
3. Learning requires the resolution of disagreement between logically discussed, contrasting modes of adaptation to the world. During the process of learning it is

mandatory to take the different views of reflection, action, feeling and thinking in consideration.

4. Learning is a holistic process that involves the integrated function of the total person.
5. Learning results from synergetic transactions between the person and the environment.
6. Learning is the process of creating knowledge. This includes a constructivist theory of learning where social knowledge is transformed to personal knowledge of the student.

Based on the ELT, Kolb (1984: Online) defined learning as the process whereby knowledge is created through the transformation of experience. The two differences in learning involve perception and processing. Kolb and Kolb (2005b:194) elaborate and explain that the ELT model represents two dialectically related modes of grasping experience (perception) and transforming experience (processing). Perception can be defined as the manner in which information is acquired in new situations. It can take place through sensing or feeling as well as thinking. Processing is the personalisation of information and experiences. This can be done actively or reflectively (Fardouly 2014: Online).

The course of experiential learning follows a cycle of learning which starts with the completion of a Concrete Experience (CE), followed by Reflective Observation (RO) on that experience. From these insights, a theory or Abstract Conceptualisation (AC) is constructed. This is then tested through an Active Experimentation (AE) (Kolb & Kolb 2005a:2).

This experiential learning model is based on the existence of these four learning modes where the student has the opportunity to cover all the bases of learning – experience, reflecting, thinking and acting (Kolb & Kolb 2005b:194). Concrete experience involves direct experience, feelings and emotions. Information is perceived through senses and meaning is connected to the experience that acts as basis for observations and reflections. Reflective observation entails reflecting on (think about) a present experience from many perspectives on a personal basis, collecting the details and gathering new information about the experience. Emphasis is placed on understanding the meaning of ideas and situations rather than practical implications. These

reflections are absorbed and separated into abstract concepts. Abstract conceptualisation is important to create meaning of and reason for an experience in order to integrate observations and guide new plans for future actions. The focus here is on ideas and concepts that are logical. Active experimentation involves the manipulation of the external world to modify the experience to create the one to follow. Practical applications, instead of reflective understanding, are made use of to change situations and influence others (Kayes 2005:250).

The ELT cycle has been linked to the process of brain functioning and arises from structures in the brain. Figure 2.3 relates Kolb's learning cycle with the structures in the brain. Franzoni and Assar (2009:15) suggest that the most effective way of learning is brought about when the whole brain is utilised. Greater potential of the brain for learning and creativity occurs when an enhanced connection exists among the structures.

FIGURE 2.3: ELT LEARNING CYCLE AND CORRESPONDING REGIONS OF THE CEREBRAL CORTEX
Adapted from Kolb & Kolb (2005b:195)

Kazu (2009:87) elaborates on this view and explicates that people learn through feeling, thinking, watching and doing, and links these actions to the four modes described above. Individuals with an abstract learning style learn by thinking information through in contrast to those with a concrete learning style who operate based on feelings and emotions. Those individuals with a reflective style prefer to process knowledge through watching, whereas those with an active style experiment and learn by doing.

Experiential education can be defined as education that occurs as direct participation in the events of life where personal experiences come to the forefront. For the experience to be educational, it must possess continuity, where one experiences leads to further experiences forcing the students to learn more, and interaction that refers to the degree to which the experience relates to personal goals set (Manolis *et al.* 2012:45). In order to learn from an experiential undertaking as a personal experience in the educational process, individuals need to utilise the unlimited amount of information available productively. Failure to do so will affect their self-efficacy.

2.3.2 Kolb's four learning styles

The four learning modes of the ELT generate two bi-polar dimensions, namely information-gathering/perception (consisting of CE and AC) versus information-processing (consisting of RO and AE). These dimensions reflect how new information is perceived and acted upon (McChlery & Visser 2009:302). The information-gathering axis is also described as the apprehension dimension and involves perception that is straightforward and instantaneous and can be seen as the knowing continuum. The information-processing or transformation dimension is dialectically opposite in the sense that it is described in the notions of introversion as opposed to extroversion. The four learning styles are also distinguished by asking the 'why?', 'what?', 'how?' and 'what if?' questions (Montgomery & Groat 1998:3).

According to Kolb, learning takes place when one or more of the four modes of the ELT are utilised to resolve a learning problem; when an individual develops a preference for two of the four modes, it is described as a learning style (Kayes 2005:250). Mainemelis *et al*. (2002:2) contend that these learning styles represent specialised and restricted ways of learning. Kolb and Kolb (2005b:195) identify forces from social,

educational and organisational socialisation that give rise to the development of a preferred learning style. A preferred way of choosing among the four modes is developed due to factors such as hereditary equipment, certain life experiences and demands of the current learning environment (Kolb & Kolb 2005a:4). Cegielski *et al.* (2011:136) suggest that each individual has a preference towards a particular, but versatile, modality for learning.

From the combination of the learning dimensions, four learning styles types (Figure 2.5) emerged, namely

1. Diverger (CE and RO)
2. Assimilator (RO and AC)
3. Converger (AC and AE)
4. Accommodator (AE and CE) (Kayes 2005:250).

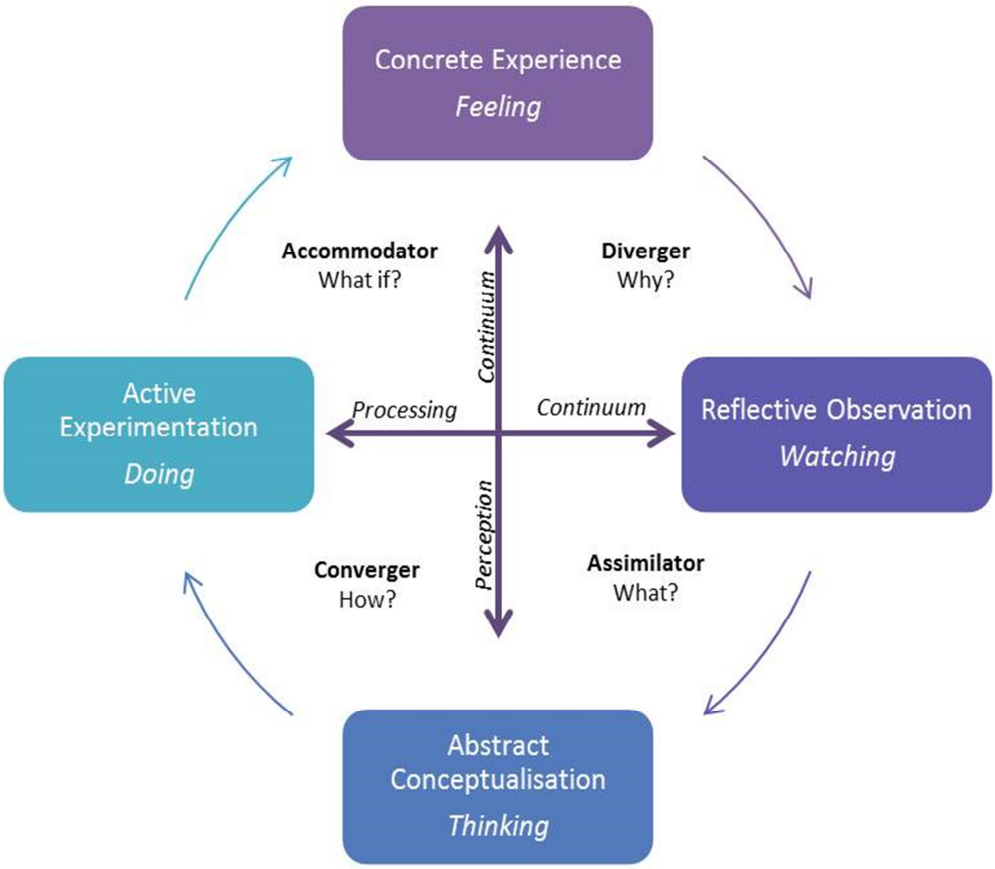

Figure 2.4: KOLB'S EXPERIENTIAL LEARNING MODEL AND LEARNING STYLES Adapted from Manolis *et al.* (2012:46)

2.3.3 The characteristics of the different learning styles described by Kolb.

Individuals, who use these different approaches to or styles of learning, usually can be recognised by different features and ways of approaching their studies.

2.3.3.1 *Diverger*

The divergers, also known as the reflectors, follow a learning style that is characterised by learning through concrete experiencing and reflective observation. Individuals, who prefer this learning style, learn through creating and generating new ideas and imagining new possibilities (Kayes 2005:250). They have been described as having good imaginative skills and highly developed values (Buch & Bartley 2002:6). They are able to view actual situations from several different points of view, and enjoy gathering information, working in groups and listening with an open mind to diverse inputs. Emphasis is placed more on observation than action that classifies them as good listeners that do well in brainstorming situations. Kolb and Kolb (2005a:7) made associations to skills with this type of learning style such as relationships, helping others and making sense of a problem.

With their interest in people and culture, their preferred fields of study are educational sciences, communication, and public and educational management (Gurpinar *et al.* 2011:309). Divergers find it difficult to make decisions, think scientifically, put ideas to action, decide what to learn, reach conclusions, and put information into practice.

Divergers perceive information concretely and process through reflective observation. Being social learners who regard feedback as essential, the suggested activities to accommodate these learners include reflective activities, group discussions and group projects. On-line working tends to isolate the diverger; therefore, the mode of delivery should rather be a traditional classroom teaching, where interaction with peers must be encouraged (Buch & Bartley 2002:6). The facilitator of learning, as explained by Montgomery and Groat (1998:5), must adopt the role of motivator to ensure that the student with this learning style is comfortable in his/her preferred learning environment.

2.3.3.2 *Assimilator*

The learning style of the assimilator typically follows the modes of learning through reflective observation and abstract conceptualisation. This is an individual described as a theorist who draws on multiple sources of information and organises information step by step and logically (Kayes 2005:250). Individuals with this learning style tend to focus less on people and more on ideas and abstract concepts that are logical and reliable, but not necessarily practical. Kolb and Kolb (2005a:5) relate thinking skills, that include information gathering, information analysis and theory building and testing, to the assimilating learning style.

Information is perceived abstractly, but processed the same as the divergers would do, through reflection. In contrast with divergers, assimilators are private learners. Assimilators prefer a traditional, structured, systematic, logical and comprehensive information presentation, which is instructor-based learning where they are allowed to have time to think things through. Activities in which this type of learning style will be accommodated, include lectures, textbook reading, case studies, independent research and objective exams.

As the assimilator is less dependent on the instructor (Buch & Bartley 2002:6), the facilitator of learning must adopt the role of an expert (Montgomery & Groat 1998:5). Gurpinar *et al.* (2011:309) maintain that the field of physics, mathematics, biology, education, law and social sciences are the ideal fields of study for assimilators.

2.3.3.3 *Converger*

The converger, who is a pragmatist, is motivated to discover the relevance of a situation. Learning is acquired through thinking and doing (Vawda 2005:37). This learning style is typical of the modes of learning that are characterised by abstract conceptualisation and active experimentation. The individuals described as convergers, prefer interaction with technical tasks or problems rather than social and interpersonal issues. They tend to solve problems practically and are decision makers (Kayes 2005:250); they prefer to use brainstorming, practical applications and case analysis as learning methods (Gurpinar *et al.* 2011:309). The strong points of convergers include that they are able to apply good time management through

planning systematically. They are goal orientated and follow instructions with care and accuracy to generate singular solutions to problems.

The literature suggests that students with these tendencies as their predominant learning style prefer fields of study such as medicine, economics, and computer science (Gurpinar *et al.* 2011:309). Kolb and Kolb (2005a:5) state that in formal learning situations convergers prefer to experiment with new ideas, simulations, laboratory assignments and practical implications. Dent and Harden (2009:217) define simulation as any educational activity that makes use of simulative aids in order to facilitate the educator to enhance the educational message. Simulation can be used in medical and allied health professions training to train students in important skills such as clinical decision making, non-technical skills and reasoning, alongside the professional characteristics of empathy, compassion and integrity. The enhancement of mastering the higher cognitive, affective and psychomotor skills is possible through simulation without compromising patient safety (Khan, Pattison & Sherwood 2011:2). This renders simulation, the preferred learning mode of convergers, the ideal in health professions education.

The information that was observed abstractly is being processed through active experiments. In seeking for the answer to "how?", students with this learning style will learn best in an environment where they can solve problems, have computer simulations and demonstrations. Small-group discussions and class room participations instead of lectures should be incorporated in teaching to the benefit of students with this pragmatic style as their preferred learning style (Buch & Bartley 2002:7). Montgomery and Groat (1998:5) state that the converger thrives in a learning environment where the facilitator of learning is the coach of the learning process.

2.3.3.4 *Accommodator*

One of the characteristics of these individuals is that they tend to find themselves in leadership roles where they take action, have the opportunity to show initiative and are willing to take risks when it comes to gathering information, from others, rather than through personal examination (Kayes 2005:250). Students with this learning style adhere to modes of learning according to which they learn through active experimentation and concrete experience. These students, sometimes called activists,

do best in situations where adaptation to the immediate changing environment is required and they prefer to solve problems according to an intuitive trial-and-error approach (Vawda 2005:39).

Accommodators generally are found to study in fields such as fine arts, history, political sciences, foreign languages, psychology and literature, and they tend to prefer to learn primarily from hands-on experience, working with others to get assignments done, and they act on intuition rather than on logical analysis. Gurpinar *et al.* (2011:309) state that accommodators are known to depend more on feelings than on logic, are impatient and plan inconsistently, which could lead to problems not being solved on time.

The facilitator needs to act as an evaluator or remediation agent in the accommodators' learning environment, and should provide open-ended problems and simulations as learning tasks. Self-directed educational strategies such as projects, role play and simulations are ideal for this type of learning style. Role play can be defined as an experiential learning method where students have to act out roles in case scenarios to attain targeted outcomes and to receive feedback to train skills. Role play is valuable in skills, knowledge and attitude development and enhances the transition from a classroom to a clinical setting (Joyner & Young 2006:225).

Table 2.1 provides a brief synopsis of the four learning styles.

TABLE 2.1: SYNOPSIS OF KOLB'S LEARNING STYLES
[Compiled by the researcher]

Diverger	**Assimilator**
• Reflector • Creates and generates new ideas. • Views actual situations from several different points and enjoys gathering information. • Enjoys group work • Emphasis is placed on observation. • Values relationship and helping others	• Theorist • Considers sound logical theories • Organises information step by step • Focuses on ideas and abstract concepts • Makes use of thinking skills • Prefers traditional and structured information presentation
Converger	**Accommodator**
• Pragmatist • Interaction with technical tasks • Solves problems practically • Decision makers • Good time management • Goal orientated	• Activist • Takes action, initiative and risks • Gathers information from people rather than own examination • Intuitive trial-and-error approach • Learns from hands-on experience

The literature suggests various educational strategies and methods to incorporate and accommodate the different characteristics of Kolb's learning styles as discussed above. These theories will be discussed in the following section.

2.4 LEARNING STYLES AS AN EFFECTIVE PEDAGOGY

Fletcher *et al.* (2008:374) defined pedagogy as the study of how learning takes place. De Vita (2001:165) implies that there is a big controversy about how to apply learning styles as an effective pedagogy. A learning environment needs to be created that promotes growth-producing experiences for students with different learning styles (Kolb & Kolb 2005b:205). In the literature three theories have been discussed to this end, namely the matching theory, the mismatch theory and multi-style teaching.

2.4.1 Matching theory

To match the characteristics of instruction to the identified preferred learning style seems logical to make instruction more effective, as students will reject the learning environment if it varies from their developed learning styles (Robotham 1999:4). Celgielski *et al.* (2011:135) indicate that subject matter will be more rapidly absorbed and a better understanding will be acquired when the pedagogical approach used in teaching closely mirrors the student's dominant learning style preference. By using teaching aids that match the students' learning style preference a harmonic learning environment is created where students can learn more effectively (Penger *et al.* 2008:1). More learning takes place, learning time is reduced and students retain information longer (Van Rensburg 2002:67).

Learning motivation, participation and quality of education, as well as performance will be increased when educational programmes are regulated according to the students' preferred learning style (Gurpinar *et al.* 2011:309; Kazu 2009:85; McChlery & Visser 2009:300). Ambrose *et al.* (2010:68) define motivation as the personal investment that an individual has in accomplishing a required position or outcome. In the context of learning, they report that motivation influences the direction, intensity, persistence and quality of the learning, and the importance of motivation cannot be overstated. When given a choice, students will opt to make use of their dominant learning style in order for them to stay in their comfort zone (Vaugh & Baker 2001:610).

Celgielski *et al*. (2011:138) propose that measurable outcomes and task performance in the educational process may be enhanced by the coordination of the instructional methodology and the student's type of learning style. Pheiffer *et al.* (2003:36) suggest that the individual learning style characteristics, and not only the content, should direct the learning process, as it will increase the teaching efficiency. They further claim that the matching of learning styles can be seen as a universal remedy for learning problems. This, however, is a claim that is easier said than it can be fulfilled, taking into consideration the size of current day classes, and limited teaching time.

With the variety of different learning styles that will increase as a result of the increase in class sizes, De Vita (2001:170) suggests that the easy alternative would be for the students to transform their learning behaviour to match the lecturer's teaching style in

order to allow the lecturers to be comfortable with their own teaching skills and strengths in which they are competent. Hawk and Shah (2007:1) believe that lecturers adopt a teaching style based on how they prefer to learn, and according to a learning approach that was effective for their own learning in their higher education studies. According to Vaughn and Baker (2001:610) educators prefer teaching styles with which they are comfortable (based on their learning styles) and to which they refer back in situations when they are confused. Therefore, a serious mismatch may occur between what the lecturer prefers and what the students need to make teaching and learning effective.

Learning style of students, the capability of the learner and educational objectives are just a few considerations that should be taken into account when lecturers consider adopting a specific teaching style, but Vaughn and Baker (2001:610) warned that constant matching of teaching styles to dominant learning styles can be the source of boredom in the learning environment. Prajapati *et al.* (2011:70) argue that an effort to match the learning styles of the dominant group will without doubt disadvantage the learners preferring other styles of learning. The matching theory can become complex as it empowers the student in the short term, but restricts the development of a balanced learner, as mentioned earlier, in that a learning style preference might change as the student develops his or her own skill of acquiring learning (Pheiffer *et al.* 2003:36). Therefore, rather than to endeavour to adopt a teaching style that would match the learning styles of the students, the mismatch theory is recommended (Prajapati *et al*. 2011:70).) to enhance the development of a balanced learner.

2.4.2. Mismatch theory

According to Romanelli *et al*. (2009:1), the mismatch theory may be applied in order to support students to develop their academic capabilities and learn more integrated habits because that will provide an opportunity to expand the spectrum of activities with which they are comfortable, and hence will ensue in the development of more integrated learners. The learners would be able to respond more effectively when they are exposed to different learning stimuli and environments that create both comfort and tension, and where there is a certain amount of challenge in the learning situation. Mismatched learning and teaching styles will support the development of the ability of students to cope with situations outside their comfort zone (Prajapati *et al*. 2011:70).

Chapman and Calhoun (2006:576) suggest that when the mismatch theory is gradually introduced and mentored the students will mature in learning. Successful learners can adapt to a learning style which the learning outcome as well as the type of assessment requires (McChlery & Visser 2009:300; Vaughn & Baker 2001:610).

Pheiffer *et al.* (2003:37) labelled the mismatch theory as a developmental approach, due to the change in learning styles, as mentioned by Kolb (*cf.* 2.3.1). Development is described by Ambrose *et al.* (2010:159) as a response to intellectual, social or emotional challenges that catalyses students' growth. Mainemelis *et al.* (2002:2) describe Jung's theory of development as the adaptation of a more holistically integrated way of development rather than a specific way, and that can be made applicable to learning too. Integrated learning can be described as the involvement of creative tension among learning styles that reacts to appropriate demands. This repetitive process that responds to the learning environment as well as content can be seen as the ideal learning cycle where the student can experience, reflect, think and act. In their research study Mainemelis *et al.* (2002:7) investigated whether learners with balanced learning styles produced more integrated learning than those who specialised in one learning style, and interesting enough, found that the balanced learner did not show greater skill in integrated learning.

Kolb (1984: Online) summarises the aim and focus of the mismatch theory. The aim is to rejuvenate the student and to create an independent student. The focus of the mismatch theory is on integrative development allowing the student to mature in each of the four learning modes or styles. The student is exposed to experiencing the rigidity and rivalry among these orientations, as it is from these tensions that creativity is generated.

Caution must be taken, however, to avoid frustration and disengagement that may result when the gap of the mismatching is made too big to overcome (De Vita 2001:170). Students also may spend a major part of their time on manipulating the material that is presented to suit their type of learning style, rather than to spend time on comprehending and applying the information (Romanelli *et al* 2009:3). McChlery and Visser (2009:300) also argue that the danger exists that emphasis may be placed on the inappropriate learning style, instead of encouraging suitable learning styles that will also enhance a life-long learning experience.

Robotham (1999:6) purports that when there is a mismatch of the preferred learning style and instruction a student may mentally avoid participation, although still physically attending, and responding to the matching theory, they may adopt a narrow learning focus. In answering the what, why, how, and what if questions, raised by Kolb's learning cycle, Montgomery and Groat (1998:4) suggest that the lecturer must teach following the ELT learning cycle (*cf.* Figure 2.3) to ensure that all the learning styles have been accommodated.

2.4.3 Multi-style teaching

Romanelli *et al.* (2009:1) posits that to utilise a diversity of teaching styles is still best practice, as every type of learner would be accommodated and when a teaching style does not match the student's learning style, the students, with the knowledge of their preferred learning styles, may use various techniques to enhance their own learning. Kazu (2009:85) explicates that it is important to realise that one learning style is neither better nor worse than another and with this in mind, the differences in learning styles can be used as an advantage. Successful students must be able to take the learning situation as well as their own potential into consideration and should demonstrate the ability to select an appropriate learning style (Robotham 1999:6). Applying this particular skill will make them more self-directed learners.

Vaugh and Baker (2001:610) advise that to be able to serve a greater diversity of students, the teaching conditions should consist of a variety of creative, non-traditional teaching techniques and strategies in Health Sciences education. De Vita (2001:173) concludes that a multi-style teaching approach should be adopted by lecturers to address each side of the learning dimensions to reach and engage all students.

2.4.4 Enhancement of the learning environment

Characteristics of a learning environment, together with individual inherited qualities of mind and character determine a student's learning position on the continuum of processing and perception of knowledge. A learning space needs to be constructed where there is equilibrium among the forces of action, reflection, experiencing and conceptualisation. Educational research and practice have confirmed that the learning

environment can be enhanced when the instructional strategy and methods accommodate various learning styles of students (Buch & Bartley 2002:5).

A curriculum can be seen metaphorically as a race that has to be run by the students. During this race there will be a series of obstacles or hurdles to overcome, such as complex learning matter, and tight schedules (Marsh 2009:3). Elements of the curriculum process include educational strategies, teaching methods, assessment and the evaluation and review of the process. Educational approaches, also known as teaching or instructional strategies can be defined as the approaches that an educator may take to actively involve students in the learning process. They are the driving forces to link the instruction to a specific learning objective. To be effective, the educational approaches must address the diversity and development needs of the students (Meador 2014: Online). Educational methods or learning situations are defined by White and Manfred (2010: Online) as the means or ways that are used to teach material to students. A variety of methods can be used with the goal of getting the learner to actively engage in learning the material, thereby making meaning of it and mastering the content. The preferred choice of methods is subjected to what and who are taught, as well as the level of competence expected.

Learning environments, as described by Richmond and Cummings (2005:48) that support the learning styles of students, as identified by Kolb include the affective, symbolic, perceptual and behavioural learning environments. The affective learning environment provides the opportunity for the student to experience an actual experience that represents the feeling of the profession in that given study. The symbolic learning environment consists of problem solving where there usually is a right answer or a best solution. In the perceptual learning environment the main goal is to identify and understand relationships among concepts. Finally, the behavioural learning environment highlights the active application of knowledge or skills to a practical problem.

To ensure enhancement of the learning with these suggested environments, Terry (2001:77) recommends two types of learning activities and assignments. First, a broader-based learning strategy option according to which students may have a choice to match their preferred learning style to the learning strategy, and second, a more

focused alternative which forces students to learn and practise specific learning style skills that do not come to them naturally.

Kolb and Kolb (2005b:207) pointed out educational principles to adhere to in order to create a learning space where the educational environment can be enhanced for learning. They include:

- Respect for learners and their experience.
- Begin learning with the learner's experience of subject matter.
- Creating and holding a hospitable space for learning.
- Making space for:
    - Conversational learning
    - Development of expertise
    - Acting and reflecting
    - Feeling and thinking
    - Linking educational experiences to the student's interest.
- Creating opportunities for learners to take charge of their own learning.

The implementation of these educational principles requires an integrated programme of institutional development that includes curriculum development, faculty (academic staff) development, student development, administrative staff development (Kolb & Kolb 2005b:209).

2.5 THE IMPORTANCE OF LEARNING STYLES IN THE SOUTH AFRICAN NATIONAL TRANSFORMED EDUCATIONAL SYSTEM

The importance of learning styles in the South African national, transformed education system will be discussed in the next section to reveal the position that learning styles take in the institutional development to improve learning.

2.5.1 Diversity of students in South Africa

Students that enrol in higher education institutions come from different ethnic and cultural backgrounds, as well as diverse training programmes where different learning styles have been followed adopted (Romanelli *et al.* 2009:1). Montgomery and Groat (1998:1) observed the diversity in students regarding ethnicity, gender, age,

nationality and cultural background and studied the impact these had on the classroom setting. Students enter higher education institutions with knowledge gained from secondary education, other courses, and through daily life. This knowledge consists of a combination of facts, concepts, models, perceptions, beliefs, values and attitudes, some of which are accurate and some that are inaccurate, insufficient and inappropriate (Ambrose *et al.* 2010:13). This supports the claim made by Montgomery and Groat (1998:1) that older students can draw from their life experience and are therefore more likely to be independent learners.

De Vita (2001:165) mentioned that with this dimension of a diverse learner population and knowledge, traditional methods of uniform instruction will be ineffective due to the fact that where English is not the first language or culture of the student, cultural conditioning must take place as previous culturally-influenced ways of learning may not be compatible with the traditional method of uniform instruction. Van Rensburg (2002:50) identified the linguistically diverse learners as having a bigger risk for academic failure.

In order to accommodate a larger and more diverse student population, the National Plan for Higher Education (2001) requested higher education institutions in South Africa to practise new models of teaching and learning (OECD 2008:348). Dunn, Honigsfeld and Doolan (2009:137) explicate that with the identification of learning styles, the variety of educational strategies will be better tolerated and this idea motivates a sense of social integrity and fairness. Respondents in their study cited that learning styles encouraged everyone to respect and accept the variety of behaviours in the teaching and learning process and promoted social equity.

The diversity of learner needs can also be addressed when learning styles are identified and used in the educational strategies (Vaugh & Baker 2001:610). Pheiffer *et al.* (2003:37) suggest that the knowledge of learning styles contributes as a valuable tool for social integration and learner empowerment. They explain that alternative ways of learning can be explored and the diversity of the different approaches to learning can be better understood. This will lead to the improvement of the learning process and the class experience. They conclude that learning styles can be used as a dynamic resource in teaching and learning and propose that it may be used as a catalyst for developing reflection, engaging students with learning, learning about

learning, and orienting students in higher education. Van Rensburg (2002:8) alludes that the awareness of the educator's strengths and weaknesses in the context of learning styles needs to be created to recognise the responsibility to a diverse student body.

One of the purposes of higher education, as stated in the Education White Paper (RSA DoE:1997) is:

> *To meet the learning needs and aspirations of individuals through the development of their intellectual abilities and aptitudes throughout their lives. Higher education equips individuals to make the best use of their talents and of the opportunities offered by society for self-fulfilment.*

The South African Qualification Authority (SAQA) states that any programme of learning should have the intention to make an individual aware of the importance to reflect and explore the variety of strategies to learn more effectively in order to contribute to the full personal development as well as the social and economic development of society (OECD 2008:78).

2.5.2 Transformational education

The high-level skills training objective of higher education as set out by the Education White paper (RSA DoE 1997) involves the training and provision of person power to strengthen this country's enterprises, services and infrastructure. This requires the development of professionals and knowledgeable workers with globally equivalent skills, but who are socially responsible and conscious of their role in contributing to the national development effort and social transformation.

The nature of education is in the midst of transformation as the traditional pedagogical method of lectures does not take individual differences into consideration and pays no attention to the role of experience in knowledge information, and as a result, adds little to students' knowledge. Depending on lectures alone can turn the students into passive underachievers, students that are able to produce a lot of facts, but unable to integrate the information into real-world situations (Manolis *et al.* (2012:44). This supports Chapman and Calhoun (2006:576) statement that didactic lectures encourage

the learning of isolated facts and subsequently make the integration of facts difficult in a clinical setting where rapid retrieval of facts is essential. They further stated that health sciences students tend to get frustrated with a traditional curriculum and that it limits some to reach their full potential.

In the report, A Framework for Transformation, the National Commission on Higher Education (1996 in OECD 2008:329) described three sets of ideas for a transformed higher education, namely

1. Increased participation;
2. Greater responsiveness;
3. Increased co-operation and partnership.

To restore the greater responsiveness, the adaptation of a changing curriculum, which met the standards of global trends and societal needs and interest, is required (Vaugh & Baker 2001:610). The improvement of student learning and teaching is declared by Prajapati *et al.* (2011:70) as a key issue of higher education.

Barr and Tagg (1995:1) explained that the mission of a higher education institution should not be instruction but rather that of producing learning with every student by whatever means work best. Changing from an instruction paradigm to a learning paradigm enforces higher education institutions to create powerful learning environments and experiences to enable the student to discover and construct self-knowledge and to improve the quality of learning for the students. The power of such a learning environment or educational strategy will be judged by the impact it has on learning (Barr & Tagg 1995:5).

Eubank and Pitts (2011:72) report that in order to enhance the curriculum delivery and learning environment, optometric educators must be aware of their student's learning styles and personality traits. The intention is not to put the student in a box accordingly, but with the knowledge both the instructor and student can improve the learning process for a successful graduation. The curriculum can be enhanced by giving more support to change a weak ability in a specific thinking or information processing skill into a learning strength (Van Rensburg 2002:8).

In correspondence Prajapati *et al.* (2011:70) also claim that educators should have a comprehensive understanding of the multiple learning styles that exist in their teaching environment to provide the most efficient learning experience. A curriculum must be designed to be flexible enough to meet each student's preferred learning style (Chapman & Calhoun 2006:582). Acknowledgement of different learning styles to move from the traditional pedagogy to more experimentally-based education has been called transformational learning (Manolis *et al.* 2012:44).

The change from disciplinary to interdisciplinary knowledge production includes the change from subject-based teaching to student-based learning and more focus to be placed on modes of academic programme delivery (OECD 2008:348). This change is in line with the SPICES model (Dent & Harden 2009:12) where the traditional strategy of the SPICES model in curriculum planning is described as teacher-centred, but the more innovative strategy is student-centred (Kazu 2009:89). This corresponds with the goal of the education legislation to transform South Africa's national education system to a more learner-centred, outcomes-based system (OECD 2008:80). This system allows academic performance to be more accurately measured in terms of the learner's ability to meet the national academic outcomes stipulated by the National Qualifications Framework (NQF) that integrates education and training and ensure quality assurance and quality promotion (OECD 2008:329).

In the student-centred approach the emphasis is placed on the students being responsible for the learning process; they are seen as co-producers of learning while at organisation level the higher education institution (HEI) takes responsibility for the institutional and individual outcomes (Barr & Tagg 1995:11; McCabe & O'Connor 2014:351). Kazu (2009:89) confirms the idea that learning is seen as a personal process and every individual behaves according to personal needs. For this reason the individual should take responsibility for his/her own learning. Ambrose *et al.* (2010:191) noted that one of the major intellectual challenges students face when studying at a higher education institution is managing their own learning, but students who have been given more responsibility for their own learning performed significantly better in examinations than those who have participated in a more traditional lecture-based approach (Dent & Harden 2009:171).

In a study done by Pheifer *et al.* (2003:38) students reported that they had benefited from gaining information about learning styles, and the belief to complete tasks and reach goals on one's own ability was reported. In agreement Kazu (2009:89) stated that for individuals to acquire the continually changing and increasing amount of information, they should be aware of their own learning style as well as the characteristics of the specific learning style in order to become autonomous and take responsibility for the learning process. Dunn *et al.* (2009:138) posit that students that are aware of how they learn best adjust their surroundings and strategies in order to facilitate the progress as they realise that it is not what, but how they study that makes them effective learners.

Students are no longer viewed as identical empty vessels that need to be filled with information (Manolis *et al.* 2012:44). Ambrose *et al.* (2010:158) make it clear that in the student-centred approach students need not be taught content. A holistic approach has become very important, in which the recognition of the complex set of social, emotional and intellectual challenges students encounter during their undergraduate programme. To ensure significant learning Fink (2003:9) describes six changes that must occur. They include:

- Foundational knowledge, like ideas and principles
- Application of intellectual, physical and social skills
- Integration of ideas, life situations and academic work
- Human dimension that entails that they know themselves and understand how the world relates to their personal life
- Caring by having an interest and curiosity to understand human implications.

By taking the mentioned aspects into consideration, it does not mean that the educator takes the responsibility for guiding the social and emotional lives of students, but more productive learning environments can be created. The role of the teacher is changed to the manager of the student's learning, a more facilitative role (Dent & Harden 2009:12). Robotham (1999:7) claims that the lecturer will become increasingly redundant in the sense that students will become more and more capable to identify and acquire resources and skills needed to achieve objectives.

In creating the required learning environment for the students to let education happen, Dent and Harden (2009:12) elaborate on this adaptive curriculum and state that the

content delivery with the teaching and learning methods and strategies should be modified to the needs of the individual learner. The learning outcomes should be made clear and learning experiences have to match the student's individual needs. Montgomery and Groat (1998:1) explained that a variety of active learning techniques should be used to engage students and should no longer use a simple scripted content delivery during a lecture.

2.5.3 The creation of a lifelong learner

One of the key roles of higher education identified by Department of Education is to fulfil human resource development through the mobilisation of human talent and potential through lifelong learning to contribute to the social, economic and intellectual life of a rapid changing society (OECD 2008:330). Students should be equipped with the essential skills, knowledge and values in order to prepare them for their various social roles as effective citizens (RSA DoE: 1997). Higher education has a moral obligation to support the student in developing the necessary academic skills for success as well as the skill to understand changes in the knowledge explosion worldwide. Valued skills such as independent thinking, time management and responsibility for learning have to be adopted by students to mature and to be more productive in preparation for their specific professions (Van Rensburg 2002:14).

The enhancement of learning contents in a specific situation should not be the only concern of higher institutions, as Robotham (1999:7) explained that more fundamental skills such as how individuals learn, how to improve the process and how to achieve self-directed learners must be achieved to ensure development of the student. This corresponds with one of the motivations for the qualification in a Bachelor of Optometry as set out by the Council on Higher Education (CHE) and the Health Professions Council of South Africa (HPCSA), namely that:

> *The qualification will equip learners with competencies which are designed to be progressive in depth and complexity allowing the learner to integrate professional specific with critical cross-field outcomes enabling the application of skills and knowledge in general settings as well to engage in lifelong learning through research and professional development* (CHE-HPCSA 2013).

The skills of self-learning and responsibility for own learning to become lifelong learners are contended as essential by Gurpinar *et al.* (2011:307), due to the constant increase and updating of knowledge in medical education that have created an overwhelming burden of information. Utilising various teaching methods to address the diversity of learning styles can encourage lifelong learning (Vaughn & Baker 2001:610). The skill to recognise and react to different styles of learning will maximise the learning, independent from the environment. This is identified as a vital skill for the autonomous learner in any career path (Romanelli *et al.* 2009:4). In the trend towards life-long learning the emphasis is placed on learning to learn, which is a ramification of the learner-centred approach, in that knowledge is seen as something that needs to be constructed by an active learner and not just absorbed by the passive learner (Vawda 2005:9).

One of the principles of learning, as researched by Ambrose *et al.* (2010:191), is that to become self-directed learners, students must learn to assess the demands of the task, evaluate their own knowledge and skills, plan their approach, monitor their progress, and adjust their strategies as needed. This principle encompasses the key metacognitive skills that are fundamental to be an effective lifelong learner. Penger *et al.* (2008:1) imply that the logic of lifelong learning suggests that students will be more motivated to learn if they knew more about their own strengths and weaknesses as this will increase their competency as a student, which will provide the foundation for the lifelong learning concept.

2.6 IMPACT ON OPTOMETRY EDUCATION

> *Higher education plays a central role in the social, cultural and economic development of modern societies. In South Africa today, the challenge is to redress past inequalities and to transform the higher education system to serve a new social order, to meet pressing national needs, and to respond to new realities and opportunities.*
>
> Education White Paper (RSA DoE 1997).

This role of higher education will become more and more important when the National Health Insurance (NHI) system is implemented, as NHI will make equal access to healthcare possible to all and will improve South Africa's health status and health

systems performance. When the NHI system is implemented, the South African Optometry Association proposes that Optometry should be integrated into the mainstream health services alongside nursing, ophthalmology and other health care professions (SAOA 2011:Online). Currently optometry services are offered mainly by the private sector and non-governmental organisations, with the limitation of being available almost exclusively in shopping malls and to those who are able to afford the services; the NHI intervention will render optometry services affordable and accessible to the majority of the population to whom it is currently out of reach.

'Who needs what as defined by whom?' is an important question in connection with learning asked by Hutchinson (in Gravett 2005:13) to analyse the needs. 'Who' being the students; 'what' being the skills and outcomes they need to achieve to be a competent professional optometrist, and 'whom' being the definers such as employers, educators and stakeholders. The CHE and HPCSA stated that the qualification in Optometry will equip the practitioner to be able to function in all contexts relevant and appropriate to the specific needs of the country and ensuring successful participation in the global society (CHE-HPCSA 2013). A parallel can be drawn from this to one of the eight exit-level outcomes of the Bachelor of Optometry degree, which are to apply self-reflective learning strategies to continually improve the health care services appropriate to the specific needs of the community to ensure a professional contribution to the needs of the society (CHE & HPCSA 2013).

The current output rate of optometry graduates from the four institutions offering the qualification is 120 - this should increase to 500 qualifying students to address the deficit in 10 years' time (SAOA 2011:Online). A big challenge for undergraduate training will come to pass as classes will increase in size and diversity. As stated by the Ministry in the Education White Paper (RSA DoE 1997), this is a need and challenge posed to the NHI:

> *There is a chronic mismatch between the output of higher education and the needs of a modernising economy. In particular, there is a shortage of highly trained graduates in fields such as science, engineering, technology and commerce (largely as a result of discriminatory practices that have limited the access of black and women students), and this has been detrimental to social and economic development.*

The learning paradigm (*cf*. 2.5.2) will continuously improve productivity and aim for higher graduation rates while maintaining or even increasing the learning standards. Previously disadvantaged students, who have struggled to meet the academic requirements, would not only have access, but also success through the development of learning technologies (Barr & Tagg 1995:4). The most difficult challenge that higher education systems in South Africa are facing, is the high dropout and failure rates. One of the reasons for this could be that educators are not capable to educate students with varying degrees of academic readiness, as well as from a variety of educational backgrounds (Vawda 2005:7).

Learning styles will become a more appropriate pedagogic concept as it is seen to be one of the success factors in higher education (Romanelli, *et al*. 2009:1) that contributes to the effectiveness of education (Kazu 2009:87). Performance can be linked to learning styles as it has been found that students with a learning style closest to the educator's teaching style perform better (McChlery & Visser 2009:300). Pheiffer *et al.* (2003:38) conclude that the use of learning styles can assist in the creation of a learner identity by making students more sensitive to the act of learning and where to fit into different contexts as a learner in.

2.7 CONCLUSION

A university should, I believe, provide an experience of living as well as the opportunity for learning

(Sloman 1964 in Penger *et al.* 2008:17).

In this chapter the significance of learning styles in the curriculum framework of Higher Education Institutions (HEI) was discussed. At the beginning of the chapter learning styles were defined and the factors influencing learning styles were mentioned. Furthermore, Kolb's LSI, learning styles as an effective pedagogy and the importance of learning styles in the South African National Transformed Educational System were discussed as well as the impact it has on Optometric education.

All the mentioned factors played a role in transforming the philosophy of teaching and learning, and made the identification of learning styles essential (Gurpinar *et al.* 2011:307). By being aware of students' learning styles, an educator will serve the

objectives of education more effectively (Kazu 2009:89). Fletcher *et al.* (2008:375) state that an understanding of the preferred learning style of an individual provides an insight into the teaching methods that are likely to be most effective for that individual.

The Department of Optometry at the University of the Free State makes use of different educational strategies to enhance the learning experience in didactic lectures and practical education in order to provide our students with the following skills set out by the Health Professions Act of 1974, pertaining to the scope of the profession of Optometry (HPCSA 1976: Online). According to Dent and Harden (2009:73) lecturers are seen as the oldest and most omnipresent method of teaching in medicine and allied health subjects. Practical sessions involve demonstration, tuition and practice of clinical skills, either on real patients in the Public Health sector or on students. Eubank and Pitts (2011:72) recommend that didactic and clinical presentations of Optometric curricula should be done in a manner that allows the students obtain the information in a meaningful way; the knowledge should be easily attained and absorbed and the individual learning styles should be considered.

The concept of learning styles emerged when it became evident that educational psychology and the study methods of individuals should be taken into account when higher education institutions start using integrated, interactive and active teaching strategies, rather than traditional lecturer-based methods (Gurpinar *et al.* 2011:307).

Exit-levels four and five of the Bachelor degree in Optometry state that the student should be able to apply appropriate learning strategies in the diagnosis of eye and related conditions, as well as in the management and delivery of eye care products, therapy and medication with the knowledge of minimum standards of optometric care (CHE & HPCSA 2013). The core skills of applying clinical knowledge and social sciences to formulate a tentative diagnosis and relevant management plan are the same regardless of the type of health care profession field in question (Prajapati *et al.* 2011:75). When qualified, an optometrist will be able to make a contribution at all levels of care and within all sectors of healthcare services delivery (CHE & HPCSA 2013).

As some researchers still question the validity of learning styles as a concept, others agree on its benefit in enabling learners to reflect on how they learn. A deep learning

approach, which is characterised by the active search for meaning to create meaning of a concept as well as to the questioning and reasoning of issues to relate to previous knowledge and personal experience, can be adopted when learning styles are taken into consideration (Van Rensburg 2002:9).

Penger *et al.* (2008:17) make it clear that learning styles are not fixed personality traits, and to create an effective learning environment the emphasis should be on the encouragement of a balanced learning approach and the consciousness of the range of approaches available to the learner, and not on the accommodation of a learning style. They conclude that the most important advantage of the application of learning styles to teaching and learning can be seen as the encouragement of the awareness of one's own thoughts and learning; to be able to reflect not just on what is learned, but also on how and why.

In the next chapter, Chapter 3, entitled **Research Design and Methodology**, the research design and methodology used in this study will be elaborated.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

Chapter 3 provides an overview of the theoretical perspectives on the research design and methodology used to investigate what the learning styles of the Optometry students at the University of the Free State are. In the first place, theoretical perspectives on the research design are provided. Thereafter a discussion follows of the process of data collection, sample selection, the pilot study and data analysis. Finally, issues of reliability, validity and trustworthiness, as well as ethical considerations are discussed

3.2 THEORETICAL PERSPECTIVES ON THE RESEARCH DESIGN

In this section the research design used in this study will be discussed.

3.2.1 The research design in this study

This study is quantitative in nature as numerical data were utilised to obtain information regarding the learning styles of the undergraduate Optometry students at the UFS (Burns & Grove 1999:5). A descriptive approach was used to describe the learning styles of the undergraduate Optometry students that will provide a foundation for future research.

Quantitative research as reviewed by McMillan and Schumacher (2001:15) is the presentation of statistical results presented with numbers. The researcher agrees with Winter (2000: Online) that a quantitative researcher aspires to break up and define facts and events into categories that are measurable and universal in order for these to be applied to all subjects and similar situations.

In this study a questionnaire in the form of a learning style inventory was completed by the undergraduate Optometry students of the University of the Free State.

Descriptive statistics, as defined by Fisher and Marshall (2009:93), were made use of as numerical procedures and graphical techniques were used to describe and organise the learning style characteristics of the undergraduate Optometry students of the UFS.

3.3 RESEARCH METHODS

The methods that were used and which formed the basis of the study comprised of literature review, and – as the empirical study – a questionnaire (Kolb's LSI) was conducted.

3.3.1 Literature review

The aim of a literature review is to conceptualise a research problem and locate it in a body of theory (De Vos *et al.* 2011:135). In this research project, the literature review provided the necessary knowledge base and context to the stated problem.

It was endeavoured to supply a deeper understanding of the importance of learning styles of undergraduate students as well as the context of the current curriculum delivery of higher education institutions in South Africa. Kolb's Experiential Learning Theory (ELT) was researched to create a foundation based on existing, related knowledge and to put the researcher's efforts into perspective for the enhancement of the curriculum according to the learning cycle as described by Kolb. The application of learning styles as an effective learning strategy was investigated to provide sound principles of the integration of learning styles in the curriculum design process.

3.3.2 The questionnaire

A questionnaire, the learning style inventory (LSI), was used as data collection method in the study.

3.3.2.1 *Theoretical aspects*

A questionnaire may be considered to be a list of questions that respondents are requested to answer, and may include open and closed questions; typically closed questions are asked using a method of ranking (Goddard & Melville 2001:47).

Kayes (2005:249) identified Kolb's LSI as the most influential learning style model, and according to Gurpinar *et al.* (2011:307), it is the most common learning style inventory administered to Health Sciences students. Researchers found the LSI useful as a descriptive tool of learning styles (Koob & Funk 2002:298). Eubank and Pitts (2011:72), as well as Sparks (1990:52), also used Kolb's LSI in identifying the learning styles in Optometry students at the Southern College of Optometry in Memphis.

A disadvantage of Kolb's LSI is that not all students necessarily have the same frame of reference and understanding of the terms and concepts that are used in the inventory. The questionnaire is only available in English.

Manolis *et al.* (2012:44) maintain that the work of Kolb has not been without critique and questions have, been raised about the LSI which has been refined by Kolb over the years. These authors infer that the instrument assumes that individuals can have only one learning style. The model was criticised, as the theory on which it is based relates more to a map of the learning process, than a learning style (McChlery & Visser 2009:302). Prajapati *et al.* (2011:70) allude that the perfect learning style measure is a fantasy.

3.3.2.2 *The questionnaire used in this study*

The LSI used in this study was a 10-item self-assessment instrument that was derived from Kolb's learning style inventory (LSI 2013: Online). It is a self-descriptive, self-scoring test in which participants rank-order words which best describe the characteristics of their learning style. The measurement is ipsative, where respondents compare two or more desirable options and pick the one that is most preferred, and the scores on one dimension will be dependent on the measurement relative to the other scores in that response set (*cf.* Appendix A3)

The following biographical data areas were covered:

- Age
- Gender
- Academic year
- Ethnic group

3.3.3 Sample selection

A sample is a portion of a population considered to be representative of that population (De Vos *et al.* 2011:198). The way in which this portion is selected is called sample selection or sampling.

3.3.3.1 *Target population*

A target population is a group of individuals who have and share certain specified characteristics (De Vos *et al*. 2011:14). In this study the target population included all the undergraduate students in the Department of Optometry at the University of the Free State during the year of 2014. Table 3.1 represents the number of registered undergraduate Optometry students in the Faculty of Health Sciences, UFS in 2014.

TABLE 3.1: NUMBERS OF REGISTERED, UNDERGRADUATE STUDENTS AT THE DEPARTMENT OF OPTOMETRY, UNIVERSITY OF THE FREE STATE, 2014

YEAR OF STUDY/ACADEMIC YEAR	I	II	III	IV	TOTAL
NUMBER OF STUDENTS	27	30	32	23	**112**

[Compiled by the researcher (Kempen, 2014) for the purpose of this study from information obtained from the Division Student Administration: Office of the Dean, FoHS, UFS, February 2014]

3.3.3.2 *Sample size*

In this study a purposeful, non-probability sampling technique was employed, as the participants possessed a similar trait, namely being undergraduate Optometry students at the UFS.

Coyne (1997:624) explains that a sampling method must ensure that the sample selection will be according to the aim of the research. Patton (2002:230) confirmed Coyne's opinion and stated that:

> *The logic and power of purposeful sampling lie in selecting information-rich cases for in-depth study. Information-rich cases are those from which one can*

learn a great deal about issues of central importance to the purpose of the inquiry, thus the term purposeful sampling'

In this study the sampling method supported the aim of the study, as all the students in the target population were selected. This can be seen in Table 3.1 above (*cf.* 3.3.3.1) showing that the sample size is the same as the number of students in the target population (n=112).

3.3.3.3 *Description of sample*

The sample consisted of all undergraduate Optometry students registered, during 2014 at the School of Allied Health Professions in the FoHS, UFS as stated above.

This included the students in the Afrikaans and English classes (the UFS offers classes according to a parallel-medium language policy), as well as male and female undergraduate students, representing White, Black, Coloured, Asian and Indian ethnic groups.

3.3.3.4 *The pilot study*

A pilot study was conducted to ensure that the questions were clear and not biased, the questionnaire is well-structured and to determine the amount of time needed for completion.

To achieve this, the Questionnaire (Appendix A3) was given to one of the class representatives of each academic year. The four students completed the pilot study on 14 March 2014 on the campus of the University of the Free State.

A short verbal introduction (Appendix B) was given about the study and the importance of a learning style, as well as the application of Kolb's Experiential Learning Theory in the Department of Optometry.

The participants were asked to sign the consent form before completing the questionnaire. The researcher was available for the duration of the pilot study for any

enquiries. The duration of the pilot study was between 30 – 45 minutes as indicated. One of the participants took a long time and required a quiet environment.

During the pilot study the participants requested more information regarding the learning styles as described by Kolb and the information document was adapted accordingly. Question number five was moved to the end of the questionnaire as one of the participants found that it was confusing when provided before the learning style inventory.

3.3.3.5 *Data collection*

The data were collected during scheduled contact sessions on 9 and 11 April 2014. These contact sessions took place on the campus of the University of the Free State with all the academic year groups present. The students were asked to complete the Questionnaire (Appendix A3) in order to identify their individual, preferred learning style.

3.3.3.6 *Data analysis*

Data analysis allows the researcher to give meaning to the data, as well as to reduce and organise the data. Burns and Grove (1999:695) define the process of data analysis as the systematic organisation and production of research findings that allows the researcher to give meaning to the results (Fisher & Marshall 2009:97).

The data collected by means of the questionnaire survey were analysed with the help of a biostatistician. To achieve the aim of the study, descriptive statistics was used to describe the preferred learning styles associated with Kolb's experiential learning theory that had been identified. Marshall and Jonker (2010:5) claimed that descriptive statistics is perfectly suited for the collection and summarising of quantitative data. It also provides a platform to illustrate the characteristics of a group of observations. Regression analysis was used to investigate the effect of the numerical variable (age) on the different learning styles.

Analytical statistics, namely the Fisher's exact test (or Chi-square statistic) was used to investigate the effect of the following categorical variables:

- Different years of study: Robotham (1999:5) found evidence that learning styles could change during the course of studies as students adapted their learning styles according to the requirements of the learning task.
- Culture or ethnic groups: De Vita (2001:173) found differences between culture and learning styles.
- Gender: Mainemelis *et al.* (2002:12) found some noteworthy differences in terms of gender. Females have a tendency to learn more when they can reflect back on an observation made or an experience, while males prefer abstract conceptualisation.

The nominal level of measurement was used to score the participants into broad categories. There was no hierarchy among the categories as one learning style is not superior to another.

3.4 ENSURING THE QUALITY OF THIS STUDY

The quality of the study was guaranteed by ensuring that the data were valid and reliable. This was done through using measurement procedures and a measurement instrument that have acceptable levels of reliability and validity.

3.4.1 Validity

Validity is defined as the extent to which the instrument measures what it purports to measure (Miller 2003:1), or how truthful the research results are (Golafshani 2003:599).

Kolb's LSI was the survey instrument of choice as it is regarded as the most influential learning style model available, and the validity further was enhanced by the fact that the inventory had been administered repeatedly to Health Sciences students. (Eubank & Pitts 2011, Gurpinar *et al.* 2011, Manee *et al.* 2013, Manolis *et al.* 2012, Pheiffer *et al.* 2003).

3.4.2 Reliability

Golafshani (2003:598) refers to the work of Joppe (2000) who refers to reliability as the extent to which results are consistent over time and an accurate representation of the total population. If the results can be reproduced under a similar methodology, the research instrument is to be considered reliable.

This is reinforced by Kayes (2005:251) who defined reliability as a measure of internal consistency of an instrument across similar scale items. Kayes also reported that the internal reliability of the LSI has been supported and Chronbach's alphas have been found in an acceptable range of .80-.87. This was confirmed by Gurpinar *et al.* (2011:308). Based on this evidence that the LSI is a reliable instrument, it was used in this study.

3.5 ETHICAL CONSIDERATIONS

A researcher needs to take cognisance of what is proper and what is improper in scientific research. In this study approval was sought from the bodies concerned and the respondents, and the participants' right to privacy and confidentiality was assured.

3.5.1 Approval

Approval for the research project was obtained from the Ethics Committee of the Faculty of Health Sciences at the University of the Free State. The allocated Ethics Committee of the FoHS number (ETOVS 210/2013) is indicated on all documents pertaining to the study.

Permission to conduct the study, involving students as subjects, was also obtained from the Dean of the Faculty of Health Sciences at the University of the Free State, Head of School of Allied Health Professions, Head of the Department of Optometry as well as the Vice-Rector, Academic at the University of the Free State.

3.5.2 Informed consent

All participants in the study gave informed consent before completing the questionnaire. (Appendix A1 & A2). As no student was under the age of 18, no parental consent was necessary.

Participants were informed before starting with the questionnaire that by completing the questionnaire they voluntarily agreed to participate in the research and they would be allowed to withdraw from the study an any given time. No form of compensation for participation in the study was offered.

A participant information letter that was based on the guidelines for informed consent as prescribed by the General Guidelines of the Ethics Committee of the FoHS, University of the Free State (Appendix A1 & A2) was given to the students before the agreed to become involved.

3.5.3 Right to privacy and confidentiality

The participants were ensured that no names or personal identification would appear on any data sheet that was sent for statistical analysis. All information was managed in a strictly professional and confidential manner.

As the participants identified their learning styles by means of the questionnaire, no feedback was given at a later stage regarding their preferred learning style. On the information letter given to students prior to their participation, a short summary of the learning styles was provided, as described by Kolb, for their personal perusal.

3.6 CONCLUSION

In Chapter 3 and overview was provided of the research methodology employed in the study, as well as the procedures that were followed.

In the next chapter, Chapter 4, entitled **Results and discussion of findings of the questionnaire survey**, the results of the questionnaire survey and the findings of the data that were collected and analysed during the study will be reported and discussed.

CHAPTER 4

RESULTS AND DISCUSSION OF FINDINGS OF THE QUESTIONNAIRE SURVEY

4.1 INTRODUCTION

The purpose of this chapter is to present the results of the questionnaire survey that was conducted to determine the learning styles of undergraduate students in the Department of Optometry at the University of the Free State (UFS).

The demographic information of the sample will be presented first (*cf.* 3.3.3.3). The quantitative results reflecting demographic information of the students participating in the questionnaire survey include a description of the student population and their distribution in the Department of Optometry. Data regarding age, gender and ethnicity, and academic year were included.

The questionnaire used was an adopted version of Kolb's learning style inventory (*cf.* Appendix A3) that had been designed to identify the learning style of an individual within Kolb's experiential learning cycle.

Descriptive statistics, namely frequencies and percentages were calculated for categorical data. Medians and percentiles were calculated for numerical data. Analytical statistics, namely the Fisher's exact test (or Chi-square statistic) was used to investigate the effect of the categorical variables (gender, year group, and ethnicity) on the different learning styles. Regression analysis was used to investigate the effect of the numerical variable (age) on the different learning styles. A significance level of 0.05 was used throughout this study.

The results are presented by means of frequencies and percentages for the categorical variables and means/medians, and standard deviations and percentiles for the numerical variables. The discussion deals with the learning styles identified. The learning styles will be described according to the different study years, culture, or ethnic groups, and gender (*cf.* 3.3.3.6). The results will be presented in diagrammatic

format to provide a breakdown of the data analysed. The chapter will conclude with a summative discussion of the findings.

4.2 DEMOGRAPHIC DESCRIPTION OF THE SAMPLE

The target population included all the undergraduate students in the Department of Optometry at the University of the Free State during the year of 2014 (*cf.* 3.3.3.1).

The results are representative of the sample population as a response rate of 94.64% was achieved by 106 students completing the questionnaire. The questionnaires were administered during an academic contact session for which, according to the rules of the FoHS, students have to achieve an attendance rate of 80%. Participants were asked to provide information as to their gender, age, ethnicity, and current academic/study year.

4.2.1 Gender of the students in the sample population

The gender distribution of the participants (n=106) in the sample population from the Department of Optometry is represented in Figure 4.1.

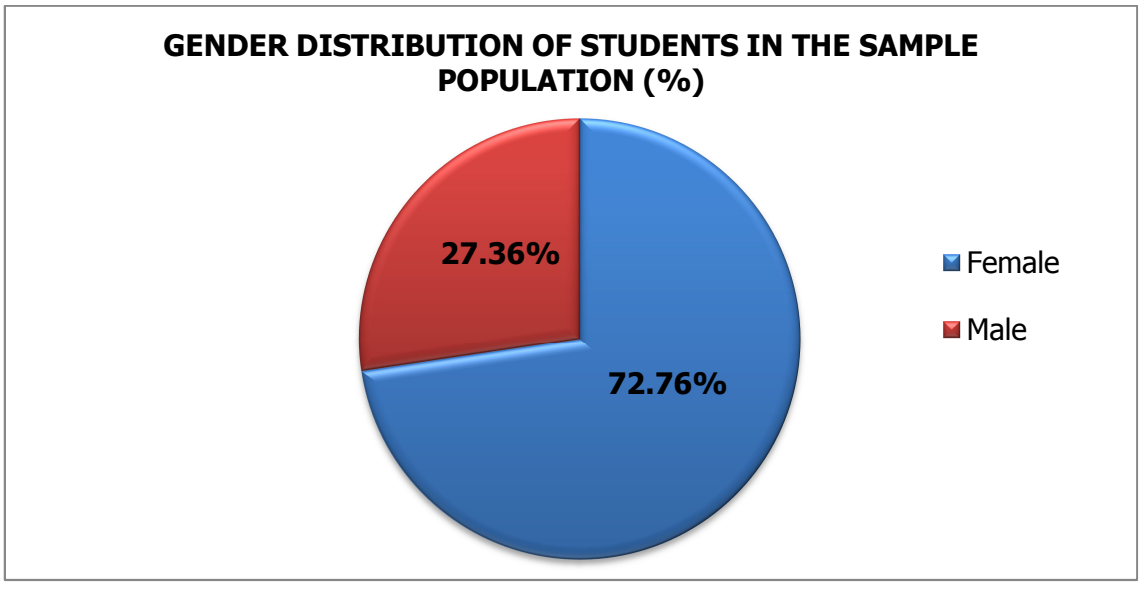

FIGURE 4.1: GENDER DISTRIBUTION OF STUDENTS IN THE SAMPLE POPULATION (n=106)

The data collected show that females formed the majority of the sample (72.64%). Allied Health Professions predominately comprise females. A change can be seen in the first-year academic group that had the highest number of males. Thirteen (13) of the 27 male participants (48.19%) were in their first year of study. Figure 4.2 summarises the gender distribution in the different academic years.

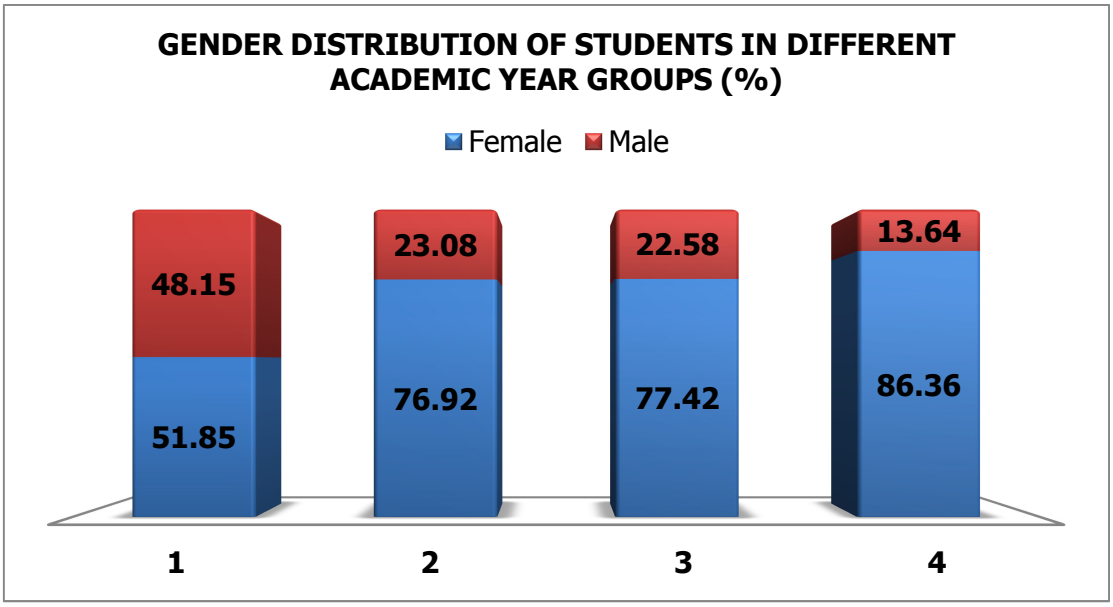

FIGURE 4.2: GENDER DISTRIBUTION OF STUDENTS IN DIFFERENT ACADEMIC YEAR GROUPS (n=106)

4.2.2 Age distribution of students in the sample population

The age median of the students (n=106) was 20.0 years with a minimum age of 18 and maximum age of 31. The inter-quartile range was 19.0 – 21.0. According to the data, the majority of participants (45.28%) fall in the 20 -21 years age group. The second largest group, 34.91% of participants, were between 18 – 19 years old, while 15.09% of the participants were in the 22 – 23-year old group. The remaining 4.72% were in the 24 – 31-year old age group.

Table 4.1 shows the age-group breakdown of the participants.

TABLE 4.1: AGE-GROUP BREAKDOWN OF THE SAMPLE (n=106)

Age group	
18 – 19 years	34.91%
20 – 21 years	45.28%
22 – 23 years	15.09%
24 – 31 years	4.72%

4.2.3 Academic year of study of students in sample population

Figure 4.3 indicates the percentage of students in the different academic years in the undergraduate Optometry Degree Programme at the University of the Free State. The distribution of students in the respective years is more or less equal. The study population consisted of 25.47% first-year students and 24.53% second-year students. The third-year class represents the biggest percentage, namely 29.25%. Of the sample, 20.75% was represented by the final-year students.

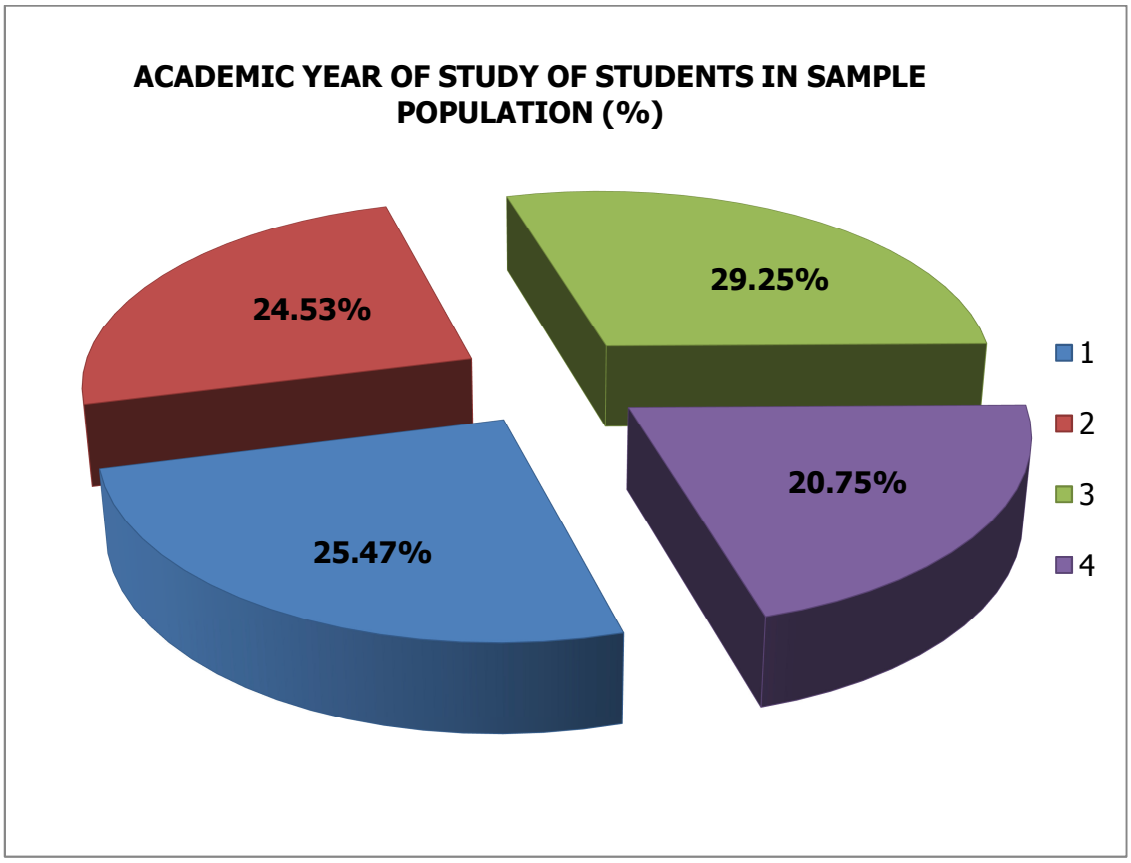

FIGURE 4.3: ACADEMIC YEAR OF STUDY OF STUDENTS IN SAMPLE POPULATION (n=106)

4.2.4 Ethnicity of the students in sample population

The majority of students at the Department of Optometry were White (74.53%), and 11.32% were African. During the data collection procedure it was noted that the Indian ethnicity was not included in the questionnaire. Students of this specific ethnicity group were asked to indicate their ethnicity as *other.* As no other population group was represented in the sample, it can be assumed that the 14.15% of the students that indicated *other,* were Indian.

Figure 4.4 is a representation of the ethnicity of the undergraduate students in the sample population.

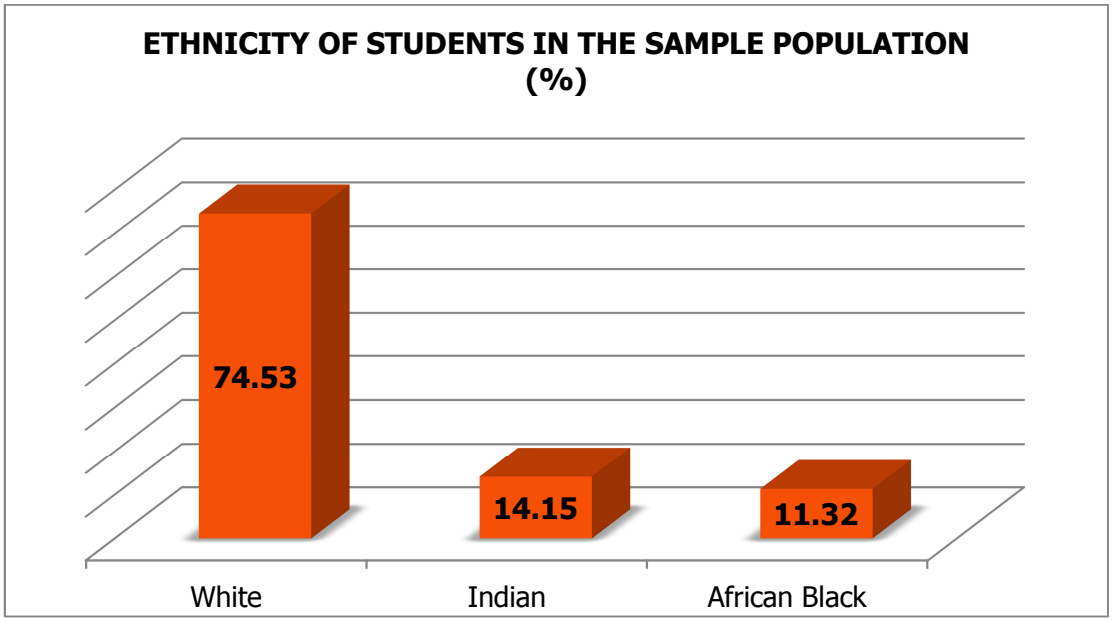

FIGURE 4.4: ETHNICITY OF STUDENTS IN THE SAMPLE POPULATION (n=106)

4.2.5 Summary of demographic information of students in sample population

A total of 106 students from the Department of Optometry at the University of the Free State completed the questionnaire for this study. From above-mentioned results (Figure 4.3), it can be seen that at the Department of Optometry undergraduate students included almost equal numbers in each academic year of study. The sample population was dominated by females and only 27.36% was male. The age distribution varied from a minimum of 18 years of age to a maximum of 31 years of age and a median at 20. White students made up 74.5% of the sample population,

followed by 14.15% Indian. A small number of students (11.32%) represented the African Black ethnicity.

In the following section the learning styles as identified by the sample population will be presented and discussed.

4.3 LEARNING STYLES OF THE SAMPLE

The participants were asked to complete the adapted Kolb's learning style inventory to be able to identify their preferred learning style.

4.3.1 Learning styles of the Optometry students at the University of the Free State

A total number of 123 learning style preferences were indicated by the sample population (n=106). The reason for more learning styles indicated than the number of students in the sample population is that fourteen (14) students (13.21%) indicated that they preferred a combination of two learning styles. One (1) student (0.94%) indicated no dominant learning style and measured equal in all four quadrants of the learning style inventory. Figure 4.5 presents the learning styles of the students at the Department of Optometry at the University of the Free State in 2014.

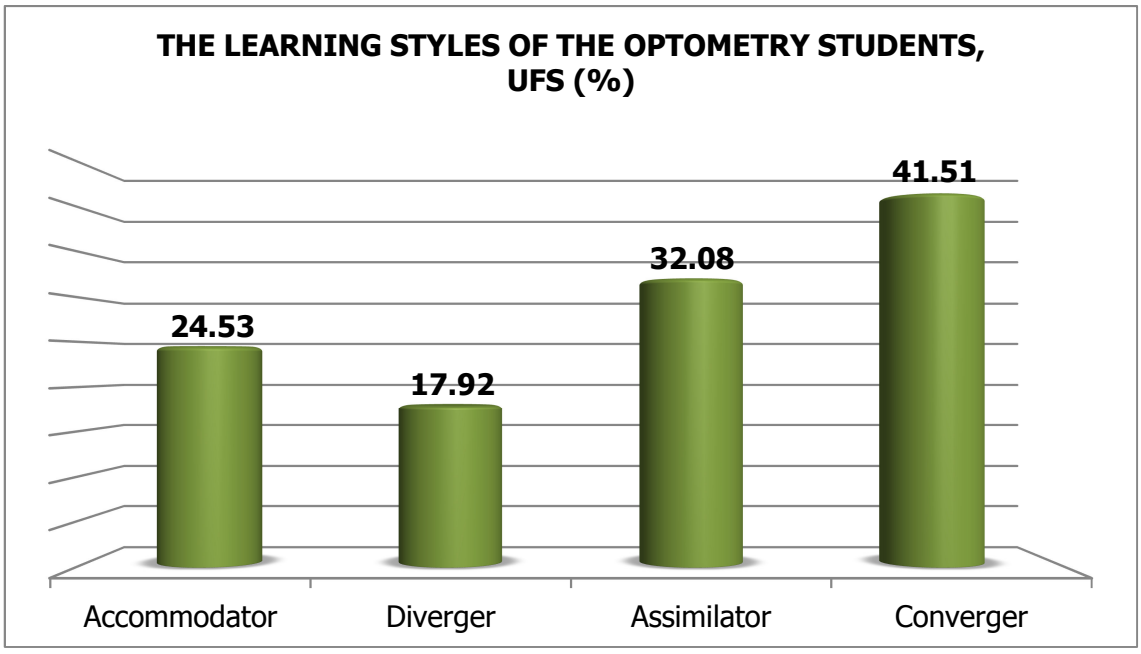

FIGURE 4.5: LEARNING STYLES OF THE OPTOMETRY STUDENTS, UFS (n=106)

The most preferred learning style by the sample population is the Converger learning style (41.51%). The Assimilator learning style was identified by 32.08% as their dominant learning style, followed by die Accommodator learning style (24.53%). The Diverger learning style was identified as the learning style that was preferred by the smallest number of students (17.92%).

The following section represents the learning styles for the different academic years respectively.

4.3.1.1 *Learning styles of the first-year Optometry students*

The learning styles of the first-year students in the Department of Optometry at the University of the Free State in 2014 are presented in Figure 4.6.

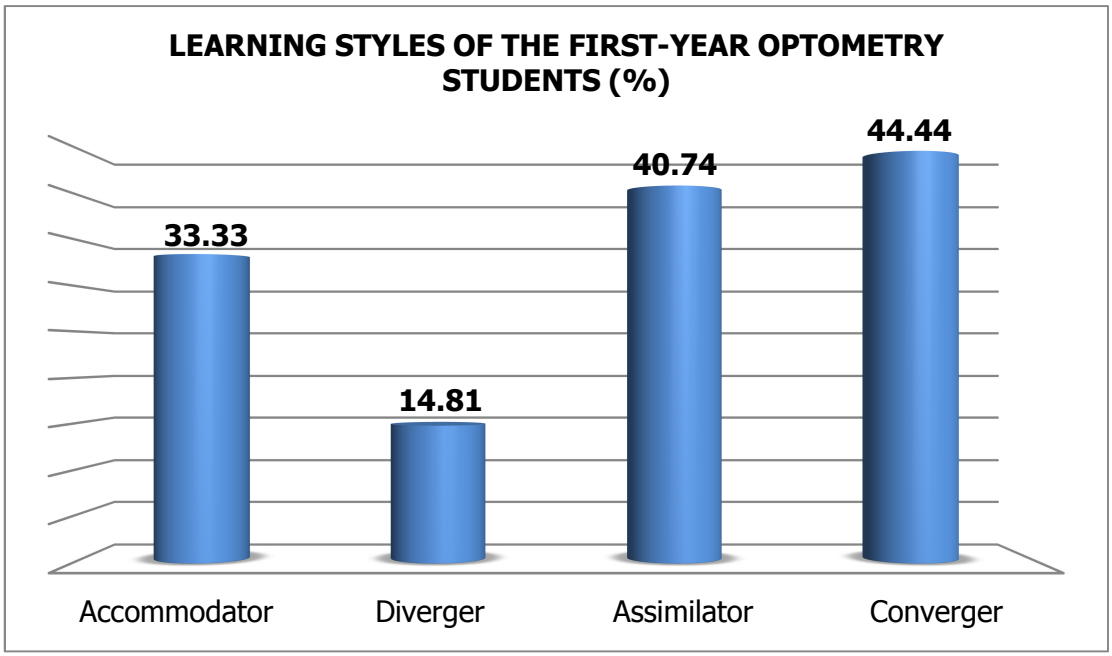

FIGURE 4.6: LEARNING STYLES OF THE FIRST-YEAR OPTOMETRY STUDENTS (n=27)

The total number of learning styles identified in the first-year group (n=27) was 36. Seven (7) students preferred more than one learning style. The most dominant learning style in the first-year group of Optometry students was the Converger learning style (44.44%). The Assimilator learning style was identified by 40.74%, and 33.33% of students in their first year of study preferred the Accommodator learning style, followed by the Diverger style with 14.81%.

Seven (7) of the 27 (25.93%) students in this academic year group indicated that they had more than one learning style. One student (14.29%) each identified the Accommodator and Diverger styles, and the Accommodator and Converger styles respectively. Three (3) students (42.86%) indicated that their dominant styles were Assimilator as well as Converger. One student had no preference for one of the learning styles as identified by Kolb.

4.3.1.2 *Learning styles of the second-year Optometry students*

Figure 4.7 points out the identified learning styles of the second-year Optometry students at the University of the Free State in 2014.

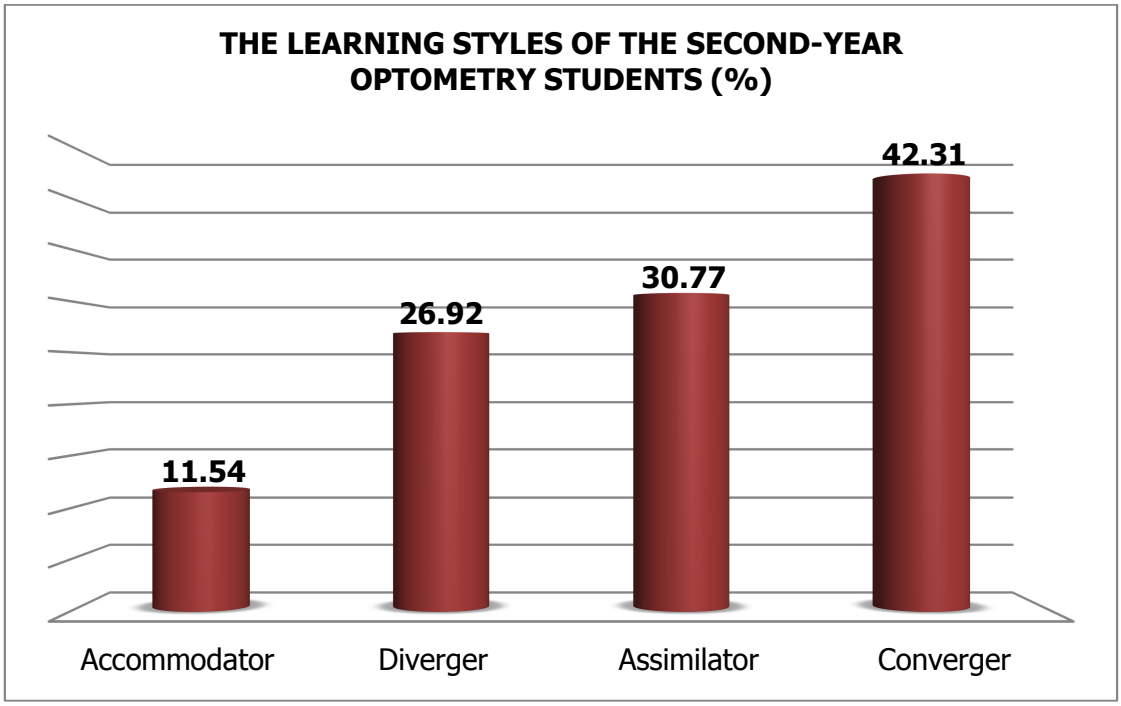

FIGURE 4.7: LEARNING STYLES OF THE SECOND-YEAR OPTOMETRY STUDENTS (n=26)

Twenty-nine (29) learning styles were identified in the second-year group (n=26) of Optometry students. Three (3) students identified more than one learning style. The most prevalent learning style was the Converger style (42.31%), followed by the Assimilator style (30.77%), while the Diverger style as dominant learning style was indicated by 26.92%. The least dominant style was the Accommodator learning style (11.54%).

Three (3) of the 26 (11.54%) students in this academic year group indicated that they had more than one learning style. Similar to the first-year Optometry students the combination of the Accommodator and Diverger styles, the Accommodator and Converger styles, and the Assimilator and Converger styles were identified by each of the students respectively.

4.3.1.3 *Learning styles of the third-year Optometry students*

Figure 4.8 represents the percentages of the 36 learning styles identified by the third-year students (n=31) at the Department of Optometry at the University of the Free State.

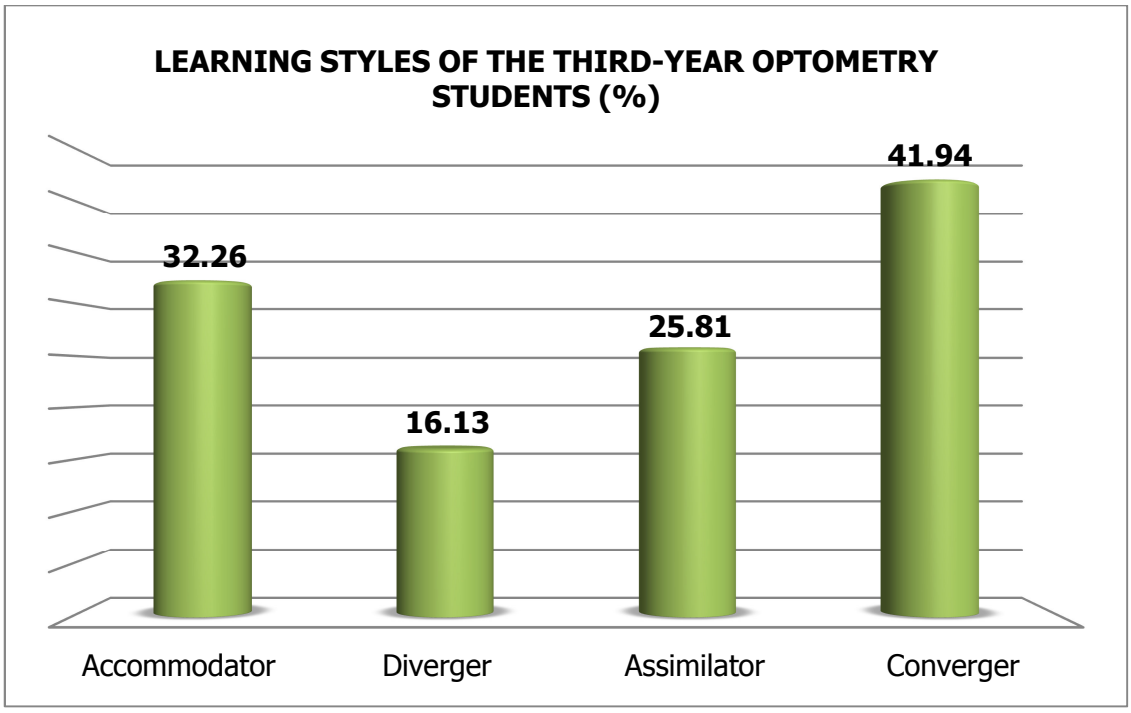

FIGURE 4.8: LEARNING STYLES OF THE THIRD-YEAR OPTOMETRY STUDENTS (n=31)

Similar to the junior years the most identified learning style was the Converger learning style (41.94%). In contrast with the second-year group the Accommodator was the second prevalent learning style with 32.26% identifying it as their preferred learning style. The Assimilator learning style was pointed out as the dominant learning style by 25.81% of the third years. Comparable to the first-year group, the least preferred learning style in this academic year group was the Diverger learning style (16.13%).

Five (5) of the 31 (16.13%) students indicated that they had more than one preferred learning style. Three (3) indicated the combination of the Diverger and Assimilator learning style, while the other two combinations identified were the Accommodator and Converger, and Accommodator and Diverger learning styles.

4.3.1.4 *Learning styles of the fourth-year Optometry students*

Figure 4.9 indicates the percentages of each of the learning styles that were identified by the final-year students at the Department of Optometry at the University of the Free State in 2014.

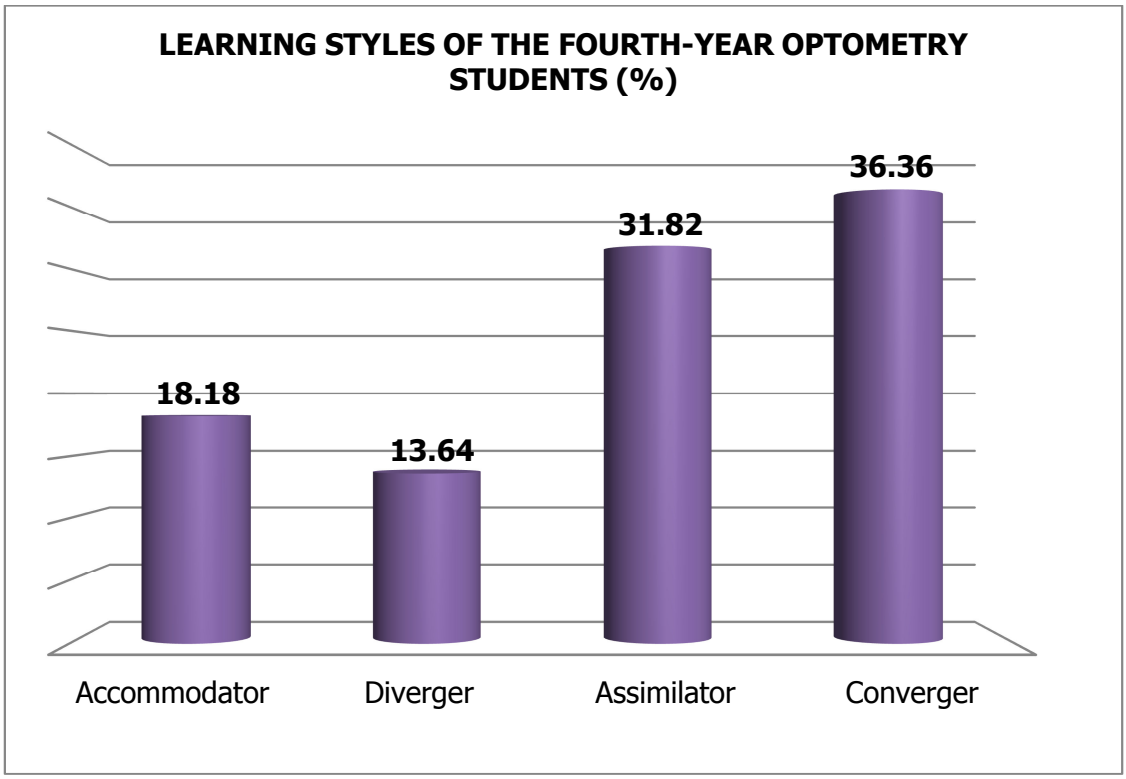

FIGURE 4.9: LEARNING STYLES OF THE FOURTH-YEAR OPTOMETRY STUDENTS (n=22)

The Converger learning style was the most popular identified learning style (36.36%), followed by the Assimilator (31.82%). Of the fourth years, 18.18% preferred the Accommodator learning style, and the Diverger learning style was indicated by 13.64%. No one of the fourth-year group indicated that they preferred more than one learning style.

4.3.2 Summary of the learning styles of the Optometry students at the University of the Free State in 2014

The most preferred learning style of students at the Department of Optometry at the University of the Free State was the Converger learning style. The Assimilator learning style was identified by the second most respondents in the first, second and fourth academic years. The third academic year group measured the Accommodator learning style as second most preferred learning style.

The following section will present and discuss the effect of the age, gender, academic year group and ethnicity on the different learning styles that were identified.

4.4 LEARNING STYLES COMPARED WITH CATEGORICAL VARIABLES

The 123 individual learning styles that each participant in the sample population (n=106) identified, were compared with the categorical variables (gender, year group, and ethnicity). The results of these comparisons are presented and discussed in this section.

4.4.1 Learning styles compared with gender

Figure 4.10 presents the four different learning styles compared with the gender of the sample population.

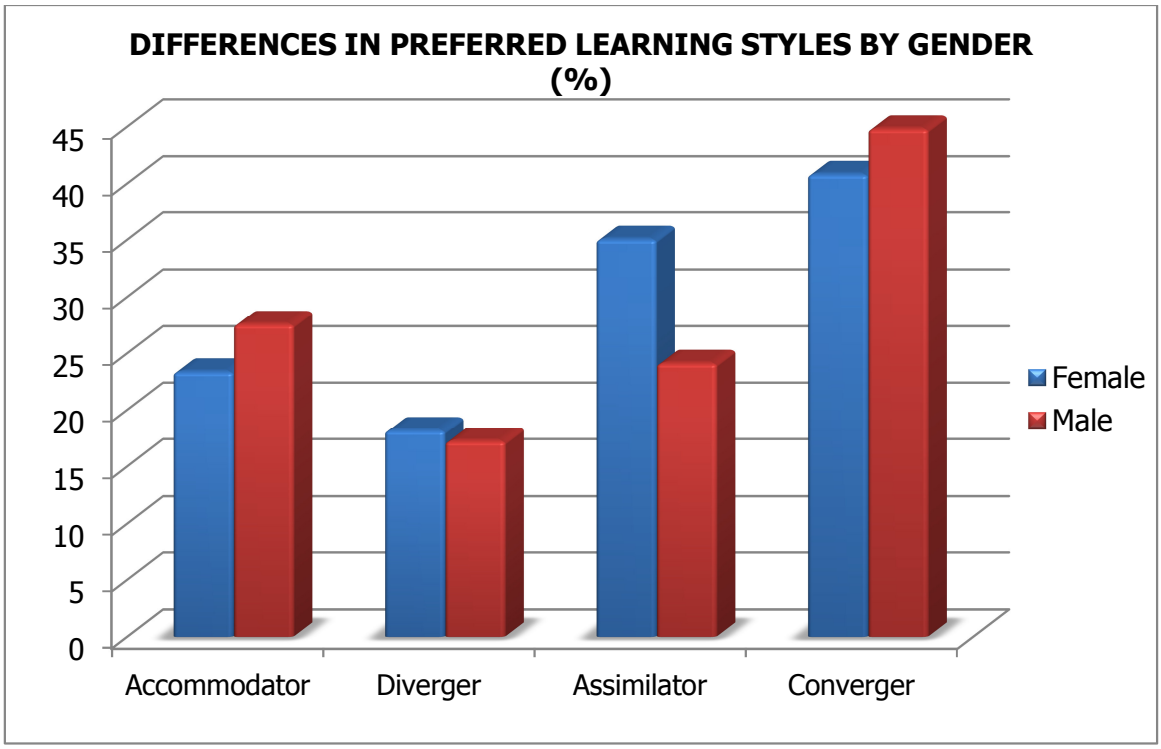

FIGURE 4.10: DIFFERENCES IN PREFERRED LEANING STYLES BY GENDER (n=106)

According to the data analysis the male students preferred the Converger and Accommodator learning styles. Female students dominantly measured as Divergers and Assimilators. The p-values of the data were >0.05; therefore, gender has no statistically significant influence on the identified learning styles.

4.4.2 Learning styles compared with age

Regression analysis was used to investigate the effect of the numerical variable (age) on the different learning styles. Table 4.2 indicates the p-values for the data.

TABLE 4.2: P-VALUES FOR PREFERRED LEARNING STYLES PER AGE GROUP

Learning Style	P-value
Accommodator	0.6534
Diverger	0.9104
Assimilator	0.2826
Converger	0.6705

For all the learning styles, the p-value > 0.05 was found, that indicates for this sample population that age did not have an effect on their learning styles.

4.4.3 Learning styles compared to the academic year groups

The identified learning styles were compared to the different academic year groups to determine whether the academic year of a student had an influence on the learning style. The results were found to be insignificant, and for this sample population no influence of the academic year was found on learning styles.

Figure 4.11 represents the comparison of the learning style with the academic year groups.

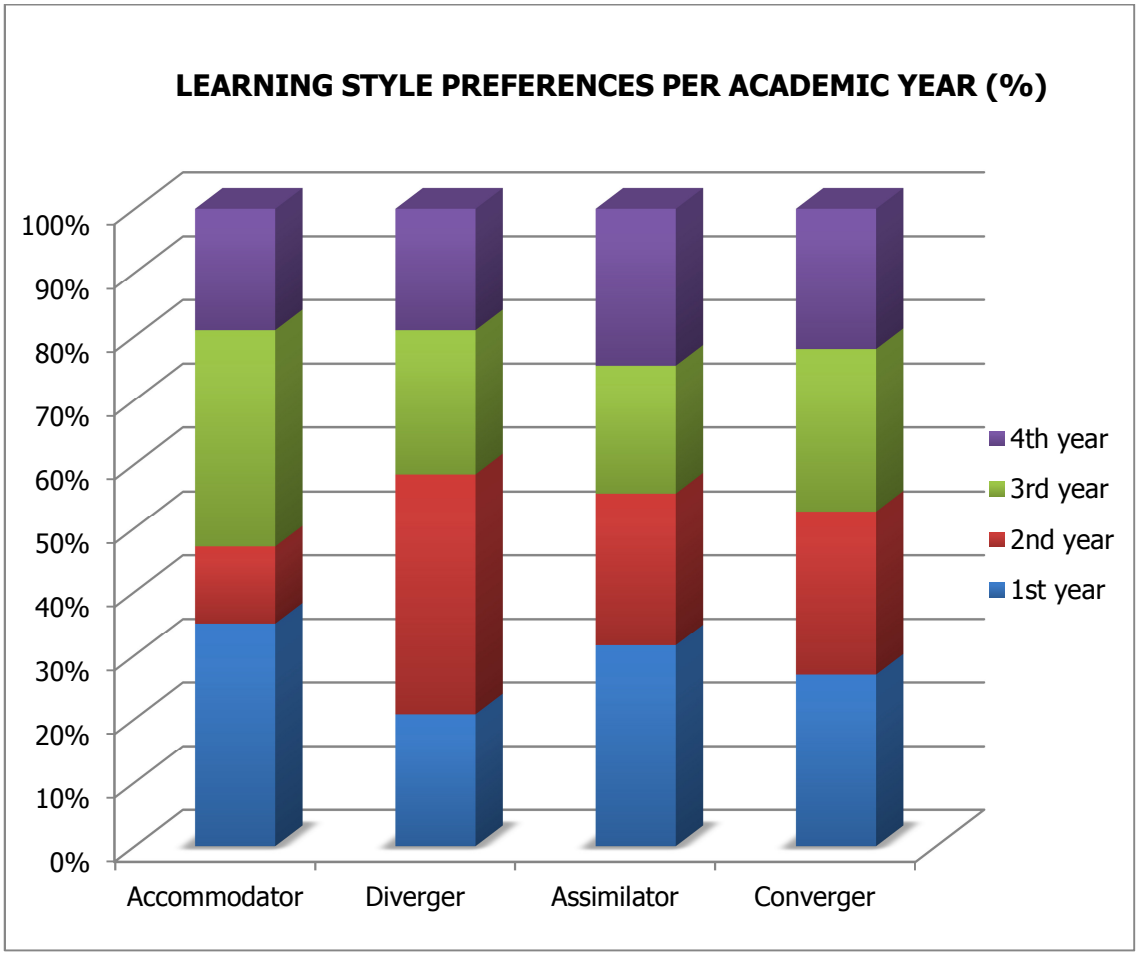

FIGURE 4.11: LEARNING STYLES PREFERENCES PER ACADEMIC YEAR (n=106)

4.4.4 Learning styles compared to ethnicity

Figure 4.12 presents the four different learning styles compared with the ethnicity of the sample population.

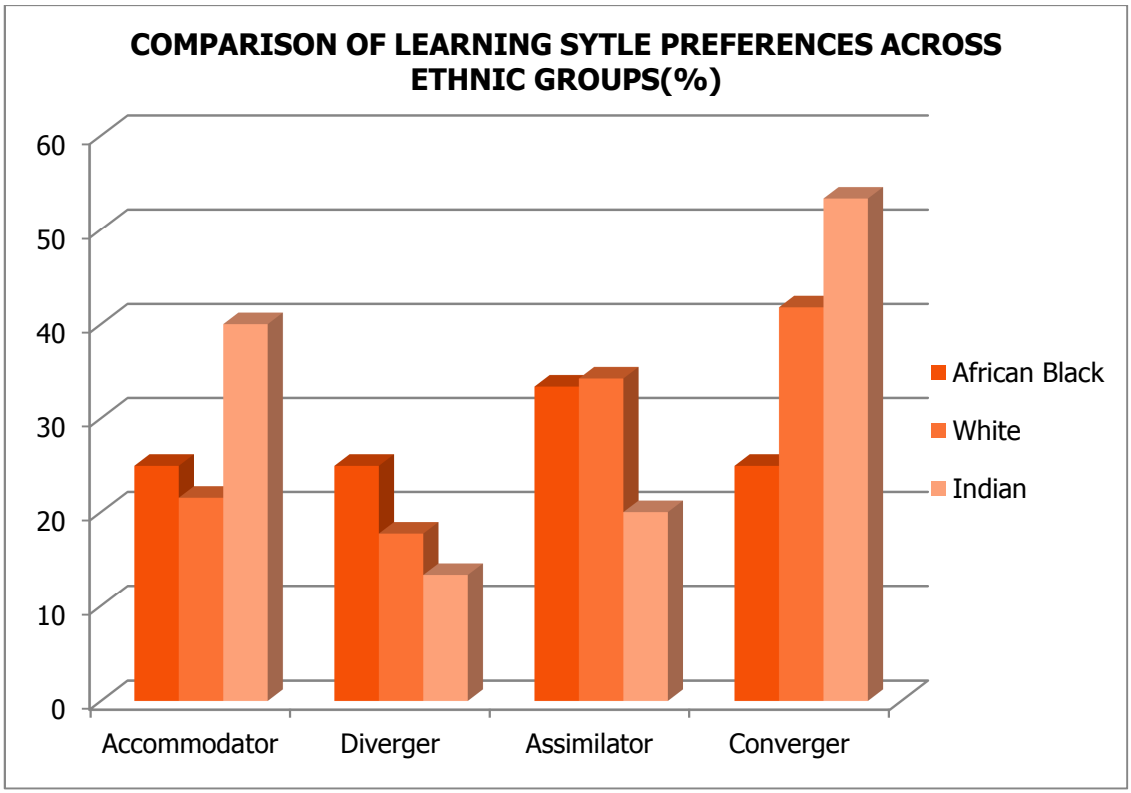

FIGURE 4.12: COMPARISON OF LEARNING SYTLE PREFERENCES ACROSS ETHNIC GROUPS (n=106)

The data show that the students in the Indian population group had a strong preference for the Converger and Accommodator learning styles. In this sample population it was found that ethnicity did not have an influence on any of Kolb's learning styles. The p-values were found >0.05.

4.4.5 Summary of the learning styles compared to categorical variables

In order to investigate the effect of age, gender, academic year and ethnicity on learning styles the identified learning styles were compared with these categorical variables. In the sample population none of these variables had an effect on the identified learning styles and the p-values were found >0.05.

4.5 CONCLUSION

In Chapter 4 an overview of the results and a discussion of the findings of the survey using the learning style inventory that was conducted have been provided. From the findings the conclusion can be drawn that the undergraduate Optometry students that were investigated during 2014 employed the four learning styles according to the

following order: (i) Converger; (ii) Assimilator; (iii) Accommodator; and (iv) Diverger. This ranking order was true over the four study years, except that in the third study year the Accommodator learning style was ranked the second highest and the Assimilator learning style third.

The findings also indicated that neither of the variables of age, gender, academic year and ethnicity had any significant effect on the students' preference of learning style.

In the next chapter, Chapter 5, entitled, **A discussion of the learning styles as described by Kolb and used by the Optometry students in the Faculty of Health Sciences at the University of the Free State**, the learning styles identified will be discussed in detail with recommendations with regard to curriculum delivery at the Department of Optometry.

CHAPTER 5

A DISCUSSION OF THE LEARNING STYLES AS DESCRIBED BY KOLB AND USED BY THE OPTOMETRY STUDENTS IN THE FACULTY OF HEALTH SCIENCES AT THE UNIVERSITY OF THE FREE STATE

The skill of knowing how to learn is a must for each worker … It opens doors to all other learning and facilitates the acquisition of other skills.
[Blakmoore (1996) in Buch and Bartley 2002:5]

5.1 INTRODUCTION

The overall goal of this study was to enhance the learning environment and improve the learning of Optometry students at the UFS. To achieve this goal the study aimed to determine the students' learning styles by means of Kolb's learning style inventory, to describe the identified learning styles in terms of Kolb's elucidations, and make recommendations to adapt the curriculum delivery and the learning environment to accommodate the preferred learning styles.

Learning styles are referred to as the method of choice for the perception and processing of knowledge. Learning styles form an important part of students' learning strategies in higher education, and can be used to guide the choice of teaching methods to enhance the learning environment and make learning more effective.

The identification of a learning style can assist lecturers to address areas such as the diversity of students in a transformational education environment (*cf.* 2.5.1). It also contributes to the development of effective life-long learners (*cf.* 2.5.3), and necessarily will need to play a more important role in Optometry education with the implementation of National Health Insurance (*cf.* 2.6) in South Africa, as HEIs offering optometry training will be expected to increase the number of graduates that complete their studies successfully.

The Experiential Learning model developed by Kolb can be applied to the current curriculum of the Optometry Department of the UFS. Therefore, Kolb's learning style

inventory was used to identify the learning styles of the Optometry students at the UFS.

Chapter 1 of this report dealt with the introduction and orientation to the study; Chapter 2 comprised a discussion of a thorough literature study that was conducted by die researcher. The main topics that were reviewed in Chapter 2 were definitions of learning styles with factors influencing learning styles, Kolb's learning style inventory, learning styles as an effective pedagogy, and the importance of learning styles in the South African National Transformed Educational system (*cf.* Figure 2.1). Chapter 3 described the research design, methodology, and sampling employed in the study. A description and discussion of the results of the adapted Kolb's learning style inventory survey were provided in Chapter 4.

In this chapter, Chapter 5, the preferred learning styles of the Optometry students will be discussed and recommendations will be provided with regard to the curriculum delivery at the Department of Optometry at the UFS.

5.2 DIFFERENT ASPECTS OF THE CURRICULUM DESIGN PROCESS

To achieve the goal of education legislation with transformation to a more student-centred system, the Department of Optometry at the UFS follows an outcomes-based curriculum. This educational strategy allows the Department to accurately measure whether the student meets the national academic outcomes as stipulated by the National Qualifications Framework (NQF), and it also guarantees quality assurance and quality promotion (*cf.* 2.5.2).

To enhance the curriculum delivery at the Department of Optometry the incorporation of the identified learning styles have to be considered. Figure 5.1 provides an overview of the different elements of the curriculum design process with the relation among different concepts to enhance curriculum delivery.

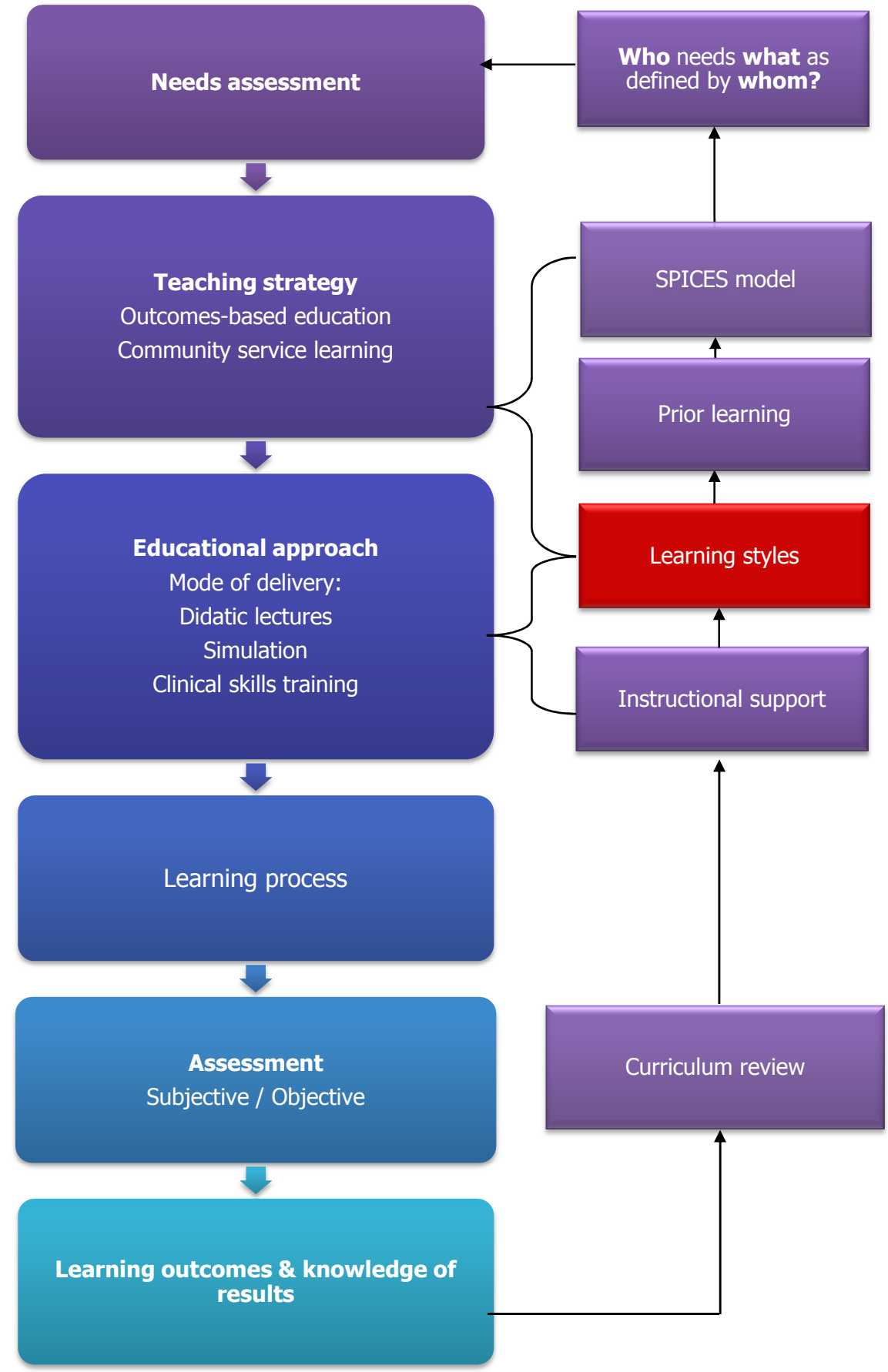

FIGURE 5.1: THE CURRICULUM DESIGN PROCESS
[Compiled by the Researcher]

The constant dynamic interaction among the elements of curriculum design makes constructive alignment of these elements very important (*cf.* 2.4.4). The curriculum design process starts with a needs assessment (*cf.* 2.6) to formulate the outcomes of the outcomes-driven curriculum (*cf.* 2.5.2). The exit-level outcomes of the Optometry degree have been established by the CHE and the HPCSA (*cf.* 2.6). The Department has to plan the different educational and teaching methods that align with assessment in order to achieve the different module outcomes and ensure that significant learning has taken place (*cf.* 2.5.2).

From this model it can be seen that the learning process is affected by the interaction between the educational strategy and individual differences such as learning styles and prior knowledge. The chosen educational strategy must be designed with the SPICES model's continuum in mind (*cf.* 2.5.2). The teaching method will depend on learning styles and instructional support such as technology and simulation. Due to the design process being a cyclic process, learning outcomes in terms of motivation, performance and engagement can be enhanced when the strategies are reviewed and adjusted according to the feedback.

5.3 LEARNING STYLES OF THE OPTOMETRY STUDENTS AT THE UNIVERSITY OF THE FREE STATE

The Converger learning style was identified as the dominant learning style of the students at the Department of Optometry (*cf.* 4.3.1). Students that prefer the Converger learning style tend to choose medical science as their field of study where they are in an environment where they are forced to think on their feet to make immediate decisions and solve problems practically (*cf.* 2.3.3.3).

The second most preferred learning style was the Assimilator learning style. This result correlates with previously researched data that found the Assimilator style popular in Optometric education programmes (*cf.* 2.2.2.5).

5.3.1 Learning styles of different academic year groups

The two dominant learning styles of the first, second, and fourth years were the Converger and Assimilator learning styles. The third-year academic group was the only

group that identified the Accommodator learning style as their second preferred learning style (*cf.* 4.3.1.3). This learning style is linked to students that are activist and take up leadership (*cf.* 2.3.3.4). Although academic year groups had no statistically significant influence on the identified learning styles, it is interesting to mention that the Department identified the third-year group as a very strong group that takes initiative and action that corresponds with the characteristics of the learning style identified.

5.3.2 Learning styles compared to categorical variables

In contrast with what has been found in the literature (*cf.* 2.2.2) no statistical difference was found when the identified learning styles of the Optometry students were compared to categorical variables such as gender, age, academic year groups and ethnicity (*cf.* 4.4). It can be argued that categorical variables could not have had an impact due to the fact that the sample population was homogenous, consisting of mainly females, Whites and a small age difference was found (*cf.* 4.2). This result will make the implementation of employing learning styles as an effective pedagogy in the Department of Optometry less complicated, as more focus may be placed on groups than on individuals.

5.4 ENHANCEMENT OF CURRICULUM DELIVERY AT THE DEPARTMENT OF OPTOMETRY, UFS

The definition of a learning style involves aspects such as how a student perceives, interacts with and responds to a learning environment (*cf.* 2.2.1). A learning style determines how a student will run the metaphorical curriculum race to overcome the obstacles and hurdles (*cf.* 2.4.4) and achieve the set outcomes to become a competent optometrist. According to Kolb's learning styles, perception of knowledge can take place through abstract conceptualisation or through a concrete experience. Processing of information can be done through reflective observation or active experimentation (*cf.* 2.3.2).

The Converger and Assimilator learning styles that was identified by the students as the most preferred learning styles have the same characteristics regarding the perception of knowledge, but have different ways of processing the information.

Students at the Department of Optometry prefer to perceive information through the application of logic and thought. The majority of the students preferred to process the information perceived by being involved in a practical exercise, while a large group would choose to observe a practical demonstration and reflect on the demonstration (*cf.* 2.3.1).

Figure 5.2 illustrates the ways of perception of and the different ways of processing knowledge according to the Converger and Assimilator learning styles. These characteristics of learning have to be taken into consideration when deciding on an educational and teaching method for the students at the Department of Optometry.

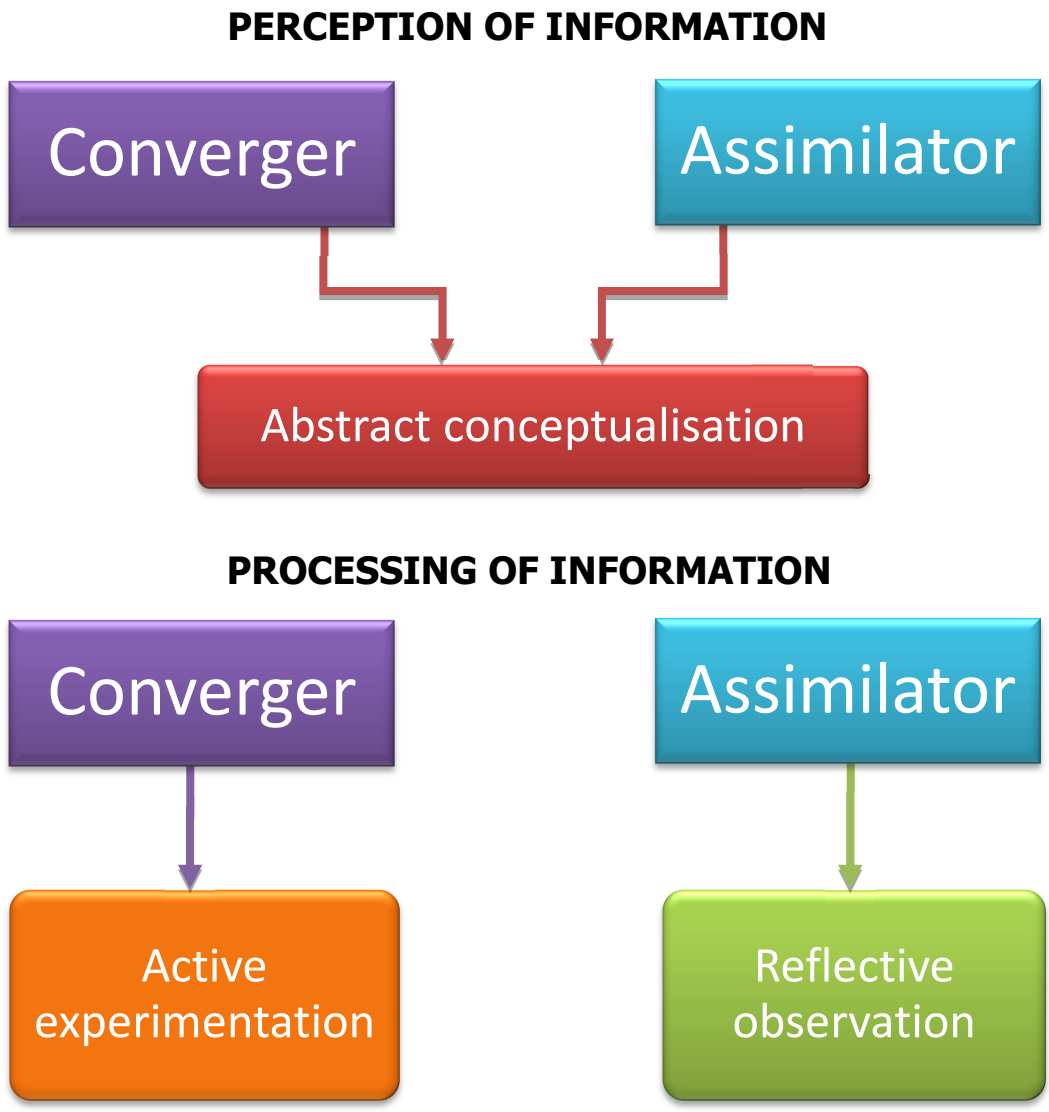

FIGURE 5.2: THE PERCEPTION AND PROCESSING OF INFORMATION OF THE CONVERGER AND ASSIMILATOR LEARNING STYLES [Compiled by the Researcher]

5.4.1 The current curriculum at the Department of Optometry, UFS

An evaluation of the current curriculum at the Optometry Department of the UFS was made to investigate whether Kolb's experiential learning cycle could be applied to the current curriculum. The first- and second-year Optometry curricula at the UFS mainly consist of theoretical modules. In the third and fourth academic years more practical modules and clinical modules are built-into the curricula.

Table 5.1 presents the qualification programme with the compulsory modules, with indications of whether each is a practical or a theoretical module.

TABLE 5.1: COMPULSORY MODULES IN FIRST-YEAR, B.OPTOM DEGREE, UFS

	MODULE CODE	MODULE NAME
Theoretical modules	PHYS1534 & PHYS1544	**Physical and Geometric Optics**
	BMBO1508	**Basic Anatomy and Physiology**
	PSIN1514	**Introduction to Psychology**
	ETHS1522	**Ethics and Management Skills**
Theoretical and practical modules	OTMS1512 & OTMS1523	**Optometric Theory and Methods**
	OPHT1522	**Ophthalmic Dispensing**

The current curriculum for the first-year Optometry students has two modules with practical components and is provided by the Department of Optometry. These modules consist of *Optometric theory and methods* (OTMS1512) and *Ophthalmic dispensing* (OPHT1522), and underscore the theory and practice of preliminary tests for an optometric evaluation and basic dispensing skills. The remaining four modules of the first-year curriculum are offered by other departments at the University of the Free State.

Taking Kolb's cycle into consideration the first-year students will have a missing component, as there is no concrete experience for the students since the students in their first year of study have no contact with patients; skills that are taught, are practised on fellow students.

The second-year curriculum comprises nine modules which mainly are offered by the Department of Optometry. The foundational knowledge that is laid down in the first year is built onto by teaching students the skills to perform a comprehensive eye examination on a patient in the theory and practical module, *Optometric theory and methods* (OTMS2613 and OTMS2623) and the theory of dispensing skills is elaborated on in the module *Ophthalmic dispensing* (OPHT2612 and OPHT2622). Six modules in the second year do not have a practical component attached to the module and mainly consist of theory. Table 5.2 provides the outline of the compulsory modules provided in the second academic year.

TABLE 5.2: COMPULSORY MODULES IN SECOND YEAR, B.OPTOM DEGREE, UFS

	MODULE CODE	MODULE NAME
Theoretical modules	GENA2612 & GENA2622	**General Pathology**
	PUBH2622	**Public Health**
	ENVO2612	**Environmental and Occupational Optometry**
	PHYS2654 & PHYS2664	**Ophthalmic and Visual Optics**
	BMBO2608	**Applied Anatomy and Physiology**
	CLNS2622	**Contact Lenses and Practice**
Theoretical and practical modules	OTMS2613 & OTMS2623	**Optometric Theory and Methods**
	OPHT2612 & OPHT2622	**Ophthalmic Dispensing**
	LVIS2622	**Low Vision**

Second-year Optometry students are exposed to a single concrete experience at the end of the year when all the skills that they need to master in their second year have been attained. A comprehensive eye examination is done under supervision of a qualified Optometrist. It is not expected of the students to make any diagnosis on pathology, as they only will be introduced to the theory in the third and fourth years of study.

Six of the twelve modules in the third year have a practical component where students can process the knowledge that is perceived by active experimentation. A clinical module is introduced in the third-year curriculum. Table 5.3 presents the compulsory modules in the third year of study at the Department of Optometry.

TABLE 5.3: COMPULSORY MODULES IN THIRD YEAR, B.OPTOM DEGREE, UFS

	MODULE CODE	MODULE NAME
Theoretical modules	PATH3702	**Ocular Pathology**
	GOPH3704	**General and Ocular Pharmacology**
	ORES3704	**Optometry Research Skills**
	SYPM3704	**Systems Pathology and Medical Microbiology**
	PHCR3704	**Public Health**
Theoretical and practical modules	LVIS3702	**Low Vision**
	OPHT3702	**Ophthalmic Dispensing**
	CLNS2622	**Contact Lenses and Practice**
	PAED3702	**Paediatric Optometry**
	DGNS3702	**Diagnostic Skills**
	BVIS3704	**Binocular Vision**
Clinical module	COPT3706	**Clinical Optometry**

Third-year students have a *Clinical Optometry* module (COPT3706) that involves two general clinics a week. This is a clinical module where patient consultations are performed by students and supervised by an Optometrist. Students are expected to apply their theoretical knowledge and clinical skills acquired to fully examine and manage patients that present with ocular and visual problems. Students would also be moulded to maintain professionalism in providing quality care to all patients that are consulted. This provides a direct, personal experience to the student to integrate knowledge learned during previous years with clinical skills. The student has the opportunity to act on the grounds of reflection, previously mastered knowledge and skills, and own ability, to be open minded, and to be adaptable to change and learn from the specific experience relating to the patient (*cf.* 2.3.1).

One of the specific module outcomes for COPT3706 is that the student must be able to present a clinical case to fellow students and optometrists and analyse different cases and deliberate the appropriate management interventions. The assessment for this outcome is done by means of a case presentation during a scheduled lecture time, currently named *Case Presentation*. The result contributes 20% to the year mark for this module in the third year. This provides an opportunity for the student to reflect on the direct experience with the patient and for fellow students to learn from reflective observation (*cf.* 2.3.1).

The main focus in the fourth study year is for students to be able to apply scientific health care skills and technologies during the examination of the eye and related conditions within the context of the scope of practice, and appropriate to the needs of the individual and community, while adhering to appropriate medico-legal ethics, health and safety regulations, and codes of conduct. To ensure that students become competent qualified Optometrists, it is essential for students to apply appropriate learning strategies in the diagnosis of eye and related conditions and they are expected to interact consultatively in the management and delivery of eye-care products, therapy and medication, with knowledge of minimum standards of optometric care (*cf.* 2.6). Table 5.4 provides the curriculum outline in terms of the exit-level modules in the Optometry degree at the UFS.

TABLE 5.4: COMPULSORY MODULES IN FOURTH YEAR, B.OPTOM DEGREE, UFS

	MODULE CODE	MODULE NAME
Theoretical modules	PATH4802	**Ocular Pathology**
	ETHS4802	**Ethics and Management Skills**
	ORES4802	**Optometry Research Skills**
	CMED4802	**Clinical Medicine for Optometric Practice**
	NOPT4804	**Neuro-Optometry**
	LVIS4802	**Low Vision**
	CLNS4802	**Contact Lenses andPractice**
Theoretical and practical modules	PAED4802	**Paediatric Optometry**
	BVIS4802	**Binocular Vision**
Clinical module	COPT4800	**Clinical Optometry**

To ensure that students' professional and clinical responsibilities are upheld within the relevant regulatory frameworks and parameters of the national health policy the fourth-year curriculum has a *Clinical Optometry* module (COPT4800) that is a 72-credit-bearing module that comprises specialty clinics. The specialty clinics include low vision, contact lenses, binocular and paediatrics and pathology clinics respectively. Patients are referred from the third-year general clinic to one of the speciality clinics for an extensive evaluation if any abnormality that was picked up during the general evaluation. The predicate for this module comprises two formal evaluations in each speciality and grand rounds which are *Case presentations* during the same time slot as that of the third years. Some of the theoretical modules still have a practical component, but the main focus is on clinical teaching.

5.4.1.1 *Clinical evaluation in the current curriculum at the Department of Optometry, UFS*

For evaluation in the current Optometry curriculum, clinical training at the Department of Optometry, UFS, follows the STEPS technique (Figure 5.3) as described by Dent and Harden (2009:92).

FIGURE 5.3: STEPS TECHNIQUE FOR CLINICAL TRAINING [Compiled by the Researcher]

In the non-clinical years the theory regarding the skills and the context within which they will be mastered and applied are set. Tutoring takes place during practical training where students are able to demonstrate the skills on their peers with the skills being explained with repeated demonstration. Students are then provided the opportunity to practise the skills, under supervision, on patients.

The cycle of learning modes as described in Kolb's experiential learning theory (*cf.* 2.3.1) is applicable to the current educational methods used in didactic lectures, practical work, and clinical course work as employed in the Department of Optometry of the UFS (Figure 5.4). This, particularly, is the case in the third and fourth academic year when the four modes of Kolb's learning cycle are utilised.

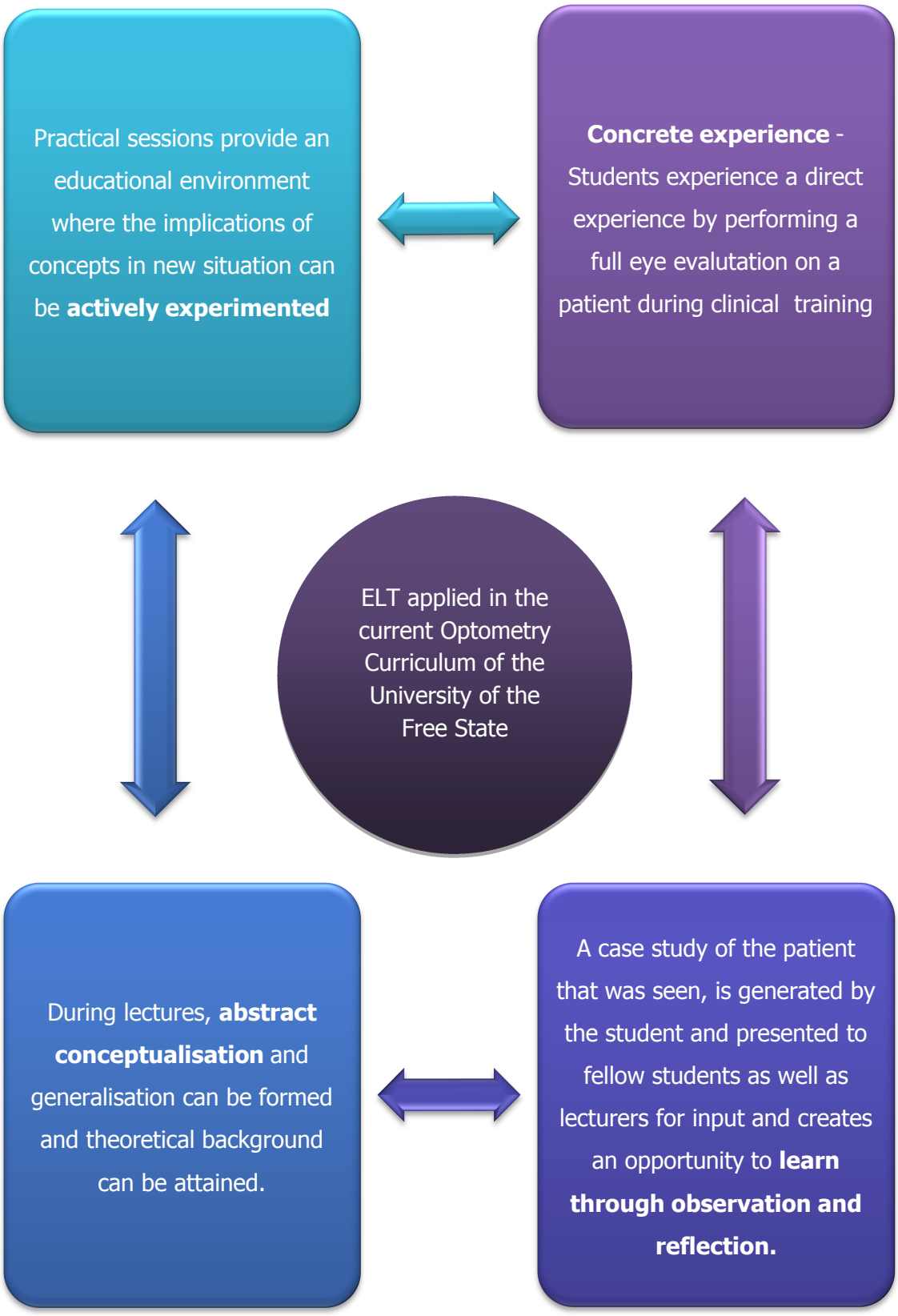

FIGURE 5.4: ELT APPLIED IN THE CURRENT OPTOMETRY CURRICULUM, UFS [Compiled by die Researcher]

5.4.2 Recommendations

This section will deal with recommendations which the researcher wishes to make, based on the findings of the study and aimed at enhancing the Optometry curriculum at the University of the Free State. Recommendations are made with a view to enhancing the learning in each learning mode (as described by Kolb) with emphasis on strategies to improve teaching aimed at supporting the learning taking place according to the two dominant identified learning styles, namely the Converger and the Assimilator learning styles. Depending on the learning outcome, the lecturer may choose to match or mismatch the instruction to the dominant learning styles identified, or follow a multi-style approach to address all the learning dimensions (*cf.* 2.4).

5.4.2.1 ***Concrete experience***

The concrete experience refers to the learning mode of perception of knowledge, which was identified as the least preferred learning mode by the students of the Department of Optometry (*cf.* 4.3.1). This, however, does not mean that it has to be disregarded as a learning mode. Research has shown that multi-style teaching, where all four learning modes are utilised, is still best practice (*cf.* 2.4.3). This experience is a very important aspect of health professions education, as it is a direct reflection of the profession that the students aspire to enter, and refers to the affective learning environment (*cf.* 2.4.4) that mimics the professional environment that the students aspire to enter. Focus is placed on the integration of knowledge that has been attained during lectures and practicals. This learning mode is not readily used in the first and second year of study as the skills that are required for the evaluation of a patient have not been embedded yet.

The educational environment in which the direct experience takes place must be set in such a way that it is least destructive for the student. The Optometry clinic at the National District Hospital is well equipped and has all the necessary equipment for students to test, diagnose and manage their patients. Care must be taken to ensure that the clinic is not overbooked as students may feel intimidated and rushed when they have to see too many patients. The supervisor: student ratio ideally should be 1:3 to provide the student adequate time with the supervisor during the eye examination when uncertainties occur.

The enhancement of a concrete experience can be achieved by placing more emphasis on reflection. A large group of students identified this learning mode as their way of processing information. After the concrete experience, students currently are provided with an opportunity to reflect on the patient that has been examined and to compile a report to present as a case study. The presentation is assessed by lecturers and peers. The result forms part of their predicate for examination in the module *Clinical Optometry* for third- and fourth-year students (*cf.* 5.3.1).

Input and feedback from fellow-students and lecturers create an opportunity for students to gather new information about the actual experience and to create an awareness of different points of view and perspectives (*cf.* 2.3.1).

Reflective observation may also enhance the students' experience with the patients. Students should be provided with an opportunity to observe their peers when performing a comprehensive eye examination. It is recommended that peer evaluations in clinic should be introduced. Students in their final year should be provided with the opportunity to have at least one peer assessment on a general patient. The peer assessment will mimic the final assessment set-up in general clinic. The student will act as the internal examiner and the optometrist/supervisor will act as the external examiner. The student that is assessing is provided with the rubric (Appendix C) to assess their fellow student and is present throughout the examination while the supervisor will come in from time to time to make observations. The supervisor, together with the two students, at the end will have a discussion with constructive feedback. A final mark will be assigned to the student, which will contribute to the predicate mark for the clinical module COPT4800 (*cf.* 5.4.1).

This type of assessment enhances the learning experience for both students. Feedback is the return of information about the result of the activity. Supervisors should be informed that the feedback provided should be direct and focused on improvement. Concern has to be expressed about areas that need improvement, and appreciation should be shown for areas where the student has done very well.

5.4.2.2 *Reflective observation*

Ideally, reflection should be done after each clinic session for third- and fourth-year students. Time should be incorporated after the clinic for the students and supervisor to discuss the case. Areas where the student can improve should be pointed out by the supervisor, and students should have the opportunity to express their feelings and raise challenges faced during the experience. The Department of Optometry has to keep a balance between service learning and service delivery, as the clinic is part of a public district hospital. This provides many challenges in the sense that students have to be encouraged to do the testing as quickly as possible, but at the same time have a meaningful experience where learning can take place. The Health Professions Council of South Africa (HPCSA) regulates the number of patients that a student must examine during their undergraduate studies as prerequisite for registration to practise Optometry in South Africa (see Table 5.1). Human resources also are a challenge. Most of the supervisors in clinic are in private practice and have to rush off after the clinic session to attend to their private patients.

TABLE 5.5: COMPULSORY NUMBERS OF PATIENTS DURING UNDERGRADUATE STUDIES

TYPE OF PATIENT:	NUMBER OF PATIENTS:
General patients	120
Contact lense patients	15
Binocular vision patients	5
Paediatric patients	6
Low vision patients	6
Pathology patients	10

Case presentation creates an ideal platform for reflection and reflective observation and the time should be used effectively. The current structure merely provides the opportunity for the student that is presenting for learning to take place with the reflection on the concrete experience. There is an opportunity after the presentation for questions, but students do not use this wisely. Second–year students also feel inferior to the seniors and do not have the courage to ask questions. It is important that the students realise that the outcome of this lecture time is to build on the different levels of knowledge of the different year groups. The current module guide

and rubric do not provide sufficient information (Appendix D). An updated module guide and rubric (Appendix E) redesigned by the researcher may be included in the students' year guide. From this students will know what is expected of them and which requirements they have to meet at the end of the module.

To enhance the learning environment during case presentation, the recommendation would be that students be divided randomly into smaller groups with representatives for each year group. These groups should stay the same throughout the year to ensure that students are comfortable with each other. After the scheduled presentations the students should discuss the cases within their groups. Second-year students should be encouraged to ask seniors about test procedures and results that are unclear. This will aid in building on the theory that has been explained and discussed during lectures. Third- and fourth-year students should have the opportunity to build on the experience to prepare them for the experience that follows. The lecturers involved in case presentation should facilitate the process and act as helpers or coaches (*cf.* 2.3.3.3). Each lecturer should have two to three groups of students among which they could walk around to ensure that what is explained correlates with the theory. Areas which might be discussed in greater detail during lectures and practical sessions can also be identified thus.

5.4.2.3 *Abstract conceptualisation*

The two dominant learning styles identified by the students perceive knowledge through abstract conceptualisation (*cf.* figure 5.2). Students prefer to form a theoretical concept by thinking. The instructional method of choice would be a traditional lecture where the facilitator adopts the role of an expert (*cf.* 2.3.3.2). To be fully effective a lecture needs to be well-structured, expressive and clear. The focus must shift from a passive transmission of information to a more active learning experience with activities, questioning and reviews to cater for the individual needs of students (*cf.* 2.5.2). The students that identified themselves as Assimilators prefer lectures where information in presented logically and according to a step-by-step approach. They are regarded as private learners, and generally prefer not to engage in group discussions. This is in contrast with the Convergers that thrive on class participation and small group discussions (*cf.* 2.3.3.3).

Lectures and practical sessions provide the opportunity to make meaning of the experience and construct knowledge that is more theoretical and comprehensive. The lectures and practical sessions offer learning opportunities that involve logical thinking and ideas that will ensue in an understanding of the problem and the opportunity to actively plan for the next experience. The enhancement of the learning environment during lectures depends on the specific learning objectives. Most of the modules in first and second years use lectures as the only teaching method (*cf.* 5.4.1) - lectures should be used in combination with other instructional methods that complement the students' learning styles.

As the majority of Optometry students identified themselves as being Convergers, the lectures may be enhanced with the utilisation of simulation (*cf.* 2.3.3.3). In the second-year module, *Introduction to Low Vision* (LVIS2622), one of the outcomes requires of the students to understand the environment of a low-vision patient. Simulation may be used in conjunction with a lecture where the vision loss due to eye diseases is simulated on glasses and students have to wear them to perform certain household tasks. Afterwards, students have a debriefing session with the facilitator of learning on the feelings they have had while they have been wearing the glasses.

To enhance the learning experience for Assimilators during lectures, case studies may be presented during lecturing time (*cf.* 2.3.3.2). The importance of techniques used to interpret a case study must be explained. Students can also be given a specific diagnosis and then have to compile a case study to be discussed in smaller groups.

Role play is a learning strategy of choice for students that identified the Accommodator learning style as their preferred learning style (*cf.* 2.3.3.4). When planning to incorporate role play into the lecture it is important to clarify the learning objectives, to create challenging cases and to involve all students. In the first- and second-year module, *Optometric theory and methods* (*cf.* 5.4.1), role play can be used to improve the students' skills in history-taking, and in the third- and fourth-year clinical module it may be utilised for the integration of information into possible diagnoses and the management of patients.

The Diverger learning style has been identified as the least preferred learning style, but to create a multi-style teaching environment or to follow a mismatch approach, it is

important to include the strengths of this specific learning style. Divergers prefer settings in which they can brainstorm in groups (*cf.* 2.3.3.1). To provide an activity at the end of the lecture requiring of students to think creatively and solve a problem would be ideal for this learning style. Such activities could include crossword puzzles or the creation of a concept map.

5.4.2.4 *Active experimentation*

The majority of students prefer to process information through active experimentation. Skills training through practical sessions are commonly used in the Department of Optometry (*cf.* 5.4.1.1). Most of the modules in the third and fourth years have a practical component (*cf.* 5.4.1); therefore, the foundation of prior learning must be in place. During non-clinical years the theory on which the skill is based, and the context in which it will be learned and applied, must be established.

Practical training provides the opportunity for the students to demonstrate the skill on their peers while the lecturer explains the skill together with repeated demonstration. Students prefer to be actively involved in the demonstration. This learning mode can address both the preferred learning styles of the Optometry student by including a feedback session at the end of the practical session. Feedback aids the learner to achieve an expected level of performance and promotes learning. Feedback from fellow students can be helpful in identifying the qualities of good work as well as in diagnosing their own problems. The feedback and reflection must be focused on the key knowledge and skills that are required; it must be frequent, and linked to additional practice opportunities to be effective.

5.5 SUMMATIVE PERSPECTIVE

In summary, the conclusion that can be drawn from the literature study and the survey that was conducted, that the use of learning styles should be considered when teaching and learning strategies and methods are designed and selected. A learning style strategy will enhance student learning as it directly addresses the needs of the student.

The recommendations (Figure 5.5) in this chapter may serve as a guide for the academic staff of the Optometry Department to develop the teaching and learning strategies and learning modes for the modules for which they are responsible. The implementation of the learning style strategy will vary according to the learning outcomes and needs of the students.

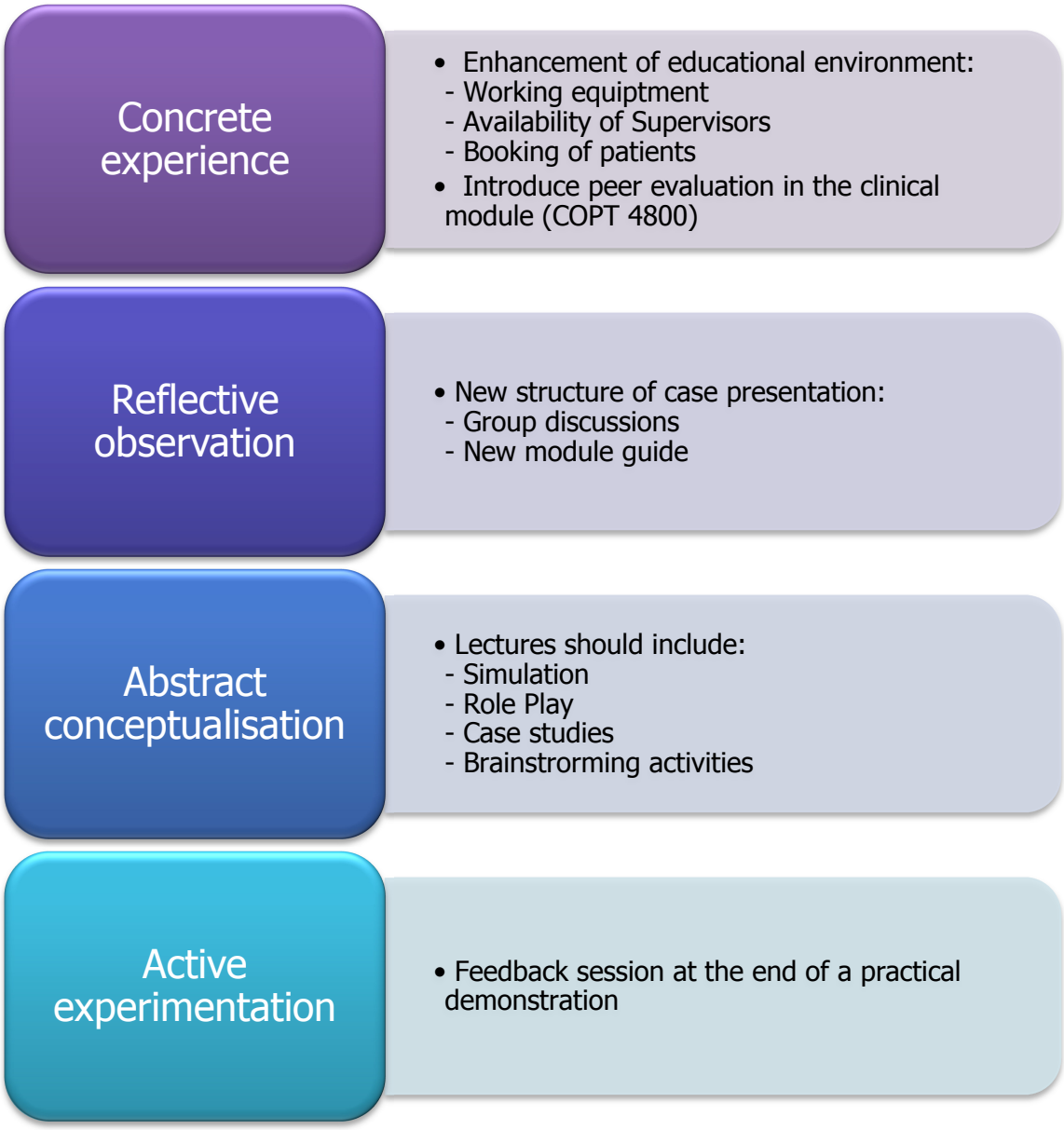

FIGURE 5.5: RECOMMENDATIONS TO ENHANCE THE CURRENT OPTOMETRY CURRICULUM DELIVERY
[Compiled by the Researcher]

5.6 CONCLUSION

Chapter 5 was devoted to a discussion of the learning styles of the 2014 Optometry students in the Faculty of Health Sciences at the University of the Free State. This discussion was anchored in Kolb's well-known exposition of learning styles, and included the role of the different elements that influence the curriculum design process. Recommendations for the enhancement of the delivery of the curriculum were made based on the principles of Kolb's experiential learning cycle.

In the next chapter, Chapter 6, entitled **Conclusion, recommendation and limitation of the study,** final conclusions on the study will be drawn, the limitations of the study will be discussed, and recommendations will be made.

CHAPTER 6

CONCLUSION, RECOMMENDATION AND LIMITATION OF THE STUDY

6.1 INTRODUCTION

Learning styles can be used effectively to inform pedagogy to guide the planning, development and implementation of an educational method that improves the teaching and learning environment to make learning more effective for students.

The aim of the study was to describe the learning styles of Optometry students at the University of the Free State (UFS) with a view to create a better understanding of how students acquire learning and to enhance the learning environment accordingly (*cf.* 1.4.2).

The purpose of this chapter is to provide an overview and concluding thoughts on the final findings of this study. The chapter gives an overview of the study, followed by conclusions that were drawn, a short discussion on the limitations of the study, the significance of the study, including the contribution to knowledge, recommendations on the way forward and a conclusive remark.

6.2 OVERVIEW OF THE STUDY

The study was carried out based on two research questions. The findings of the research form the basis of the recommendations discussed in this chapter.

In Chapter 1 (*cf.* 1.3) an outline of the research questions were presented. These research questions guided the research study and shaped the final outcome which is presented in this final chapter. In 6.2.1 the research questions are reviewed together with the main findings of each research question.

6.2.1 Research question 1

The research question as stated reads:

What is the significance of learning styles in the curriculum framework of higher education institutions?

The following objective was pursued:

To gain a deeper understanding of the significance of learning styles in the curriculum framework of higher education institutions. This objective addressed the first research question and was pursued by means of a literature study in order to provide a theoretical basis for this study.

This research question aimed to provide a background to the study. In Chapter 2, the significance of learning styles in the curriculum framework of higher education institutions was conceptualised and contextualised. The main areas which were studied are: Learning styles (*cf.* 2.2), Kolb's Learning Style Inventory (*cf.* 2.3), Learning styles as an effective pedagogy (*cf.* 2.4), The importance of learning styles in the South African National Transformed Educational System (*cf.* 2.5) and the Impact on Optometric Education (*cf.* 2.6). For better understanding and clarity, these primary areas of study were categorised into subdivisions, as will be elucidated now:

To create a better understanding of the concept of a learning style, the section Learning styles (*cf.* 2.2) focused on learning style definitions (*cf.* 2.2.1) with the factors influencing learning styles (*cf.* 2.2.2) that include personality (*cf.* 2.2.2.1), academic discipline (*cf.* 2.2.2.2), gender (*cf.* 2.2.2.3), culture (*cf.* 2.2.2.4), and generation (*cf.* 2.2.2.5).

Kolb's Learning Style Inventory (*cf.* 2.3) was investigated, as it had been identified from literature as the most influential learning style model administered in terms of students in Health Sciences. This section focused on the Experiential learning theory (*cf.* 2.3.1) that is the foundation for Kolb's Four Learning Styles (*cf.* 2.3.2).

In order to understand the learning environment that is effective for each learning style, the characteristics of the different learning styles, as described by Kolb (*cf.* 2.3.3), were researched and discussed.

The application of learning styles as a teaching strategy was discussed in terms of learning styles as an effective pedagogy (*cf.* 2.4). Three theories were explicated, namely the Matching Theory (*cf.* 2.4.1), the Mismatch Theory (*cf.* 2.4.2), and the Multi-style Teaching (*cf.* 2.4.3). Researching the enhancement of the learning environment (*cf.* 2.4.4) provided the researcher with a basis from which to build on the curriculum enhancement according to the learning styles' characteristics.

The importance of learning styles in the South African National Transformed Educational System (*cf.* 2.5): This section focused on how learning styles can address the diversity of students in South Africa (*cf.* 2.5.1), as well as the importance of learning styles in transformational education (*cf.* 2.5.2). It also explored how learning styles may aid in the creation of a lifelong learner (*cf.* 2.5.3) to turn one of the mission statements of the UFS into a reality.

The learning paradigm shift in transformational education had an impact on optometric education (*cf.* 2.6), and this section focused on the implications that National Health Insurance will bring and how to improve the productivity and graduation rates of undergraduate Optometry students with the aid of learning styles.

An overview of chapter 2 is provided in Figure 2.1.

6.2.2 Research question 2

The research question that was stated reads:

What are the learning styles of the current undergraduate Optometry students in the Faculty of Health Sciences at the University of the Free State?

The following objective was pursued:

To identify and describe the learning styles of Optometry students. This objective addressed the second research question and was pursued by means of a questionnaire, namely Kolb's LSI.

An adapted version of Kolb's Learning Style Inventory was presented to the sample population comprising 106 undergraduate Optometry students registered at the School of Allied Health Professions, in the FoHS, UFS during 2014 (*cf.* 3.3.3.3). Participants were asked to complete the questionnaire after they had provided informed consent to take part in the study. A pilot study was conducted prior to this survey (*cf.* 3.3.3.4).

The results and discussion on the findings of the questionnaire survey deal with the identified learning styles of the 106 undergraduate Optometry students who completed the questionnaire. The questionnaire consisted of questions the responses of which would create a demographic profile of the participants, and the LSI to identify the preferred learning styles of the students (respondents).

The main findings of these sections were presented under the following headings: Demographic description of the sample (*cf.* 4.2), and Learning styles of the sample (*cf.* 4.3). In correspondence with what was found in the literature on the learning styles of health sciences students, the learning style that was identified in this study as the most preferred learning style was the Converger learning style. The second most identified learning style was the Assimilator learning style.

In order to address research question 2, a discussion on the learning styles of the Optometry students in the FoHS at the UFS as described by Kolb was presented (*cf.* Chapter 5). This was done in three sections; different aspects of the curriculum design process (*cf.* 5.2); the learning styles of the optometry students at the UFS (*cf.* 5.3) and enhancement of the curriculum delivery at the Department of Optometry, UFS (*cf.*5.4).

Learning styles are an important element in the different aspects of the curriculum design process (*cf.* 5.2) that have to be taken into consideration when a learning and teaching method is chosen to achieve a set outcome. The characteristics of the learning styles of the Optometry students at the UFS (*cf.*5.3) were taken into

consideration in making recommendations with a view to the enhancement of curriculum delivery at the Department of Optometry, UFS (*cf.* 5.4).

The current curriculum at the Department of Optometry, UFS (*cf.* 5.4.1) was explained in the context of the relevance of Kolb's experiential learning cycle to effective teaching and learning. Recommendations (*cf.* 5.4.2) were made on the enhancement of the learning environment at the Department of Optometry, UFS for each component of Kolb's experiential learning cycle with special focus on the identified preferred learning styles.

6.3 CONCLUSION

The improvement of curriculum delivery through using lecturing and clinical time more effectively in order for deep learning to take place is a vital, continuous process. This study originated from a need to enhance the educational environment that addresses the diversity of the current generation of students at the Department of Optometry at the UFS in terms of different learning styles.

Copious research has been done on learning styles and the application of learning styles in the health sciences educational environment. This research was conducted after the researcher had found that no research was done focusing on Optometry education in the South African higher educational context.

A more student-centred learning approach can be adopted with the incorporation of learning styles as an educational strategy. From the literature it is clear that the use of learning styles in higher education institutions can increase the graduation output rate and equip students with the skill of self-learning and taking responsibility of their own learning to become lifelong learners.

In order to produce confident and independent optometrists, students should be provided with the opportunity to combine and integrate skills and knowledge in the context of an experience. Kolb's learning cycle provides four components that can be utilised to enhance the learning experience and can be applied to the current curriculum delivery structure of the Department of Optometry at the UFS.

Kolb's work on learning identified four learning styles, namely the Diverger, Accommodator, Converger, and Assimilator. The participants in this study completed Kolb's LSI in order to identify their preferred way of perception and processing knowledge, known as learning styles. The data revealed that the most identified learning style at the Department of Optometry was the Converger learning style, followed by the Assimilator learning style.

Recommendations were made on the enhancement of the four components of Kolb's learning cycle. Attention was given to enhance the learning environment for the two preferred learning styles. Depending on the learning outcome and based on the knowledge of the preferred learning styles, the lecturer can choose to match or mismatch the learning styles of the students to the teaching method or apply a multi-style teaching approach. The recommendations by no means are a way of trying to adjust the teaching styles of lecturers, nor the learning styles of students, but to enhance the delivery of the curriculum and provide a guide that may be used to meet individual needs.

6.4 LIMITATIONS OF THE STUDY

The researcher recognises the following limitations in the study:

The questionnaire was available only in English and this could have influenced the responses of the students. A list of definitions was provided to the participants, but not all students might have had the same frame of reference in order to understand the terminology used in the LSI.

For the scope of the study reported in this mini-dissertation, one method of identifying the learning styles was sufficient, but for triangulation interviews might have been conducted with the individual students to confirm the results of the LSI survey to determine whether the student agreed with the learning style identified during the survey.

6.5 CONTRIBUTION OF THE RESEARCH

It is believed that the research will make a useful contribution in terms of new knowledge that has been added to available knowledge on teaching and learning in optometry education. The research findings will contribute to the integration of the knowledge of Kolb's learning cycle into teaching and learning at the Department of Optometry to improve skills development and the competencies of Optometry students to enhance the experiences in the undergraduate curriculum. To this end it is important that lecturers become fully informed about learning styles and how to apply this knowledge to the advantage of students.

With the learning styles of the undergraduate students identified, the researcher believes that the Department of Optometry, through implementation of the recommendations, may create a teaching and learning environment that will accommodate the diversity of this generation of undergraduate students.

The sound research approach and methodology ensured the quality, reliability and validity of the research and the completed research can be used as a basis for further research agendas.

The overall goal, the aim and the objectives of the study were achieved, and the research end product, namely the recommendations to enhance the current curriculum delivery at the Optometry Department using the identified learning styles, was compiled based on sound principles by making use of relevant literature.

6.6 RECOMMENDATIONS

In order for the study to yield significant and valuable results, the following recommendations are made, namely that

- the findings of the study be submitted to the Executive Committee of the Department of Optometry for consideration and implementation.
- the findings of the study be presented to the students to create an understanding of the learning strategy that will address individual learning needs most effectively.

- further studies be conducted on teaching methods that include role play and the use of case studies.
- further research be conducted in the field on the use of simulation in Optometry as the majority of students preferred to learn from active experimentation that does not involve a real patient.
- a follow-up study be done on learning styles of optometry students to determine whether the learning styles of the first- and second- year students changed after they have been introduced to clinical training.

6.7 CONCLUSIVE REMARK

To overcome the obstacles in the metaphoric curriculum race and achieve excellence as an educator and as a student might be one of the biggest challenges in health science education.

This study should be seen as an attempt to give direction to educators in the Department of Optometry so that they can develop a learning environment that motivates students to achieve excellence in the competencies and knowledge set out to qualify as a competent Optometrist.

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APPENDICES A – E

Appendix A1 – A3: THE QUESTIONNAIRE USED IN THIS STUDY

Appendix A1: INFORMATION DOCUMENT AND INFORMED CONCENT DOCUMENT (ENGLISH)

Appendix A2: INLIGTINGS DOKUMENT EN INGELIGTE TOESTEMMINGSDOKUMENT (AFRIKAANS)

Appendix A3: QUESTIONNAIRE: KOLB'S LEARNING STYLE INVENTORY

Appendix B POWERPOINT © PRESENTATION USED TO INTRODUCE THE QUESTIONNAIRE TO STUDENTS

Appendix C RUBRIC FOR THE ASSESSMENT IN GENERAL CLINIC (COPT 4800)

Appendix D CURRENT MODULE GUIDE SECTION FOR CASE PRESENTATION

Appendix E PROPOSED MODULE GUIDE SECTION FOR CASE PRESENTATION

APPENDIX A

THE QUESTIONNAIRE USED IN THIS STUDY

APPENDIX A1

INFORMATION DOCUMENT AND INFORMED CONCENT DOCUMENT

(ENGLISH)

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS UV

DEPARTEMENT VAN OPTOMETRIE
DEPARTMENT OF OPTOMETRY

CONSENT TO PARTICIPATE IN RESEARCH

PROJECT TITLE: THE LEARNING STYLES OF OPTOMETRY STUDENTS AT THE UNIVERSITY OF THE FREE STATE.

You have been asked to participate in a research study.

You have been informed about the study by Me Elzana Kempen (researcher). Me Kempen will be available throughout the completion of the questionnaire.

You may contact the Secretariat of the Ethics Committee of the Faculty of Health Sciences, UFS at telephone number (051) 4052812 if you have questions about your rights as a research subject.

Your participation in this research is voluntary, and you will not be penalised or lose benefits if you refuse to participate or decide to terminate participation.

If you agree to participate, you will be given a signed copy of this document as well as the participant information sheet, which is a written summary of the research.

The research study, including the above information has been verbally described to me. I understand what my involvement in the study means and I voluntarily agree to participate.

_____ _____

Signature of Participant Date

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YUNIVESITHI YA FREISTATA

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YUNIVESITHI YA FREISTATA
UFS UV

DEPARTEMENT VAN OPTOMETRIE
DEPARTMENT OF OPTOMETRY

INFORMATION DOCUMENT

THE LEARNING STYLES OF OPTOMETRY STUDENTS AT THE UNIVERSITY OF THE FREE STATE.

Dear Student,

I, Elzana Kempen, am doing research on the learning styles of Optometry students at the University of the Free State. Research is just the process to learn the answer to a question. In this study we want to learn about the learning style preferences of students at the Department of Optometry in order to enhance the curriculum delivery as well as to create self-awareness to you as a student regarding how you can improve your learning.

I am asking you to participate in a research study.

The research will be done by completing a standardise questionnaire to be able to identify your learning style as describe by Kolb. The questionnaire is an adapted Kolb Learning Style Inventory and is only available in English.

The four learning styles as described by Kolb is summarised as follows:

Diverger - Individuals who prefer this learning style learn through creating and generating new ideas and imagining new possibilities. They are able to view actual situations from several different points and enjoy gathering information, working in groups and listening with an open mind to diverse inputs. They tend to put more emphasis on observation than action.

Assimilator - Learning with this style takes place when individuals draw on multiple sources of information and organise information step by step and logically. Individuals with this learning style tend to focus less on people and more on ideas and abstract concepts that are logical reliable, but not necessary practical.

Converger - These individuals prefer interaction with technical tasks problems rather than social and interpersonal issues. They tend to solve problems practically and are

decision makers and prefer to use brainstorming, practical applications and case analysis as learning methods.

Accomodator - Being in a leadership role that takes action, initiative and risks where information was gathered from people rather than own examination, are one of the characteristics of these. They do best in situations where adaptation to the immediate changing environment is required and solve problems in an intuitive trail-and-error approach.

It will take approximately 30-45 minutes to complete the learning style inventory and develop your learning style profiles. There are no costs or risks involved for you to participate in this study.

Participation is voluntary and you may withdraw from this study at any given moment without penalty. You will remain anonymous and your data will be treated confidentially at all times. You will not receive any compensation for completing the questionnaire.

The purpose of this questionnaire is to identify your learning style. As you complete the learning style inventory remember that there are no right or wrong answers. The inventory gives you an idea of how you learn; it does not evaluate your learning ability.

Your profile will remain confidential and will be used for research purposes only. The results of this research project may be published and/or presented at forums and congresses.

Contact details of researcher:

Ms E Kempen
Department of Optometry
Allied Health Professions
University of the Free State
Tel: 071 688 9714/ 051 405 2691

Contact details of Secretariat and Chair: Ethics Committee of the Faculty of Health Sciences, University of the Free State – for reporting of complaints/problems: Telephone number (051) 4052812

APPENDIX A2

INLIGTINGS DOKUMENT EN INGELIGTE TOESTEMMINGSDOKUMENT (AFRIKAANS)

INFORMATION DOCUMENT AND INFORMED CONCENT DOCUMENT (AFRIKAANS)

UNIVERSITY OF THE FREE STATE
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YUNIVESITHI YA FREISTATA
UFS UV

DEPARTEMENT VAN OPTOMETRIE
DEPARTMENT OF OPTOMETRY

TOESTEMMING TOT DEELNAME AAN NAVORSING

PROJEKTITEL: DIE LEERSTYLE VAN OPTOMETRIE STUDENTE AAN DIE UNIVERSITEIT VAN DIE VRYSTAAT

U is versoek om aan 'n navorsingstudie deel te neem.

U is oor die studie ingelig deur Me Elzana Kempen (researcher). Me Kempen sal beskikbaar wees ten alle tye met die voltooing van die vraelys.

U kan die Sekretariaat van die Etiekkomitee van die Fakulteit Gesondheidsweteskappe, UV by telefoonnommer (051) 4052812 kontak indien u enige vrae het oor u regte as 'n proefpersoon.

U deelname aan hierdie navorsing is vrywillig, en u sal nie gepenaliseer word of voordele verbeur as u weier om deel te neem of besluit om deelname te staak nie.

As u instem om deel te neem, sal 'n ondertekende kopie van hierdie dokument sowel as die deelnemerinligtingsblad, wat 'n geskrewe opsomming van die navorsing is, aan u gegee word .

Die navorsingstudie, insluitend die bogenoemde inligting is verbaal aan my beskryf. Ek begryp wat my betrokkenheid by die studie beteken en ek stem vrywillig in om deel te neem.

_____ _____

Handtekening van deelnemer Datum

Me Elzana Kempen, National District Hospital,
White Block, 3st floor, Office 3, Roth Avenue, Willows, Bloemfontein
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DEPARTEMENT VAN OPTOMETRIE
DEPARTMENT OF OPTOMETRY

INLIGTINGSDOKUMENT

DIE LEERSTYLE VAN OPTOMETRIE STUDENTE AAN DIE UNIVERSITEIT VAN DIE VRYSTAAT

Geagte student,

Ek, Elzana Kempen, is besig om navorsing oor die leerstyle van Optometrie studente aan die Universiteit van die Vrystaat te doen. Navorsing is slegs die proses waardeur die antwoord op 'n vraagstuk verkry word. In hierdie studie wil ek meer oor die leerstyl voorkeure van die studente aan die Departement Optometrie leer om die aanbieding van kurrikulum te verbeter asook 'n self-bewustheid te kweek by jou, as student, oor hoe om jou leer proses te verbeter,

Ek versoek jou om aan die navorsingstudie deel te neem.

Die navorsing word gedoen deur die voltooing van 'n gestandaardiseerde vraelys wat jou in staat sal stel om jou leerstyl te identifiseer soos beskryf deur Kolb. Die vraelys is 'n aangepaste weergawe van Kolb se Leerstyl Inventaris en is slegs beskikbaar in Engels.

Die vier leerstyle, soos beskryf deur Kolb, word soos volg opgesom:

Divergeerder - Individue wat hierdie leer styl verkies leer deur die skep en die ontwikkeling van nuwe idees enl nuwe moontlikhede. Hulle is in staat om die werklike situasies uit verskillende oogpunte te sien en geniet die versameling van inligting, werk in groepe en luister met 'n oop gemoed te diverse insette. Hulle is geneig om meer klem te plaas op waarneming as optrede.

Assimilator - Leer met hierdie styl vind plaas wanneer individue staat maak op verskeie bronne van inligting en organiseer inligting stap vir stap en logies . Individue met hierdie leerstyl is geneig om minder te fokus op mense en meer op idees en abstrakte konsepte wat logiese betroubaar is, maar nie nodig practise nie.

Konvergeerder - Hierdie individue verkies interaksie met tegniese taak probleme eerder as sosiale en interpersoonlike kwessies. Hulle is geneig om prakties probleme op te los en is besluitnemers. Hulle verkies dinkskrums, praktiese toepassings en geval ontleding as leer metodes .

Akkomodeerder - Vul 'n leierskap rol wat aksie, inisiatief en risiko's neem. Inligting word ingesamel van mense eerder as eie ondersoek . Hulle doen die beste in situasies waar die aanpassing by die onmiddellike veranderende omgewing vereis word en probleme op te los in 'n intuïtiewe benadering.

Dit sal ongeveer 30-45 minute om die leerstyl inventaris te voltooi asook die ontwikkeling van jou leerstyl profile. Daar is geen koste of risiko's betrokke vir jou deelname aan die studie.Deelname is vrywillig en jy kan op enige gegewe oomblik aan die studie onttrek sonder enige nagevolge. Jy sal anoniem bly en die data sal vertroulik gehanteer word ten alle tye. Daar is geen vergoeding vir die voltooiing van die vraelys.

Die doel van hierdie vraelys is om jou leerstyl te identifiseer. Soos jy die leerstyl inventaris voltooi, onthou dat daar is geen regte of verkeerde antwoorde nie. Die inventaris gee jou 'n idee van hoe jy leer, dit evalueer nie jou leer vermoë nie.

Jou profiel sal vertroulik bly en sal gebruik word vir navorsing doeleindes. Die resultate van hierdie navorsingsprojek mag gepubliseer word en / of aangebied word op forums en kongresse.

Kontakbesonderhede van navorser

Ms E Kempen
Junior Lecturer
Department van Optometry
Skool van Aanvullende Gesondheids Wetenskappe
Universiteit van die Vrystaat
Tel: 071 688 9714/ 051 405 2691

Kontakbesonderhede van die Sekretariaat en Voorsitter: Etiekkomitee van die Fakulteit Gesondheidswetenskappe, Universiteit van die Vrystaat – vir rapportering van klagtes/probleme: Telefoonnommer (051) 4052812

APPENDIX A3

QUESTIONNAIRE: KOLB'S LEARNING STYLE INVENTORY

QUESTIONNAIRE

KOLB'S LEARNING STYLE INVENTORY

DEFINITIONS

Involved:	Complicated and difficult to comprehend.
Tentative:	To be hesitant, uncertain and cautious.
Discriminating:	Able to see fine distinctions and differences.
Practical:	To be concerned with an experience or actual use of theory.
Receptive:	To be able to apprehend/understand quickly.
Impartial:	An opinion has not been formed beforehand towards or against any particular side or party.
Analytical:	To use analysis which is the process of considering something or examining it in order to understand it or to find out what it consists of.
Relevant:	The importance or significance in a specific situation or to a specific person.
Feeling:	A physical or mental effect that is produced in the mind by a stimulus or sensation.
Watching:	Looking or observing closely or attentively.
Thinking:	The process to exercise the mind in order to make a decision.
Doing:	An action or the performance of an action.
Accepting:	To take or receive something that is offered.
Aware:	To be informed of current developments.
Evaluating:	To judge or assess the worth.
Risk-taker:	The practice of taking action which might have undesirable consequences.
Intuitive:	To act on a situation with instinctive knowledge or belief.
Questioning:	Enthusiastic or eager for philosophical or other investigations.
Logical:	Use the principles of reasoned thought or argument as distinguished from irrationality.
Productive:	Producing or have the power to produce.
Concrete:	Relating to characteristics of things capable by being perceived by the senses.
Observing:	To see, perceive and notice.

Abstract:	Theoretical, not applied or practical.
Active:	The act of being busy or involved.
Present-oriented:	To be adjusted in existence of at the moment and in time.
Reflecting:	To think, meditate or ponder.
Future-orientated:	To be adjusted to a situation that occurs after the present time.
Practical:	To be concerned with an experience or actual use of theory.
Open to new experiences:	To be ready to entertain new ideas.
Perceptive:	To have the ability to comprehend of grasp a concept quickly
Intelligent:	To have the capacity for understanding and ability to perceive and comprehend meaning.
Competent:	To have sufficient skills and knowledge to perform a certain task.
Experience:	Direct personal participation or observation.
Observation:	The act of observing.
Conceptualisation:	The formation of a concept out of observations, experience or data.
Experimentation:	The act, process, or practice of an attempt at something new or different.
Intense:	Characterised by deep or forceful feelings.
Reserve:	To keep or retain for oneself.
Rational:	To be able to reason and be capable of logical thought.
Responsible:	To be able to take rational decisions without supervision and to be accountable for one's own actions.

References:

Collins Dictionary. Online
http://www.collinsdictionary.com/dictionary/english/discriminating?showCookiePolicy=true
Retrieved on 21 October 2013

Office use only

SECTION 1: DEMOGRAPHIC INFORMATION

☐ ☐ ☐ 1-3

In the following section, demographic information is requested. Please make a cross (X) in the appropriate box for each item, except for question 1 where you write the number.

1.	What is your age?	_____Years		☐ 4
2.	What is your gender?	(a) MALE	1	☐ 5
		(b) FEMALE	2	
3.	In which year are you currently academically?	(a) First	1	
		(b) Second	2	☐ 6
		(c) Third	3	
		(d) Fourth	4	
4.	To which ethnic group do you belong?	(a) African	1	
		(b) Caucasian	2	☐ 7
		(c) Coloured	3	
		(d) Asian	4	
		(e) Other	5	

SECTION 2: LEARNING STYLE INVENTORY

Rank order each set of four words (going across) in the 10 items listed below. Assign a 4 to the word which best characterises your learning style, a 3 to the next best, a 2 to the next, and a 1 to the least characteristic word. Assign a different number to each of the four words. Do not make ties.

For example:

		Column 1		**Column 2**		**Column 3**		**Column 4**
1.	4	Pink	1	Purple	3	Green	2	Blue

		Column 1		**Column 2**		**Column 3**		**Column 4**
1.		Involved		Tentative		Discriminating		Practical
2.		Receptive		Impartial		Analytical		Relevant
3.		Feeling		Watching		Thinking		Doing
4.		Accepting		Aware		Evaluating		Risk-taker
5.		Intuitive		Questioning		Logical		Productive
6.		Concrete		Observing		Abstract		Active
7.		Present-Orientated		Reflecting		Future-orientated		Practical
8.		Open to new experiences		Perceptive		Intelligent		Competent
9.		Experience		Observation		Conceptualisation		Experimentation
10.		Intense		Reserve		Rational		Responsible

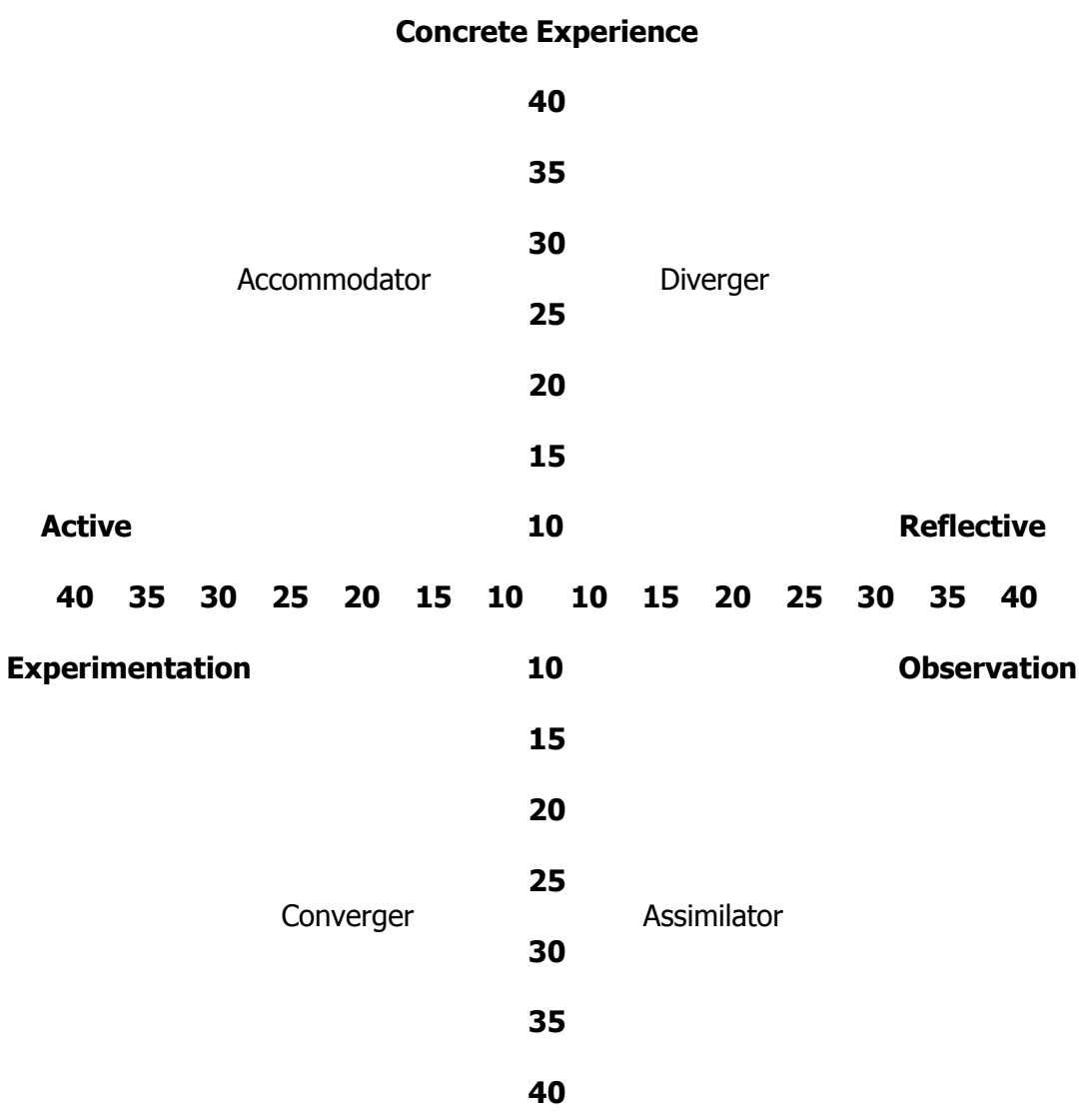
Total the rank numbers you have given to the ten words in each of the four columns (add all of your scores going down).

Total:	Column 1	Column 2	Column 3	Column 4

The sum of the first column gives you your score on Concrete Experience.
The second column gives you your score on Reflective Observation.
Your score on the third column is for Abstract Conceptualisation.
The fourth column is your score on Active Experimentation.

Transfer each of your scores to the Learning Style Profile on the next page by placing a mark by the number you scores on each of the four dimensions. Connect these four marks with straight lines. Your dominant learning style is determined by locating the quadrant with the largest enclosed space on your Learning Style Profile.

LEARNING STYLE PROFILE



5.	My dominant learning style as determined by the Learning style Inventory below.	(a) Accomodator	1
		(b) Diverger	2
		(c) Assimilator	3
		(d) Converger	4

☐ 8

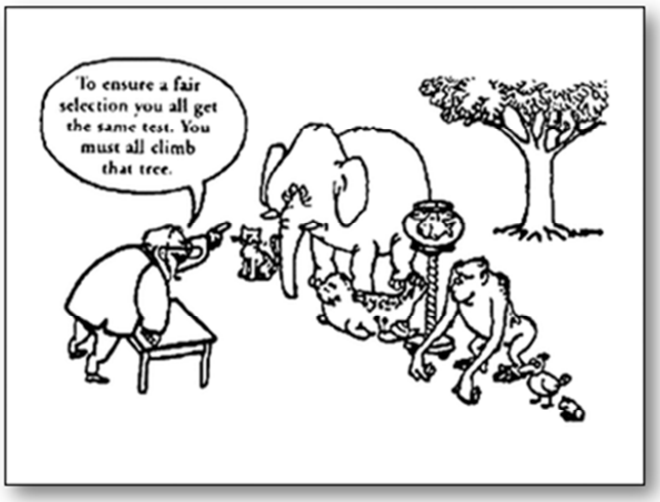
Thank you very much

Your co-operation in completing this questionnaire is greatly appreciated

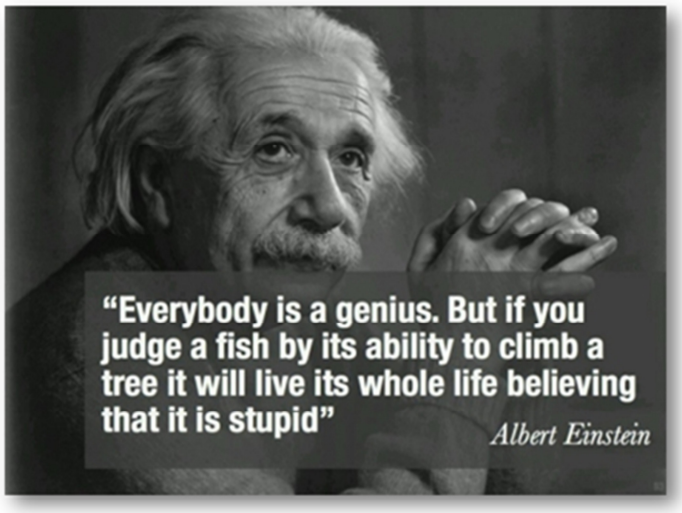
APPENDIX B

POWERPOINT © PRESENTATION USED TO INTRODUCE THE QUESTIONNAIRE SURVEY TO STUDENTS

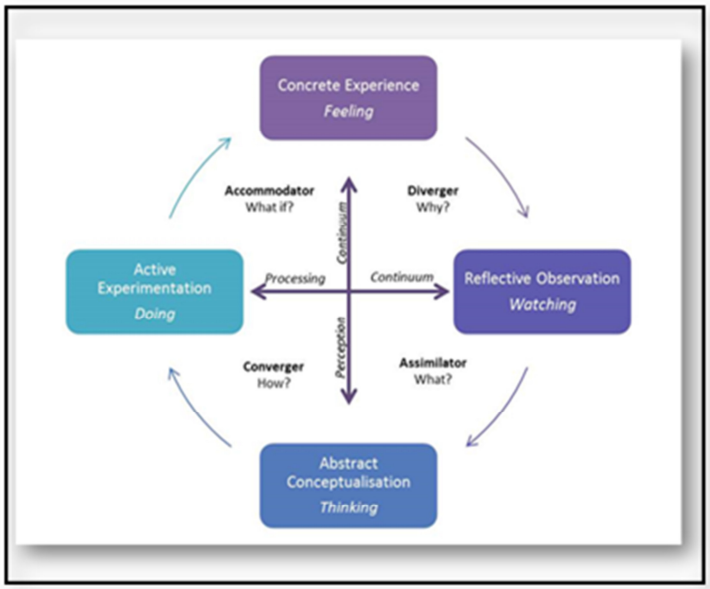
Good morning,
I am Elzana Kempen and am here today to request your voluntary and anonymous participation in a research project on the different learning styles of the undergraduate students at the Optometry Department at the University of the Free State.



As we all are unique, we all acquire learning on different ways….

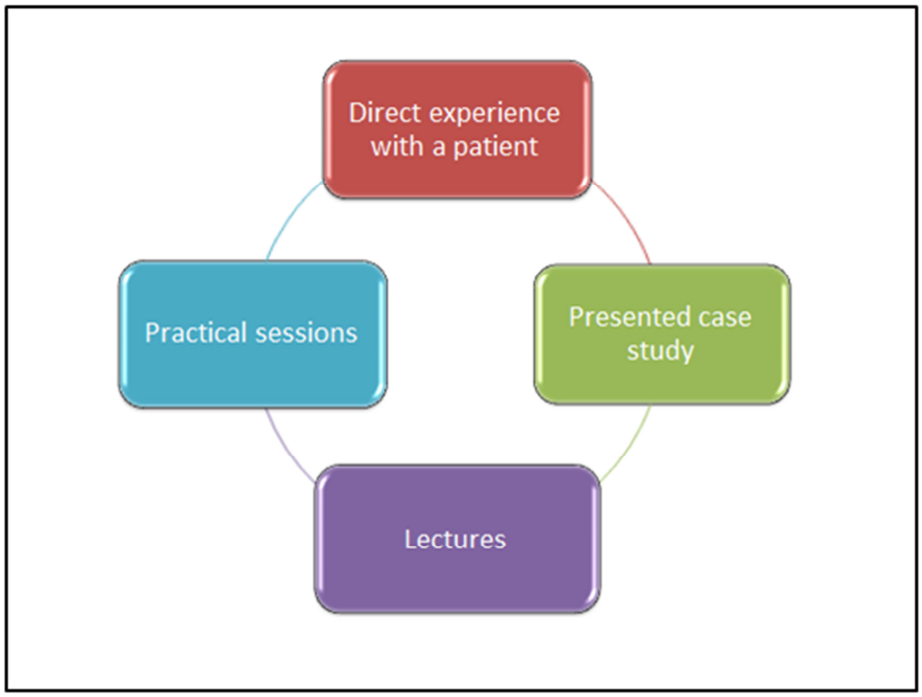


And from this quote we can see that we are designed to do things differently…



The research aim to identify your preferred learning style as described by Kolb.

- It will take approximately 30-45 minutes to complete the learning style inventory and develop your learning style profiles.
- There are no costs or risks involved for you to participate in this study.
- Participation is voluntary and you may withdraw from this study at any given moment without penalty.
- You will remain anonymous and your data will be treated confidentially at all times.
- You will not receive any compensation for completing the questionnaire.



For application of Kolb's learning style theory in the Department of Optometry:

- The concrete experience can be linked to the direct involvement with a patient when the patient is evaluated in clinic.
- Case presentation provides a good opportunity to reflect back on what has been done and to learn from other students' experiences
- Abstract conceptualisation can be done during lectures and practical sessions provide opportunity to actively experiment.

As you can see the method of learning differs in the four modes and some of you learn better in practical sessions while other value the lectures more.

Example how to complete the LSI:

- Rank order each set of four words (going across) in the 10 items listed below.
- Assign a 4 to the word which best characterises your learning style, a 3 to the next best, a 2 to the next, and a 1 to the least characteristic word.
- Assign a different number to each of the four words. Do not make ties.

		Column 1		Column 2		Column 3		Column 4
1.	4	Pink	1	Purple	3	Green	2	Blue

- Your favourite colour is pink, then green, blue and purple

- Transfer your totals to the graph on the last page and identify your learning style.
- More information is provided in the information document given.
- THANK YOU

APPENDIX C

RUBRIC FOR THE ASSESSMENT IN GENERAL CLINIC (COPT 4800)

Student:_____ Date:_____

Examiner:_____Patient File No: _____

Time allocation:

- 80 minutes in test room (Management and patient education, completion of ICD 10 codes and referral letter must be completed in test room)
- Extra time for glucose and blood pressure measurement.
- Dispensing: 10 minutes for frame selection, fitting and measurements.

SECTION 1

Did the candidate:

- Introduce him/herself and make the patient comfortable. YES/NO
- Make sure all equipment is clean. YES/NO
- Wash his/her hands (or use the sanitizer). YES/NO

External Observation:

- Did the student make a proper external observation and record findings correctly YES/NO

Case History

- Did the candidate explain the purpose of a case history? YES/NO
- Did the candidate enquire about?
  - i. Chief complaint/primary reason for visit?
  - ii. Patient's ocular symptoms? YES/NO
  - iii. Patient's ocular history (i.e. previous Rx, previous eye test, ocular injury, eye operations) YES/NO
  - iv. Patient's specific family ocular history? YES/NO
  - v. Patient's specific visual requirements? YES/NO
  - vi. Any headaches experienced? YES/NO
  - vii. Patient's health status? YES/NO
  - viii. Medication being taken? YES/NO
  - ix. Allergies to any medication YES/NO
- Did the candidate apply the FOLDAR format adequately when applicable? YES/NO
- Did the candidate ask question in a logical sequence based on the information solicited? YES/NO
- Did the candidate show attentiveness to the patient's response? YES/NO
- Did the candidate elicit sufficient data for a good patient profile? YES/NO
- Did the candidate overcome barriers to communication? YES/NO
- Did the student write down the correct problem list? (included both visual, non-visual and systemic health problems) YES/NO

____/20

SECTION 2
Preliminary tests

Visual acuity
Did the candidate:

- Explain the purpose of the test correctly? YES/NO
- Provide proper instructions to the patient? YES/NO
- Ensure occlusion of the untested eye with monocular acuities and made sure that the patient is not peeping? YES/NO
- Ensure adequate target illumination (overhead lamp for near YES/NO
- Perform the test in a smooth and efficient way? YES/NO
- Obtain an accurate distance acuity measure for OD, OS and OU? (**Yes** if all the measurements are correct) YES/NO
- Determine unaided near acuities ensuring reading material is held at 40cm at all times? YES/NO
- Record **all** visual acuity findings accurately in Snellen fraction? YES/NO
- Perform pinhole (where applicable) YES/NO
- Perform the +2.00 test (where applicable) YES/NO
- Observe patient during examination (look out for squinting, turning heads) YES/NO

____/11

Note: Pinhole not a must if VA is less than 6/12
+2.00 test to be done where VA is 6/6 and better in non-presbiope

Cover test (distance and near)
Did the candidate:

- Explain the purpose of the test correctly? YES/NO
- Provide proper instructions to the patient? YES/NO
- Use an appropriate target (*single letter on line above distance VA of worse eye, spot of light if VA < 6/18) for* ***distance***?) YES/NO
- Use an appropriate target (*6/9 or one line above near VA of the worse eye for* ***near*** *cover test @ 40cm and ensure patient can see* YES/NO
- Perform the unilateral cover test first and correctly **(*Cover totally over eye to prevent peripheral fusion, hold occluder for about 2 seconds)*?** YES/NO
- Perform the alternating cover test correctly (***Adequate cover and*** YES/NO
- Record and Interpret the findings **accurately**? YES/NO
- Perform the test in a smooth and efficient way? YES/NO

____/8

NPC

Did the candidate:

- Explain the purpose of the test correctly? YES/NO
- Provide proper instructions to the patient? *Look at fixation dot, maintain target single for as long as you can)* YES/NO
- Use an appropriate target to control fixation and accommodation based on VA measurements? YES/NO
- Ensure that the target is initially single, and then move the target towards the patient at a reasonable rate and at the level of the YES/NO
- Determine NPC accurately and verifies break point objectively YES/NO
- Determine recovery point (based on at least 3 readings) YES/NO
- Record and Interpret the findings accurately? YES/NO
- Perform the test in a smooth and efficient way? YES/NO

____/8

Pupillary distance (distance and near)

Did the candidate:

- Explain the purpose of the test correctly? YES/NO
- Provide proper instructions to the patient? YES/NO
- Use correct target for fixation? (tip of finger or pen) YES/NO
- Close one eye? YES/NO
- Position himself/herself at eye level with patient? YES/NO
- Take Near PD? YES/NO
- Record and Interpret the findings accurately? (*within 2mm of* YES/NO
- Perform the test in a smooth and efficient way? YES/NO

____/8

Notes: Monocular PD must be taken with a patient with a strabismus.
Gross PD measurements when nystagmus is present.

Motilities: Pursuits:

Did the candidate:

- Explain the purpose of the test correctly? YES/NO
- Provide proper instructions to the patient? (*Follow target with eyes and don't move head)* YES/NO
- Use correct target? (*Woolf-ball or pen light*) YES/NO
- Hold target at approximately 40cm? YES/NO
- Evaluate each of the diagnostic action fields? YES/NO
- Ask patient to report pain or diplopia? YES/NO
- Record and interpret the findings accurately? (*Full/unrestricted, restricted & jerky/smooth, specify meridians if applicable)* YES/NO
- Perform the test in a smooth and efficient way? YES/NO

____/8

Note: Ductions should be performed when a muscle restriction or squint are noticed.

Saccades:
Did the candidate:

- Explain the purpose of the test correctly? YES/NO
- Provide proper instructions to the patient? YES/NO
- Use 2 different fixation targets? YES/NO
- Hold targets approx 20cm apart, and maintains this distance throughout testing of saccades? YES/NO
- Evaluate each of the diagnostic action fields? (H,V & 2x oblique) YES/NO
- Record and interpret the findings accurately? (*Accurate/overshoot and undershoot and specify meridians)*? YES/NO
- Perform the test in a smooth and efficient way? YES/NO

____/7

Confrontation visual fields
Did the candidate:

- Explain the purpose of the test correctly? YES/NO
- Provide proper instructions to the patient? YES/NO
- Use correct target? (*Wolff ball, pen light, approx. 2cm in diameter)* YES/NO
- Align him/herself at eye level of patient, about 60cm to 1m away? YES/NO
- Move target from unseen to seen and then across visual field? YES/NO
- Evaluate temporal, nasal, superior, inferior and oblique fields? YES/NO
- Record and interpret the findings accurately? (*Comparable to/same as examiner, specify area of any field restriction)*? YES/NO
- Perform the test in a smooth and efficient way? YES/NO

____/8

Pupil reflexes:
Did the candidate:

- Explain the purpose of the test correctly? YES/NO
- Provide proper instructions to the patient? YES/NO
- Appropriately set up (dim illumination if required) – ensure student can see pupil distinct from iris? YES/NO
- Measure pupil size in bright and dim illumination? YES/NO
- Provide a distance fixation target for the light reflex? YES/NO
- Assess the direct light reflex? YES/NO
- Assess the consensual light reflex? YES/NO
- Assess for APD (swinging flashlight test) correctly (*procedure and interpretation)?* YES/NO
- Assess near reflex? (*where applicable)* YES/NO
- Provide a near target for the near reflex? YES/NO
- Record the test results properly? YES/NO
- Perform the test in a smooth and efficient way? YES/NO

____/12

Note: A second problem list should be formulated.

SECTION 3

Retinoscopy

Did the candidate:

- Explain the purpose of the test correctly? YES/NO
- Provide proper instructions to the patient? YES/NO
- Set the phoropter or trial frame to the obtained distance PD? YES/NO
- **Position the patient and align and level the phoropter** YES/NO
- Put up a working distance lens and **explain the effect**? YES/NO
- Provide appropriate target (6/60 or spot of light)? YES/NO
- Put lights off and both eyes are open? YES/NO
- Position him/herself at eye level at the correct working distance away from the patient. Uses RE for patient's RE and vv. (*is able to alter working distance and working distance lens accordingly)?* YES/NO

____/8

Note: Sphere correction can be done with the proof of power crosses.

Tolerance for accuracy:
±0.50D for sphere and cylinder power;
±20° for ≤ 1.00DC;
±15° for > 1.00;
±10° for ≥ 2.00DC.

- Accurately determine the correct sphere power OD? YES/NO
- Accurately determine the correct cyl power OD? YES/NO
- Accurately determine the correct cyl axis OD? YES/NO
- Accurately determine the correct sphere power OS? YES/NO
- Accurately determine the correct cyl power OS? YES/NO
- Accurately determine the correct cyl axis OS? YES/NO

- Correctly record the prescription and the VA after retinoscopy? YES/NO
- Perform the test in a smooth and efficient way? YES/NO

____/8

SECTION 4

Distance Subjective Refraction

i. Monocular subjective: RE and LE

Did the candidate:

- Explain the purpose of the test correctly? YES/NO
- Provide proper instructions to the patient and is done monocularly? YES/NO
- Provide an appropriate target based on VA's after retinoscopy YES/NO
- Provide proper illumination (room illumination)? YES/NO
- Stop at the appropriate endpoint for best sphere (either using the fog/unfog technique or the ±0.25 lenses to MPMVA? YES/NO

____/5

ii. Duochrome: RE and LE

Did the candidate:

- Put the lights off? YES/NO
- Occlude one eye? YES/NO
- Provide proper instructions – emphasize darkness and clarity of targets and not brightness of background? YES/NO
- Use appropriate lenses (+ for green side and – for red side)? YES/NO
- Leave patient at *just green best / one into green?* YES/NO

____/5

iii. Cross-cyl technique RE and LE

Did the candidate:

- Occlude one eye? YES/NO
- Use an appropriate target (*an 'o' 1 line above best VA)?* YES/NO
- Provide proper instruction to the patient? YES/NO
- Determine axis correctly? YES/NO
- Determine power correctly? (*Add +0.25DS for every -0.50cyl*) YES/NO

____/5

iv. Binocular balance (can use HIC or Prism dissociation)

Note: Can only be done if VA is better than 6/12

Did the candidate:

- Provide proper instruction to the patient? YES/NO
- Use an appropriate target (*letter one line above best VA*)? YES/NO
- Use the correct fogging lenses, ensures that patient is fogged? *or*
- Use correct prisms if using the prism dissociation method? YES/NO
- Use correct lenses to balance and stop at the appropriate end YES/NO

____/4

- Perform the refraction in a smooth and efficient manner? YES/NO
- Record the final prescription accurately? YES/NO
- Check the Visual Acuity? YES/NO

____/3

Near refraction

v. Determination of reading addition

Note: Fused-cross cyl or MEM retinoscopy must be performed and then refinement of the ADD.

Fused-cross cyl:

Did the candidate:

- Explain the purpose of the test? YES/NO
- Provide proper instruction to the patient? YES/NO
- Ensure adequate target illumination (overhead lamp)? YES/NO
- Use the appropriate target (Fused-cross cylinder at 40cm) YES/NO
- Put +/- 0.50 cylinder lens in front of both eyes. YES/NO
- Reduce plus lenses binocularly until horizontal best? YES/NO

- Take the VA after determining the add YES/NO

____/6

OR

MEM retinoscopy (not to be done on a prebiope):

Did the candidate:

- Explain the purpose of the test? YES/NO
- Provide proper instruction to the patient? YES/NO
- Ensure adequate target illumination (normal illumination)? YES/NO
- Use an age-appropriate target? YES/NO
- Done binocular with distance prescription? YES/NO
- Neutralize the reflex within 0.50D of examiner YES/NO

____/6

Refinement of ADD:

- Put up the appropriate lenses binocularly to obtain the correct addition based on fused cross cyl, or PRA and NRA results YES/NO
- Refine add with +/- 0.25DS lenses YES/NO
- Measure the range YES/NO
- Know how to adjust power of the add to increase the working YES/NO
- Record the patient's working distance and range with the final add YES/NO
- Take the VA after refining the add YES/NO

____/6

<u>SECTION 5</u>:

Accommodative tests:

Amplitude of accommodation (compulsory in non-presbioop)

Did the candidate:

- Explain the purpose of the test? YES/NO
- Provide proper instruction to the patient? YES/NO
- Provide an appropriate target (line above best VA or 6/9)? YES/NO
- Ensure adequate target illumination? YES/NO
- Ensure determination of **sustained blur** by asking patient to blink and see if they can clear the target (*this emphasizes first, just* YES/NO
- Record findings accurately in diopters (OS, OD, OU)? YES/NO
- Give the interpretation of findings (according to *Hofstetter's rule: minimum 15– 0.25 of age)?* YES/NO

____/7

Negative and Positive relative accommodation

Did the candidate:

- Explain the purpose of the test? YES/NO
- Provide proper instruction to the patient? YES/NO
- Provide appropriate (*accommodative)* target at 40cm? YES/NO
- Ensure adequate target illumination? YES/NO
- Perform the technique with both eyes open? YES/NO
- Add Plus lenses simultaneously before the patient's eyes at an appropriate rate until first sustained blur is reported? YES/NO
- Add minus lenses simultaneously before the patient's eyes at an appropriate rate until first sustained blur is reported? YES/NO

- Accurately record and interpret the findings?

____/8

Binocular status / Vergence tests:
Von Graeffe done with Rx on
Did the candidate:

- Explain the purpose of the test? YES/NO
- Provide proper instruction to the patient? YES/NO
- Select an appropriate target (vertical row of letters based on best corrected VA for horizontal phoria and horizontal row for vertical YES/NO
- Provide proper room illumination (lights on)? YES/NO
- Use correct dissociating prisms (10 -12 BI and 6BU)? YES/NO
- Test both the horizontal and vertical phorias at distance and near? YES/NO
- Give proper interpretation of the horizontal findings (including direction and amount, BI = Exophoria, BO = esophoria YES/NO
- Give proper interpretation of the vertical findings (including direction, amount and eye, BD OD hyper)? YES/NO
- Perform the test in a smooth and efficient manner? YES/NO

____/9

OR

Maddox rod done with Rx on
Did the candidate:

- Explain the purpose of the test? YES/NO
- Provide proper instruction to the patient? YES/NO
- Select appropriate target (spot of light)? YES/NO
- Proper room illumination (dim)? YES/NO
- Use correct dissociating prisms (10 -12 BI and 6BU)? YES/NO
- Test both the horizontal and vertical phorias at distance and near? YES/NO
- Measure any deviation correctly (appropriate base direction and prism to reach alignment)? YES/NO
- Proper interpretation of findings (direction and amount, Crossed = exo, Uncrossed =eso)? YES/NO
- Perform the test in a smooth and efficient manner? YES/NO

____/9

Reserves done with Rx on
Did the candidate:

- Explain the purpose of the test? YES/NO
- Provide proper instruction to the patient? YES/NO
- Select an appropriate target (*Vertical row of letters based on best corrected VA)?* YES/NO
- Proper room illumination (dim)? YES/NO
- Perform the test in a smooth, efficient and effective way manner (*moving prisms smoothly in the same direction, simultaneous and at an appropriate rate*)? YES/NO
- Accurately record break and recovery for BI at distance? YES/NO
- Accurately record blur, break and recovery accurately for BO at distance? YES/NO
- Accurately record break and recovery accurately for BD at distance? YES/NO
- Accurately record break and recovery accurately for BU at distance? YES/NO
- Accurately record blur, break and recovery accurately for BI at YES/NO

- Accurately record blur, break and recovery accurately for BO at YES/NO

____/11

SECTION 6
Ocular Health

i. OPHTHALMOSCOPY:

Did the candidate:

- Explain the purpose of the test? YES/NO
- Provide proper instruction to the patient? YES/NO
- Provide target for the patient to focus on? YES/NO
- Ensure that the room illumination is set up correctly YES/NO
- Used R eye for patient R eye and vice versa YES/NO
- Correct disc diagrammed according to: YES/NO
  i. Disc ratio, margins, depth and colour of the disc
  ii. Macula
  iii. Vasculature – AV, venous pulsation, HTN signs
  iv. Background – colour, haemorrhage

____/6

ii. SLITLAMP

Did the candidate:

- Explain the purpose of the test? YES/NO
- Provide proper instruction to the patient? YES/NO
- Observe the external as well as ocular structures? YES/NO
- Assess both eyes with diffuse, optic section and performed lid YES/NO
- Record and draw any abnormality? YES/NO

____/6

iii. TONOMETRY:

Did the candidate:

- Explain the purpose of the test? YES/NO
- Provide proper instruction to the patient? YES/NO
- Performed tonometry on both eyes? YES/NO
- Record the results correctly? YES/NO

____/4

OTHER TESTS:

Note: Vergenge facility, AC / A ratio, Fixation disparity can be requested to be performed.

_____

_____

_____

_____

SECTION 7

i. Diagnosis:

The student should write down her/his diagnosis before the examiner checks the results. Comments

_____

_____

_____/5

ii. Management Plan: (*Note that the management plan should address all the problems on the problem list. The student should write down her/his management plan before the examiner checks the results):* **Comments**

_____

_____

_____/5

iii. Patient education

Note: Should be done after the examiner has checked the results as part of management. Student should be called aside where patient education must be discussed before it will be communicated to the patient.

Did the candidate:

- Describe the patient's condition in a clear concise manner? YES/NO
- Provide sufficient information to allow the patient to understand his/her condition? YES/NO
- Describe the management in a clear concise manner? YES/NO
- Provide sufficient information to allow the patient to understand his/her treatment? YES/NO
- Advise the patient when to return for re-examination? YES/NO
- Ask if the patient has any question regarding the diagnosis and management? YES/NO
- Present the information in a logical sequence? YES/NO
- Avoid offering conclusions that go beyond the clinical data YES/NO
- Avoid using jargon that might confuse the patient? YES/NO
- Treat the patient with courtesy and respect? YES/NO

____/10

DISPENSING EVALUATION:

i. Selection of frame and lenses

Did the candidate:

- Took the patient's occupation and lifestyle as well as the current prescription into account to make the correct lens selection? YES/NO
- Prescribed any tint, and if so was the correct tint provided depending on the patient needs? (Variable tint, gradient tint and fixed tint and was the rate correct e.g. A,B,C,D tint) YES/NO

- Made sure that the frame is appropriate for the prescription? YES/NO
- Made sure that the frame selected is appropriate for the patient face shape and size (e.g. frame width, temple length) YES/NO
- Assist patient throughout the frame selection and advise patient on different option? YES/NO
- Explain to patient that frames on display are a display frame and won't improve vision while fitting it on? YES/NO
- Advice patient on frame colour considering the patient's complexion and hair colour? YES/NO
- Look at the horizontal & vertical alignment of the frame YES/NO
- Look at the four point touch? YES/NO
- Look at the vertex distance? YES/NO
- Look pantascopic tilt? YES/NO
- Look at the bending of temple behind the ear? YES/NO

____/12

ii. Measurements

- Was the candidate at the same level as the patient? YES/NO
- What PD measurement was taken, was candidate aware when to take the monocular PD's YES/NO
- Did the patient fixate at the correct point while performing the measurements? YES/NO
- Was candidate aware of the minimum fitting and segment height? YES/NO
- Was the measurement 1mm difference from the examiner? YES/NO

____/5

Comments

_____

_____

_____

_____

Mark allocation:

Techniques and recording:		**50 %**
1. Case History 2. Preliminary tests	____/20 ____/70	5%
3. Retinoscopy 4. Refraction & Determining of an add	____/16 ____/34	25 %
5. Accommodation & Vergence tests	____/35	5%
6. Ocular health	____/16	10 %
7. Diagnosis, Patient education and Management	____/20	5%

Overall presentation and communication:		**20%**
Case history flowed in a good orderly manner. Student managed the patient holistically and patient education was respectable.	____/5	
Student handled the evaluation of the patient well in regards to being professional and ethical.	____/5	
Communication in regards to explaining the purpose of each relevant test as well as clear instructions.	____/5	
Student is in control of the evaluation, performing the relevant tests in a confident manner.	____/5	

Dispensing		**30%**
Dispensing of spectacles with patient	____/17	30%

Final mark:	

Failure criteria during clinical evaluation:

- Incorrect diagnosis and management.
- Incorrect retinoscopy and subjective refraction.
- Missed pathology during ophthalmoscopy and /or slitlamp.
- Obtain an overall mark of less than 50%.
- Incorrect targets or techniques in most tests.
- Incorrect frame selection according to gender and prescription.

APPENDIX D

CURRENT MODULE GUIDE SECTION FOR CASE PRESENTATION

Grand Rounds

(Case presentations and reports)

The Grand Rounds are meant to provide a forum for presentations of clinical cases.

Each student is to select a clinical case that he/she had seen in the clinic. Note that simple cases of cataract, refractive error / presbyopia, conjunctivitis are not accepted in the grand rounds. The student should submit a case report based on the format given below 7 days before the presentation day. The case report should be typed; double line spacing and an Arial font 12 used. This case report together with the name and the UM number of the patient should be placed in a box which is clearly marked "CASE PRESENTATIONS" which is outside the Optometry secretary's office on the first floor (National Hospital).

Students are encouraged to use all available modern technology to enhance their oral presentations eg: Power point, Slide shows, Transparencies. Photographs of patient's anterior or posterior segment and visual field plots are encouraged.

The duration of the oral presentation is 20 minutes.

Format for Grand Rounds:

- History
- Examination
- Ancillary testing
- Treatment
- Differential diagnosis
- Diagnosis and discussion
- References

Assessment:

Students are evaluated according to the following criteria:

- Etiquette / Deportment of student.
- Content of the case.
- Presentation of the case.

- Theoretical knowledge in relation to the case study.
- Analysis of the case
- Correlation of results.
- Diagnosis
- Management.
- The ability of the presenter to answer questions confidently.
- The power point slides

Presentation Evaluation Form

		Mark	**Comments**
1. Case	Case history presented clearly (5)		
	Examination / Test done correctly (10)		
	Ancilliary tests discussed (3)		
	Management clearly stated and it is justifiable (10)		
	Diagnosis and differential diagnosis (case analysis done correctly, correlation of results and complaints done and the student has the theoretical knowledge in relation to the case) (10)		
	References are appropriate (2)		
2. Presentation:	Slides : Clear to read; no cluttering of information, few bullets per slides, acceptable font (18 and larger) (2)		
	Organization and delivery of the case is good; including voice, pace and clarity of the presentation. (3)		
	The presenter answers questions from the audience (5)		
Total Marks			

APPENDIX E

PROPOSED MODULE GUIDE SECTION FOR CASE PRESENTATION

CASE PRESENTATION AND DISCUSSION

Description of this lecture time:

Case presentations provide a forum for presentations of clinical cases with reflection. It forms part of the clinical module COPT 3706 & 4800 that counts towards clinical attendance. In this lecture time there will be case presentations made by students that reflected back on a patient seen in clinic. There will also be group discussion on the cases presented.

Exit level Outcome:

Students graduating with a B.Optometry degree and working as an Optometric health professional will have the required competencies of skills, knowledge and attitudes required, by meeting the following criteria:

The student will demonstrate the application of required theoretical knowledge and clinical skills with the presentation of a clinical case to fellow students and optometrists that has been analysed and reflected back with the appropriate management of ocular and visual problems.

General Module Outcome:

Students from different year group should be able to build on the different levels of knowledge required to perform a comprehensive eye examination on a patient with the correct diagnosis and management.

Specific Module Outcomes:

The learner should be able to:

- Reflect on a clinical case and present with a complete case history, examination, diagnoses and management.

- Demonstrate confidence and a sound understanding in the interpretation and case analysis.
- Display good presentation skills and designing of presentation.
- Participate in group activities and discuss different clinical case studies

Assessment Criteria

Students will be assessed according to the rubric provided. The assessment will be done by supervisors / optometrist as well as peers. The assessment mark will count towards the predicate mark for the involved module.

Case Presentation Rubric

Name of Presenter: _____

GRADING SCALE

5 = Excellent *4 = Good / above average* *3 = Satisfactory /Average /*

2 = Fair / below average *1 = Poor*

ASSESSMENT CRITERIA	**SPECIFIC OUTCOME**	***GRADING SCORE***	***JUSTIFICATION FOR A SCORE OF 1***
Case history:	A clear and complete case history with a good patient profile presented.	5 4 3 2 1	Incomplete and vague case history with a poor patient profile presented.
Examination:	Extensive and complete examination with all relevant tests done and correct reporting.	5 4 3 2 1	Examination incomplete and poor reporting
Interpretation and Case Analysis:	Demonstrates confidence and a sound understanding of the results. Indepth knowledge was evident. Case analysis was done correctly – correlated results and problem lists.	5 4 3 2 1	Does not demonstrate an understanding of the results and could not modify the examination accordingly. Only surface knowledge was evident. Case analysis was inadequate. No correlation of results with complaints/problem lists.
Diagnosis:	Diagnosis was accurate and extensive. Substantial theoretical knowledge to reach an accurate diagnosis of the case	5 4 3 2 1	Diagnosis was incorrect. Student has weak theoretical knowledge, to provide a correct and evidence-based diagnosis of the case
Management:	Management is clearly stated and comprehensive. It is justifiable in addressing the patient's needs.	5 4 3 2 1	Management unclear and insufficient. Not addressing patient main complaint.
References:	Factual information used correctly and when needed. Correctly referenced. No plagiarism.	5 4 3 2 1	Some information incorrect and unreferenced or in doubt. Plagiarism. Referenced Google, Wikipedia etc.
Presentation:	Good presentation skills (audible with eye contact) that captured the attention of the audience. Appropriate time usage of 15 min.	5 4 3 2 1	Poor presentation skills that shows lack in confidence and preparation. Exceeded time limit/did not use 15 minutes effectively.
Presentation Tool(s):	Media used appropriately and effectively with all the relevant information mentioned.	5 4 3 2 1	Media poorly prepared, inapplicable, not used effectively. Incomplete reporting of information.

Presentation:	Slides clear to read; no cluttering of information, few bullets per slides, acceptable font and colour (18 and larger)	5 4 3 2 1	Slides unclear with poor contrasting background, small font size and not in bullet format.
Questions	Shows insight/depth in the answering of questions	5 4 3 2 1	Cannot meaningfully and correctly answer questions

Comments:

_____
_____
_____
_____
_____
_____

Total: _____ x 2 = _____ %

Lecturer / Student: _____